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The Influence of Early Mother–Child Interaction on Preschool Cognitive/Linguistic Outcomes in a High-Social-Risk Group

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ABSTRACT: In this paper, elements of early mother–child interaction are related to later cognitive and linguistic outcomes in a sample of 53 high social risk mothers and their preschoolers. Mother–child interaction was observed longitudinally when the children were 13 and 20 months old. Multiple regression analyses were used to predict cognitive and linguistic outcomes at 3 and 5 years from measures of early mother–child interaction. The results indicated that the quality of early mother–child interaction was a significant predictor of preschool cognitive and linguistic outcomes. This was shown to be true regardless of the contribution of the mother's IQ.

RESUMEN: En este ensayo, se ponen en relación los elementos de la temprana interacción entre madre y niño con los resultados cognitivos y lingüísticos posteriores, en un conjunto-muestra de 53 madres de alto riesgo social y sus niños de edad preescolar. La interacción madre-niño fue observada longitudinalmente cuando los niños tenían 13 y 20 meses de nacidos. Se usaron los análisis de regresión múltiple para predecir los resultados cognitivos y lingüísticos a los 3 y 5 años, tomando en cuenta las medidas de la interacción temprana entre la madre y su niño. Los resultados de la investigación indicaron que la calidad de esa interacción era una medida significativa para predecir los posteriores resultados cognitivos y lingüísticos preescolares. Se demonstró la veracidad de este hecho independientemente de la contribución del cuociente de inteligencia de la madre.

RÉSUMÉ: Dans cet article les éléments d'intearction précoce mère-enfant sont liés aux futurs résultats cognitifs et linguistiques chez un échantillon de 53 mères à risque social élevé et leurs enfants d'âge préscolaire. L'interaction mère-enfant a été observée longitudinalement quant les enfants avaient 13 et 20 mois. Les analyses de régression multiple ont été utilisées pour prédire les résultats cognitifs et linguistiques à 3 et 5 ans à partir de mesures d'intearction précoce mère-enfant. Les résultats ont indiqué que la qualité de l'interaction mère-enfant était un important facteur de prédiction des résultats cognitifs et linguistiques des enfants d'âge préscolaire. Cela s'est avéré vrai sans qu'il n'y ait aucun lien avec la contribution du QI de la mère.

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抄録：この論文は、53組のハイ・ソーシャルリスクマザーとその就学前児童における、早期母子相互交流と、後における認知的・言語的達成度との関連性について考察する。母子相互交流を縦断的に、13カ月と20カ月の時点で観察した。早期母子相互交流評価から、 3才および 5才における認知的・言語的達成度を予測するのに、多項目回帰分析を用いた。その結果によれば、早期母子相互交流の質は、就学前における認知的・言語的達成度を有意の差をもって予測する。その結果は、母親のＩＱの高さには関係がなかった。

Research over the past two decades has shown that the quality of early mother–child interaction has important implications for children's later cognitive and linguistic development (e.g., Bakeman & Brown, 1980; Beckwith, 1990; Bee et al., 1982; Belsky, Rovine, & Taylor, 1984; Bradley & Caldwell, 1976a, 1976b; Brazelton, 1988; Clarke-Stewart, Vanderstoep, & Killian, 1979; Coates & Lewis, 1984; Farran & Ramey, 1980; Morisset, Barnard, Greenberg, Booth, & Spieker, 1990; Olson, Bates, & Bayles, 1984; Redding, Harmon, & Morgan, 1990; Tamis-LeMonda & Bornstein, 1989). A number of studies have attempted to identify specific elements of the early social environment that can impact children's later intellectual development. High maternal involvement, maternal sensitivity, and positive maternal responsiveness to infant cues have been shown to have positive effects on children's mental development (Elarado, Bradley, & Caldwell, 1975; Epstein & Evans, 1979; Farran & Ramey, 1980; Lewis & Goldberg, 1969; Stern, Caldwell, Hersher, Lipton, & Richmond, 1973; Wachs & Gruen, 1982), whereas critical and controlling behaviors have been related to poor intellectual development (Bayley & Schaefer, 1964; Cross, 1984; Epstein & Evans, 1979; Nelson, 1973; Snow, Midkiff-Borunda, Small, & Proctor, 1984). Several studies discuss the importance of establishing rhythmicity in dyadic interaction, in which both the mother and the child adapt and respond to each other in mutually satisfying ways (Barnard, Hammond, Booth, Bee, Mitchell, & Spieker, 1988; Brazelton, Koslowski, & Main, 1974; Houck, Booth, & Barnard, 1991; Korner, 1971; Thoman, 1975).

