

Influence of Caregiver Responsiveness on the Development of Young Children with or at Risk for Developmental Disabilities

Carol M. Trivette

The effects of a responsive caregiver style of interaction on the cognitive development of young children with or at risk for developmental disabilities constitutes the primary focus of this practice-based research synthesis. A secondary focus of the synthesis is to explore the effects of a responsive caregiver style of interaction on the social-emotional development of these children. Responsive caregiver interactions are defined as sensitive, appropriate responses that are contingent on the child's production of a behavior. Findings from the 13 studies examined in this synthesis indicate that this style of interaction has a positive influence on the cognitive development of young children with or at risk for developmental disabilities, even after the effects of several demographic variables were controlled. A responsive caregiver style also has a positive influence on the social-emotional development of these children. Implications for practice are described in terms of the caregiver styles of interaction most likely to optimize cognitive and social-emotional development of young children with or at risk for developmental delays.

Purpose

The primary purpose of this practice-based research synthesis is to determine the effects of a responsive caregiver style of interaction on the cognitive development of young children with or at risk for developmental delays. The secondary focus of this synthesis is to determine the effects of this style of interaction on the social-emotional development of young children with or at risk for developmental disabilities. In this synthesis, the term *caregiver responsiveness* is used to describe interactions that are contingent on the child producing a behavior and that are sensitive and appropriate to the child's developmental level. Although there have been various terms used to describe this type of caregiver interaction with infants or young children, it is most frequently referred to as responsive style of interaction (Beckwith & Cohen, 1989).

Responsive caregivers are important because they promote feelings of control and self-efficacy in children, which contribute to children's sense of competence, thereby increasing performance (Lewis & Goldberg, 1969). Responsiveness as defined here also promotes in children a strong sense of security about their environment and a greater interest in environmental exploration. Children learn they can trust the environment to be supportive and are therefore willing to explore and try new things.

Cognitive development in young children is enhanced through the active production of behavior that the child uses while exploring the environment (Beckwith & Cohen, 1989). The reader is referred to Bornstein (1989) for further discussion of the major theoretical assumptions underlying the relationship between a responsive style of adult interaction and the cognitive and social-emotional development in children.

The conduct of this synthesis is guided by a framework that focuses on the degree to which variations in the home environment are associated with variations in the social-emotional development of children (Dunst, Trivette, & Cutspec, 2002). In general terms, a practice-based research synthesis differs from more traditional meta-analyses by systematically examining and unpacking the characteristics of practices that are related to differences in

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outcomes or consequences. Specifically, this type of analysis focuses more on an understanding of *how* the same or similar characteristics exert the same or similar observable effects and not solely on statistical relationships between or among these variables.

Background

There is a large body of research on early caregiver-child interaction (see Shonkoff & Phillips, 2000). Research over the past three decades has shown that a responsive maternal style of interaction has positive effects on the cognitive and social-emotional development of children who are typically developing (e.g., Bornstein, 1989; Coates & Lewis, 1984; Estrada, Arsenio, Hess, & Holloway, 1987; Olson, Bates, & Bayles, 1984). A number of studies show that maternal responsiveness has a positive effect on children's cognitive development (Elardo, Bradley, & Caldwell, 1975; Epstein & Evans, 1979; Lewis & Goldberg, 1969), whereas controlling interactions are related to poor cognitive functioning (Bayley & Schaefer, 1964; Hann, Osofsky, Barnard, & Leonard, 1994; Kelly, Morisset, Barnard, Hammond, & Booth, 1996). For example, infants whose mothers restrict their exploratory behaviors tend to exhibit delays in cognitive development (Olson et al., 1984), whereas infants whose mothers are responsive to them both verbally and physically tend to have positive developmental outcomes (Coates & Lewis, 1984).

Beginning in the 1960s, numerous studies involving the parents of children with disabilities demonstrated differences in interactional patterns between parents of children with and without disabilities (e.g., Crawford, 1982; Hann et al., 1994; Lojkasek, Goldberg, Marcovitch, & MacGregor, 1990; Mahoney, 1988a, 1988b; Marfo & Kysela, 1988; Rondal, 1978; Tannock, 1988; Terdal, Jackson, & Garner, 1976). Studies beginning in the 1980s examined the impact of various types of interactions (e.g., the effects of a directive style of interaction during free play) on the development of children with or at risk for developmental disabilities (e.g., Beckwith & Parmelee, 1986; Crawley & Spiker, 1983). This research synthesis focuses specifically on the effects of a responsive style of interaction on the cognitive and social-emotional development of children with or at risk for developmental disabilities, not on the similarities and differences of interaction styles between parents of children with and without disabilities.