There is evidence that negative patterns of mother–child interaction are more likely to occur in families that are at high social risk due to social and/or economic disadvantages (e.g., Bernstein, 1961; Cohen & Beckwith, 1979; Maccoby, 1980; Olim, 1970; Smith, Flick, Ferriss, & Sellman, 1972; Snow et al., 1976). Mothers from socioeconomically disadvantaged environments have been reported to be less stimulating and less responsive (Barnes, Gutfreund, Satterly, & Wells, 1983; Ramey, Farran, & Campbell, 1978; Tulkin & Cohler, 1973), and more restrictive and controlling (Bee, VanEgren, Streissguth, Nyman, & Leckie, 1969; Clarke-Stewart, 1973; Clarke-Stewart et al., 1979), than mothers from middle-class environments.

Another factor linked to poor intellectual outcomes in children is low maternal intelligence (Longstreth et al., 1981; Yeates, MacPhee, Campbell, & Ramey, 1983). Considerable research indicates that maternal IQ is the single best predictor of child IQ, and that additional measures of the early social environment are of little value in predicting children's later intellectual development beyond that which can be explained by maternal IQ (Longstreth et al., 1981; Scarr & Weinberg, 1978). Scarr (1985) suggested that proximal parent–child interaction variables are associated with children's intellectual functioning only because both share a more fundamental origin in distal variables such as maternal IQ. In contrast, other researchers studying the effects of heredity and environment on children born to mothers with few social or economic resources have concluded that children's intellectual outcomes are a result of the risky environment in which the children

Table 1
Sample Characteristics (N = 53)

Variable	Mean or %	Std Dev	Description
Maternal age	22.31	4.41	At child's birth
Maternal IQ	90.57	9.04	Quick Test
Maternal education	11.46	1.56	Years of schooling
Partner status	55.6%		% Unpartnered
Race	93.4%		% White
Welfare status	57.4%		% On welfare
Child GA	40.02	1.46	Gestational age at birth
Child sex	57.4%		% Male
Child's birth order	51.9%		% First born

are reared, and not solely the result of the effects of maternal intelligence (Lee & Burchinal, 1987; Ramey, Yeates, & MacPhee, 1984; Sameroff, Seifer, Baldwin, & Baldwin, 1993; Yeates et al., 1983).

The purpose of this study was to examine the quality of interaction in a group of high social risk mothers and their infants and to identify specific aspects of the interaction that predicted later preschool cognitive and linguistic outcomes. Additionally, we explored the question of whether the child's linguistic and cognitive competencies were solely a function of differences in maternal intellectual functioning, or were due to both maternal intelligence and the quality of the mother–child interaction.

METHODS

Subjects

As part of a larger ($N = 147$) longitudinal study of high social risk mothers and their children, a subsample of 53 mothers and their children are included in the present report. These 53 dyads were included on the basis of their continuing longitudinal participation in the study, at child ages 13 and 20 months, and again at 36 months and/or 5 years. Fifty-three dyads were followed when the children were 13, 20, and 36 months of age, and 29 of the dyads were again seen when the children were 5 years of age.

Demographic characteristics of the subsample are provided in Table 1. In general, the mothers were White and had slightly less than 12 years of formal education. Fifty-six percent of the mothers were unpartnered and 57% were on welfare. All but two infants were carried to term, and these two infants did not weigh less than 1,500 grams. Fifty-one percent of the children were first-born and 57% were male.

Procedures and Variables[1]

Mother–child interaction was observed longitudinally in a laboratory situation when the children were 13 and 20 months old. At both 13 and 20 months, the Strange Situation (Ainsworth, Blehar, Waters, & Wall, 1978) was conducted and videotaped segments of the first reunion were later used to code affect and emotional availability. At 20 months,

[1]The measures and variables are described in more detail in the introductory article describing the Collaborative Study (Barnard, Osofsky, Beckwith, Hammond, & Appelbaum, 1996).

we additionally conducted a mother–child play session to code the quality of mother–child interaction. We chose to focus on reunion and play episodes to obtain a picture of both the infant's and mother's individual contribution to the interactions, as well as the dyadic contribution reflected in the reciprocal behaviors of the infant and mother. These early interaction behaviors were then related to cognitive/linguistic outcomes collected in the lab at 36 months and 5 years of age. All measures and resulting variables are described in detail below.

Affect and emotional availability were rated from videotaped segments of the Strange Situation (Ainsworth, Blehar, Waters, & Wall, 1978), using the Infant Hedonic Tone Scale (Emde & Easterbrooks, 1985) and the Emotional Availability Observation Scales (Osofsky, Culp, Eberhart-Wright, and Hann, 1990). The Strange Situation was chosen because it consists of eight brief episodes of increasing stress for the infant, including the entrance of an unfamiliar adult and two departures by the mother. Use of the Strange Situation to code affect and emotional availability has been previously reported by Hann, Osofsky, Barnard, & Leonard (1994).

During the Strange Situation, the child's emotional arousal is heightened to necessitate mother's sensitivity, and both mother and child are more likely to exhibit a range of positive and negative behaviors. Affect and emotional availability were coded during the 3 minutes following the first reunion of mother and child to capture the novel behaviors of both the mother and child as they are reunited after the first 3-minute separation. The first reunion was chosen for coding because for a substantial subset of infants, the second separation and reunion is too stressful. Thus while the first separation does introduce some stress and leads to some variability in mother–infant reunion behavior, the second separation for these dyads would be too stressful, and rather than more variability, the range of affect during the second reunion could actually be restricted.

After the first separation, the mother is instructed to rejoin the stranger (who leaves immediately after the mother's entrance) and child in the laboratory room, pause for about 10 seconds to give the child a chance to react to her entrance, and then do whatever she wants. The mother is told she may hold and comfort her child if necessary and to engage the child in playing with the toys again.

The following variables from the Infant Hedonic Tone Scale and the Emotional Availability Observation Scales were used in analyses: infant's positive hedonic tone (the amount of laughing, smiling, and interest); infant's negative hedonic tone (the amount of crying, fussing, and frowning); mother's positive affect (facial or vocal positive displays); and dyadic verbal reciprocity (infant vocalizes and mother responds in a sensitive and appropriate manner).

The quality of mother–child play was assessed using the Mother–Child Play Scales (Booth & Houck, 1987) at 20 months from videotapes which included a laboratory free-play session. Immediately prior to the dyadic play segment, the child played alone with toys while the mother sat in a chair in the playroom and completed questionnaires. An important feature of this scenario was that the mother and child were required to shift from their individual, solitary endeavors to joint, mutually regulated play. The observation sessions were conducted in the same room for all subjects. Videotaping took place through a one-way mirror and instructions were provided to the mother via a transmitter in her ear. During the child solitary play session, the child was placed on the floor to play with age-appropriate toys and the mother sat in the chair completing questionnaires. All mothers complied with the instruction

to respond if her child made a bid, but to avoid initiating any interactions. After 6 minutes elapsed, the mother was instructed to put her questionnaires aside and to get down on the floor and "have fun" with her child. The first 3 minutes of the 6-minute mutual play interaction were coded because the initial transition, from solitary endeavors to joint play, was of primary interest. The suggestion for the mother to shift to mutual play with her child was expected to provoke and challenge the dyad to coordinate their behavior for joint play, without explicit directions for the mother to lead or follow in play. This feature of the negatiation of play is believed to accentuate the control-salient aspects of mother–child play. The limited structure provided an efficient albeit artificial way to accelerate the occurrence of the behaviors of interest that may not have been observed naturally without provocation.

Three variables from the Mother–Child Play Scales (Booth & Houck, 1987) were chosen to reflect the quality of the interaction during the 20-month play episode: infant's engagement (the degree of infant engagement with the mother), mother's sensitivity (mother's ability to lead and follow the child in sensitive, responsive ways), and dyadic interactional fit (the degree to which the dyad achieved positive mutual adaptation during play).

The two child outcome measures used in this study were the Preschool Language Scale (PLS) (Zimmerman, Steiner, & Pond, 1979), administered in the lab when the children were 36 months old, and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) (Wechsler, 1967), given in the lab at 5 years of age. The PLS is a screening and evaluation instrument that tests articulation, auditory comprehension, and verbal ability. The verbal ability items include verbal imitation, responses to open-ended questions, and simple conversation skills. The auditory comprehension tasks tend to be supported by contextual cues and require only nonverbal responses such as pointing or manipulating test materials. Concurrent validity has been established with the Peabody Picture Vocabulary Test and the Stanford Binet L-M (Terman & Merrill, 1960; Zimmerman et al., 1979). Both the verbal and auditory subscale scores were used in study analyses.