Description of Caregiver Responsiveness

Caregiver responsiveness, the focus of this research synthesis, includes two components that occur simultaneously during an interaction. First, this style of interaction requires the adult to respond only to the child's production of a behavior. The fact that caregiver responses occur after the child produces a behavior and are not just

stimulated by the child's mere presence is an important distinguishing feature of this definition. The child's behavior that prompts a response could be a physical gesture (e.g., a smile, leg kick, or wave), a vocal sound (e.g., a laugh, coo, or word), and/or an action (e.g., dropping a spoon, throwing a ball, or picking up a toy). Following the operational definition described in this synthesis, the intentionality of the child's behavior is not important. However, one feature of a contingent response is that it occurs promptly after the child has initiated a behavior. The child's behavior, whether it is a physical gesture, vocal sound, or action, elicits a prompt response from the caregiver. For example, the caregiver quickly returns a child's smile with a smile or a child's vocalization with a tickle on the child's tummy.

The second component of a responsive caregiver interaction as defined in this synthesis is an appropriate level of response intensity. *Sensitivity* is another term frequently used in the literature to describe this characteristic. An appropriate, sensitive response is one in which the intensity level of the response matches the child's developmental level and mood. An adult response is appropriate or sensitive if the adult adjusts the response to the child's developmental level so as to make the response reinforcing for the child. For example, very young children can be overwhelmed if the adult response is too quick or loud and startles the child. Considering the child's mood is also part of an appropriate response. For example, an appropriate, sensitive caregiver response to an upset child would be for the adult to engage in behaviors likely to calm the child, such as speaking in soothing tones or hugging. On the other hand, if a toddler is very excited, an enthusiastic caregiver response might include swinging the child up in the air.

These two components, then, comprise the practice that is the focus of this research synthesis. Caregiver responsiveness, as defined and referred to in this synthesis, simultaneously contains an appropriate, contingent response to the child's production of a behavior that matches the developmental level and mood of the child.

Search Strategy

Search Terms

The following search descriptors were used to locate relevant studies: parental responsiveness, maternal responsiveness, caregiver responsiveness, parental sensitivity, maternal sensitivity, caregiver sensitivity, positive affect, IQ, and cognitive ability. The search was delimited by adding infants or toddlers or preschool children or young children as a Boolean condition and was further restricted by using the term developmental disability, disability, or at-risk.

Sources

The primary databases searched for relevant studies were: Psychological Abstracts (PsycINFO), Educational Resources Information Center (ERIC), Social Sciences Citation Index (SSCI), Sociological Abstracts, and MEDLINE. In addition, hand searches were completed for relevant journal articles, book chapters, and books in order to locate additional studies. The reference list of each newly identified study was reviewed to determine whether it contained studies previously unidentified.

Selection Criteria

Studies were included in the synthesis if: (1) caregiver responsiveness to young children's behavior was a focus of the investigation, (2) the majority of the children in the study were birth to 5 years of age and had developmental disabilities or were at risk for developmental delays, and (3) the children's cognitive development was a primary outcome measure.

Each study included in this synthesis had at least one observational assessment of caregiver responsiveness. This observation of caregiver interaction had to be made before the child was 5 years of age to be included in this synthesis. Studies that focused on children with developmental disabilities or children who were at risk for developmental delays because of medical or environmental factors were included in this synthesis. Typically developing children were only included when they comprised a comparison group in a study. The studies in this synthesis all included a standardized measure of cognitive development as a primary outcome.

Exclusion Criteria

Since the characteristics of caregiver responsiveness in this practice-based synthesis focus on a responsive style of interaction, studies that examined other types of responsive interactions between caregiver and child (e.g., responsiveness of the overall environment as measured by the Home Observation for Measurement of the Environment [HOME] inventory) were not included (e.g., Barnard & Bee, 1983; Bradley, Rock, Caldwell, & Brisby, 1989; Olson et al., 1984). Even though some studies included the appropriate independent and dependent measures, they were excluded if the analysis was performed in such a way that the specific effects of caregiver responsiveness on the cognitive development could not be determined (i.e., Seifer, Clark, & Sameroff, 1991).