The WPPSI is a well standardized test for children 4 to $6\frac{1}{2}$ years of age. Ten of the subtests are grouped into Verbal and Performance scales used to compute Verbal, Performance, and Full Scale IQ scores. The reliability and validity of the scales have been well established (Braken, 1987). The Full Scale IQ scores were used in study analyses.

The Quick Test (Ammons & Ammons, 1962), given to the mother when the child was 1 year of age, was designed as a brief individual test of general intelligence. Each of the three forms of the test employs a single plate containing four line drawings; each form is comprised of a list of 50 words arranged in order of their level of difficulty. The words are read aloud to the subject who is asked to point to the picture that is most closely associated with the word. In reporting reliabilities, the authors summarize 10 separate studies, with reliability coefficients based on comparable forms ranging from .60 to .96. Concurrent validity has been established with the Wechsler Adult Intelligence Scale (WAIS) with *r*s ranging from .70 to .84 (Abidin & Byrne, 1967; Ogilvie, 1965; Stewart, Cole, & Williams, 1967).

RESULTS

Table 2 presents the correlations among predicter variables. As shown in the table, maternal IQ was significantly correlated to three interaction variables: 13-month mother positive affect, 20-month mother sensitivity, and 20-month dyadic fit.

Table 2
Correlations Among Predictor Variables

	13-Month variables				20-Month variables							
	Infant + hedonic tone	Infant − hedonic tone	Mother + affect	Dyadic verbal recip.	Infant + hedonic tone	Infant − hedonic tone	Infant engagement	Mother + affect	Mother sensitivity	Dyadic verbal recip.	Dyadic fit	Maternal IQ
13-month predictors												
Infant + hedonic tone	—	−.11	.19	.26	.17	−.08	.24	.06	.11	.07	.16	.25
Infant − hedonic tone	−.11	—	.06	.22	−.02	.30*	.11	.21	.24	.03	.32*	−.08
Mother + affect	.19	.06	—	.32*	−.06	−.08	.14	.26	.23	.09	.25	.34*
Dyadic verbal recip.	.26	.22	.32*	—	.11	.26	.36**	.22	.31*	.35**	.35**	.23
20-month predictors												
Infant + hedonic tone	.17	−.02	−.06	.11	—	−.03	.09	.01	.03	.16	−.09	.15
Infant − hedonic tone	−.08	.30*	−.08	.26	−.03	—	.20	.16	.22	.12	.18	−.10
Infant engagement	.24	.11	.14	.36**	.09	.20	—	.12	.42**	.19	.40**	.09
Mother + affect	.06	.21	.26	.22	.01	.16	.12	—	.17	.45**	.23	.23
Mother sensitivity	.11	.24	.23	.31*	.03	.22	.42**	.17	—	.07	.31*	.45***
Dyadic verbal recip.	.07	.03	.09	.35*	.16	.12	.19	.45***	.07	—	.08	.16
Dyadic fit	.16	.32*	.25	.35**	−.09	.18	.40**	.23	.78***	.08	—	.30*
Maternal IQ	.25	−.08	.34*	.23	.15	−.10	.09	.23	.45***	.16	.30*	—

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

Table 3
Correlations Between Predictors and Outcomes

Predictor	Outcome		
	PLS Verbal ($N = 53$)	PLS Auditory ($N = 53$)	WPSSI Full Scale ($N = 29$)[a]
13-Month			
Infant + hedonic tone	−.09	.33*	.10
Infant − hedonic tone	.04	−.13	−.16
Mother + affect	.16	.42**	.03
Dyadic verbal reciprocity	.19	.41**	.00
20-Month			
Infant + hedonic tone	.15	.06	−.16
Infant − hedonic tone	−.02	−.07	−.07
Infant engagement	.06	.20	.26
Mother + affect	.13	.15	.11
Mother sensitivity	.19	.33*	.51**
Dyadic verbal reciprocity	.18	.35*	.10
Dyadic interactive fit	.13	.12	.30
Maternal IQ	.10	.42**	.38*

[a]Due to subject attrition, the sample size at 5 years was relatively small. The primary reason for attrition was the inability to locate subjects who moved frequently.
*$p < .05$; **$p < .01$ two tailed tests.

Table 3 presents the correlations of the 13- and 20-month predictor variables and maternal IQ with the PLS Verbal and Auditory Subscales and the WPPSI Full-Scale IQ score.

Five of the interaction variables were significantly correlated with the 3-year PLS-Auditory Quotient: 13-month infant positive hedonic tone, 13-month mother positive affect, dyadic verbal reciprocity at 13 and 20 months, and 20-month mother's sensitivity. One 20-month interaction variable, mother's sensitivity, was significantly correlated with the WPPSI Full-Scale IQ score. Maternal IQ was significantly correlated with both the PLS Auditory Subscale and the WPPSI Full Scale Score.

In the next stage of the analyses, multiple regression was used to determine the relative contribution of the five interaction variables (described above) in predicting the PLS Auditory Subscale and the WPPSI Full-Scale IQ Scores (Table 4). The PLS Verbal Subscale was not used because there were no significant correlations between it and the interaction variables. The predictor variables were entered into the equation stepwise. Mother's positive affect at 13 months and dyadic verbal reciprocity at 13 months were significant predictors of the PLS Auditory Scale score. Both 20-month dyadic verbal reciprocity and 20-month mother's sensitivity also were significant predictors of the PLS. Not surprisingly, in view of the correlations presented in Table 3, the 13-month interaction variables did not predict the WPPSI. Although dyadic verbal reciprocity at 20 months did not account for a significant amount of variance in predicting the WPPSI, mother's sensitivity at 20 months was a potent predictor of child IQ at 5 years.

Hierarchical regressions were used to examine the influence of maternal IQ, and the 13- and 20-month interaction variables on child linguistic and cognitive functioning (Table 5). In the first regression equation, maternal IQ was entered first, followed by the 13-month interaction variables and then the 20-month interaction variables. This analysis was used to determine whether the interaction variables contributed to the prediction of outcomes, beyond the contribution of maternal IQ. Table 5 shows that when maternal IQ

Table 4
Multiple Regressions Predicting PLS Auditory and WPPSI IQ from 13- and 20-Month Interaction Variables

Outcome	Predictor	Beta	Mult *R*	R^2 (Adj)[a]	*F*
PLS Aud.	13-Month interaction		.54	.26	7.0***
	Infant + hedonic tone	.20			
	Mother + affect	.30*			
	Dyadic verbal recip.	.26*			
PLS Aud.	20-Month interaction		.45	.17	6.22**
	Dyadic verbal recip.	.32*			
	Mother sensitivity	.28*			
WPSSI IQ	13-Month interaction		.10	−.10	.09
	Infant + hedonic tone	.10			
	Mother + affect	.01			
	Dyadic verbal recip.	−.01			
WPSSI IQ	20-Month interaction		.53	.22	4.98*
	Dyadic verbal recip.	.13			
	Mother sensitivity	.52**			

*p <.05; **p <.01; ***p <.001.
[a]The statistical "adjusted R^2" corrects R^2 to more closely reflect the goodness of fit of the model in the population.

was entered first, it was a significant predictor of the PLS, and 13-month interaction accounted for a significant amount of additional variance in predicting the PLS.

In the second regression equation, the 13-month interaction variables were entered first, followed by the 20-month interaction variables, and maternal IQ. This analysis was used to determine whether maternal IQ would be a significant predictor of outcomes, beyond the contribution of the interaction variables. When the interaction variables were entered first, 13 month interaction was a significant predictor of the PLS, 20-month interaction was a moderate predictor that was significant at the trend level, and maternal IQ ceased to be a significant predictor.

Table 5
Hierarchical Regressions Predicting the PLS Auditory and WPPSI IQ from Maternal IQ and Interaction Variables

Outcome	Step	Mult *R*	R^2 (Adj)[a]	*F* (chng)[b]
PLS Aud.	1. Maternal IQ	.42	.16	11.19**
	2. 13-Mo. Inter. Var.	.59	.30	4.28**
	3. 20-Mo. Inter. Var.	.63	.32	1.70
	1. 13-Mo. Inter. Var.	.54	.26	6.98***
	2. 20-Mo. Inter. Var.	.61	.31	2.72†
	3. Maternal IQ	.63	.32	1.93
WPSSI IQ	1. Maternal IQ	.38	.11	4.48*
	2. 20-Mo. Inter. Var.	.55	.21	2.75†
	1. 20-Mo. Inter. Var.	.53	.22	4.98*
	2. Maternal IQ	.55	.21	.71

†p <.10; *p <.05; **p <.01; ***p <.001.
[a]The statistical "adjusted R^2" corrects R^2 to more closely reflect the goodness of fit of the model in the population.
[b]For the first step in each equation the values in the *F* (chng) column represent the *F*-ratio in the first step.