Synthesis Results

Thirteen (13) studies were located in 11 research reports. Table 1 shows selected characteristics of study participants. Table 2 presents information regarding research designs used in the studies, characteristics of the

observations made of caregiver responsiveness, and the cognitive and social-emotional outcomes that constitute the focus of this synthesis.

Participants

The studies included 1,336 children who had disabilities, were at risk for developmental delays due to a variety of conditions, or were typically developing and participated as part of a comparison group (see Table 1). Just over half of the study participants ($N = 713$, 53%) were born prematurely with very low birth weights (less than 2,500 grams), 356 (27%) were identified as having a disability, 164 (12%) were considered environmentally at risk due to certain characteristics of the mother (e.g., age, educational level), and 103 (8%) were children developing typically. At the time their parents were recruited for the studies, the children ranged in age from birth to about 3 years.

The initial assessment of caregiver interaction was collected during the children's first year of life in four studies (31%). In eight studies (62%), the first assessment was made when the children were between 13 and 24 months of age. One study (Dunst & Trivette, 1988) did not report when the first assessment of parent-child interaction occurred. Five studies (38%) included in this synthesis assessed caregiver responsiveness only once during the study. Four studies (31%) reported two assessments and three studies (23%) reported three assessments of caregiver responsiveness.

All studies reviewed in this synthesis focused on interactions between primary caregiver and child. In 11 studies (85%), at least 98% of the caregivers were identified as female, usually the biological or adoptive mother of the child. Two studies (15%) did not specify the gender of the caregiver. The gender of the children who participated in these studies was reported in 12 of the 13 studies (92%). The percentage of males in the studies ranged from 44% to 61%. Eight studies (62%) specified ethnicity and 75% of the eight reported that at least 50% of the participants were Caucasian. Seven studies (54%) reported the percentage of caregivers who were married or living with a partner, with these percentages ranging from 68% to 95%. Eleven studies (85%) reported the mean educational level of the mothers. The mean educational level of the mothers was reported as being between 12.1 and 12.9 in six of the studies (46%) and three of the studies (23%) reported the mean educational level as less than 12 years.

Research Design

Table 2 summarizes the research designs employed by each study. Seven studies (54%) used a panel design, three studies (23%) used a randomized experimental design, two studies (15%) used a cross-sectional design (Crawley & Spiker, 1983; Dunst & Trivette, 1988), and one

study (8%) used a cohort design (Mahoney, Finger, & Powell, 1985). The three studies (23%) that used a randomized experimental design were reported by Mahoney and his colleagues (1998). Two of these experimental studies and the seven panel studies reported longitudinal data concerning the effects of a responsive style of interaction on developmental outcomes. Of these nine longitudinal design studies, four (44%) were short-term and covered less than two years (Beckwith & Parmelee, 1986; Hann, Osofsky, & Culp, 1996; Mahoney et al., 1998 [Study 1 and 2]). Five of the nine longitudinal studies (56%) were long-term and covered more than two years (Beckwith & Rodning, 1996; Beckwith, Rodning, & Cohen, 1992; Kelly et al., 1996; Landry, Smith, Swank, Assel, & Vellet, 2001; Moore, Saylor, & Boyce, 1998).

Practice Characteristics

There were considerable similarities regarding the characteristics of caregiver responsiveness across studies, despite the fact that researchers used a variety of terms to describe the practice and its characteristics. In 12 studies (92%), contingent responding was considered a part of the definitions of maternal responsiveness. The appropriateness or level of sensitivity of the caregiver's response was an essential part of the definition in 11 studies (85%). Eight studies (62%) used existing scales to measure caregiver responsiveness. In five studies (38%), the researchers developed the definition of maternal responsiveness rather than using existing instruments.

The observations of maternal responsiveness used in these studies occurred both in the children's homes ($N = 5$, 39%) and in clinics or laboratories ($N = 5$, 39%). Three studies (22%) did not specify where the observations occurred. Seven studies (54%) reported the length of time observed during the assessment of responsiveness. The amount of time ranged from 10 to 70 minutes, with the natural observations lasting an average of 63 minutes. In the majority of the studies ($N = 10$, 77%), independent assessments of maternal responsiveness were made from videotapes of interactions between the mothers and their children. Reliability data concerning the assessment of mother-child interaction was available for nine of the 13 studies (69%). The reliability estimates were strong in these nine studies.

Outcomes

The cognitive outcomes in each study included at least one standardized measure of cognitive development. Researchers in 10 studies (77%) used more than one measure of cognitive development. At least two different measures of cognitive development were used in seven of the eight longitudinal studies (87%).

Different cognitive instruments were used to ensure that the measures were developmentally appropriate. For

example, since the Bayley Scales of Infant Development (Bayley, 1969) is appropriate for children whose developmental age is less than 30 months, several studies changed the cognitive outcome measure they used when children were more than 30 months. Six studies (46%) used the Bayley Scales of Infant Development, five studies (39%) used the Stanford-Binet Test (Terman & Merrill, 1973), and five studies (39%) reported including various measures of language development.

Social-emotional outcomes were measured in six studies (46%). The social-emotional outcomes included: child joy or enjoyment, positive affect (e.g., smiling, laughing), social responsiveness (e.g., laughing during interaction), social initiation, pro-social problem-solving behaviors (e.g., talking about a disagreement with a peer), and school behavior problems (e.g., getting along with peers). Similar to the measures of cognitive development, social-emotional outcomes differed depending on the age of the children. For example, when children were young, the children's expressions of positive emotion (e.g., expressions of joy) were often the social-emotional measure, whereas in longitudinal studies that included older children, measures of social-emotional development focused on age appropriate social interactions (e.g., pro-social behavior).

Synthesis Findings

Table 3 summarizes the findings from the studies regarding cognitive and social-emotional development. This summary includes both a description of the influence of maternal responsive interaction on cognitive and social-emotional outcomes as reported in each study and an assessment of the strength of the relationship reported between a responsive style of interaction and the outcomes (i.e., credibility).

Cognitive Development

Positive effects of a responsive style of interaction on various aspects of cognitive development in children with developmental disabilities or at risk for developmental delays were reported in all 13 studies. Nine of the 13 studies (69%) found a positive relationship between a responsive style of maternal interaction and cognitive development as measured by standardized tests of cognitive development. Three studies (23%) found a similar positive relationship between a responsive style of maternal interaction and children's language development. The positive effects of a responsive maternal interaction style on the cognitive or linguistic development of young children were found after partialing out a number of background variables, such as mother's IQ or family's socioeconomic status (Hann et al., 1996; Kelly et al., 1996; Moore et al., 1998).

The majority of studies in this synthesis examined the effects of maternal responsiveness on cognitive outcomes longitudinally, both short-term, covering two years or less ($N = 4$, 31%) and long-term, more than 2 years ($N = 5$, 39%). In these studies, the relationship between maternal responsiveness when children were young and the children's cognitive development in later years persisted, although some interesting findings regarding the consistency of maternal responsiveness across different stages of child development were found. Overall, Beckwith and her colleagues (1992) found a positive relationship between mothers who consistently used a responsive style of interaction across their child's development and higher IQ scores when the child was 12 years of age. The reader is referred to Beckwith et al. (1992) for a full discussion of the relationship between various patterns of consistency in a responsive interaction style and long-term cognitive development.

A low degree of credibility (i.e., failure to provide data demonstrating a reliable assessment of caregiver responsiveness) was found in four studies (23%). These studies failed to provide any indication that the assessment of maternal responsiveness was reliable. A moderate degree of credibility was found in two studies (Crawley & Spiker, 1983; Mahoney et al., 1985) because research methods used in these studies left open concerns regarding rival explanations. Seven studies (54%) were assessed as having high credibility. These latter studies reported evidence regarding the relationship between the caregiver's style of interaction and the outcome in a generally unequivocal manner. All seven of these studies reported strong measures of both the practice characteristics (caregiver responsiveness) and the consequence (cognitive development). They also used research designs and analysis procedures appropriately to establish a strong relationship between the practice and its consequence and to rule out rival explanations.