These two analyses were repeated for the WPPSI. The results indicated the same pattern of prediction of the WPPSI as for the PLS. When maternal IQ was entered on the first step, it was a significant predictor of child IQ, and 20-month interaction was a moderate predictor that was significant at the trend level. When 20-month interaction was entered first, it became a significant predictor of child IQ, and maternal IQ was no longer significant.

DISCUSSION

Our results support previous findings that the quality of early mother–child interaction is highly related to developmental outcomes in a high social risk group. Although interactional variables from the child, mother, and dyadic perspectives were considered, the maternal and dyadic variables proved to be the most salient predictors of later linguistic and cognitive outcomes. Specifically, when infants and mothers engaged in reciprocal verbal interactions (13 and 20 months) and mothers were positive (13 months) and sensitive (20 months), infants scored higher on a language measure at 36 months. Additionally, infants whose mothers were highly sensitive during play at 20 months obtained higher IQ scores at 5 years of age.

The interaction variables were significantly related to auditory comprehension rather than to verbal ability as measured by the PLS. A number of explanations are possible. One is that at 3 years of age, receptive skills are more advanced than expressive skills, and, as a result there may be more to measure (Morisset et al., 1990). We also found that auditory comprehension was significantly correlated with the later 5-year WPPSI Full Scale IQ (75, $p < 01$) and verbal ability was not. Perhaps the PLS auditory comprehension scale is more related to the WPPSI Full Scale IQ because it taps skills that are more indicative of later intelligence, although this is difficult to assess as only 29 subjects were available for the WPPSI.

Of particular interest in the present sutdy was the finding that the interactive quality of the mother–child interaction made an independent contribution to the child's linguistic and cognitive competencies, beyond the contribution of maternal IQ, even though maternal IQ and 13- and 20-month interaction variables were significantly related. When the variance due to maternal IQ was accounted for, the relation between the interaction variables and child outcomes was still considerable. On the other hand, when the order of entry in the regression was reversed, maternal IQ was no longer a significant predictor of child outcomes. These results suggest that the relations between interaction variables and child outcomes reflect the effects of mother–child interaction as a unique and substantial contributor to the child's intellectual outcomes.

The results of this study seem to contradict previous research indicating that measures of the social environment are of little value in predicting children's later intellectual development beyond that which can be explained by maternal IQ (Longstreth et al., 1981; Scarr & Weinberg, 1978). It is important to remember that the present study and (others with similar results, e.g., Yeates et al., 1982) sampled children who experienced environmental circumstances vastly different from most children's. The significant contribution of home environment to child IQ found in socioeconomically disadvantaged samples, therefore, may not be paralleled in more advantaged samples. Scarr (1992) proposed that ordinary differences between families have little effect on children's development, and intellectual

potential is not altered by the environment unless the family circumstances are very poor. In these extreme cases, she concluded, the deleterious effects of poor environments can be overcome by correcting the environment to allow for normal growth and development.

This line of thinking, along with the results of the present study, lead us to believe that the quality of early mother–child interaction in a high social risk group is an important focus for preventive intervention aimed at enhancing the quality of interactions and increasing the intellectual potential of high social risk children. Regardless of the mother's IQ, interactive quality is shown to have an independent effect on a child's intellectual outcomes, and therefore, should be the focus of early intervention. Support for intervention with mothers with low IQs is provided by Feldman (1994) in his review of outcome studies of early intervention efforts with parents with intellectual disabilities, and by Kelly, Morisset, Barnard & Patterson (1996) in their presentation of case studies of mothers with low intellectual abilities and their discussion of suggested intervention techniques to improve mother–child interaction and child outcomes.

In terms of enhancing interactive quality, preventive intervention should focus both on efforts to increase the caregiver's awareness of infant behaviors and cues, and to facilitate the caregiver's positive, sensitive, and responsive interactions with the infant. Finally, preventive intervention services may achieve the most optimal results when they are begun during the first 2 years of life when patterns of mother–child interaction are forming.

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