Social-Emotional Development

Six studies (46%) examined at least one social-emotional outcome in addition to cognitive development. In five of the six studies (83%), a positive relationship between maternal responsiveness and various measures of child social-emotional development was found. Three of the studies (50%) that reported a positive relationship between maternal responsiveness and social-emotional development were long-term longitudinal studies that collected social-emotional outcome data at least two years after the ratings of maternal responsiveness were collected.

Rival Explanations

A number of rival explanations might explain the positive findings reported in the studies reviewed in this synthesis. For most of these studies, sample selection in indi-

vidual studies was based on the presence of one or more characteristics of the child (e.g., very low birth weight) or the mother (e.g., low education level) and could pose a threat to the external validity of individual studies by suggesting the findings are unique only to the population being studied. The likelihood that sample selection is an alternative explanation for these findings is reduced by the fact that the characteristics of the participants varied across studies that produced the same findings and these findings are consistent with studies of typically developing children.

Participant mortality or attrition could explain the positive findings in the longitudinal studies that made up 69% of the studies contained in this synthesis. However, the majority of these studies ($N = 6$, 66%) reported no differences on demographic measures between those participants who left and those who remained in the studies, thereby reducing the plausibility of attrition as a rival explanation.

Since data on the practice, responsive interactions, was collected through observation, an accurate assessment of the independent variable is critical. With strong reliability data reported for 8 of the 13 (62%) studies available, concerns that measurement variations in maternal interactions were a result of observer bias are minimized.

In any longitudinal study that contains a dependent measure that is age related, maturation is likely to impact the outcome, though the influence of maturation on this outcome would be expected to be consistent. Therefore, the variance accounted for by the environmental event of caregiver responsiveness adds a unique contribution to the outcome of cognitive development beyond the effect of maturation. Likewise, history could also be a plausible explanation in any individual longitudinal study. However, during the two decades in which these studies were conducted, no historical event transpired that is likely to have influenced the outcome across all of these studies.

Conclusion

Findings from this practice-based research synthesis indicate that a responsive caregiver style of interaction positively influences the cognitive development of children with or at risk for developmental disabilities. Likewise, the contention that a responsive style of interaction has a positive influence on the social-emotional development of these children is supported by findings from these studies (e.g., Bornstein, 1989; Coates & Lewis, 1984; Estrada et al., 1987; Olson et al., 1984). Findings from this synthesis parallel the results of studies conducted with children who are typically developing. Therefore, the conclusion of this synthesis is that caregivers who are responsive during interactions with infants and young children, as defined in this synthesis, are likely to have posi-

tive influences on the short- and long-term cognitive and social-emotional development of children with or at risk for developmental disabilities.

Implications for Practice

There is one caveat concerning the promotion of this responsive style of interaction when working with families. Potential variations in effectiveness of this practice across cultures must be considered since these studies were mainly conducted with Caucasian caregivers (see Participant Characteristics in Table 1). A number of researchers (Lewis, 2000; McCollum & McBride, 1997) have expressed concern regarding the appropriateness of this style of interaction across all cultures. Because it is important to be sensitive to variation in beliefs regarding what constitutes appropriate caregiver-child interaction, the use of the interactional style suggested by this synthesis would only be appropriate when working with families whose beliefs about parenting accepts adult elicitation of social and interactive behavior from children. The findings from this synthesis should not be generalized to all parents since it is known that parenting beliefs and practices are influenced by a number of cultural and socioeconomic factors (Lewis, 2000; McCollum & McBride, 1997).

The findings from this research synthesis have implications for practice with parents who believe it is appropriate for adults to elicit social behaviors from their young children. The use of a responsive style of interaction with young children with disabilities or at risk for developmental delays is supported by available research evidence. This evidence suggests that the use of a responsive style of caregiver interaction with children has positive consequences on cognitive development, even through elementary school. This same positive relationship between a responsive style of interaction and the social-emotional development of children with disabilities or at risk for developmental delays is also documented.

Practice characteristics of responsive interaction style. This synthesis informs practice by defining a caregiver style of interaction that positively influences the cognitive development of children with disabilities. One important aspect of this responsive style of interaction is the timing or sequence of the interaction. In this definition, the caregiver's interaction with the child is not initiated by the adult, but occurs in response to some behavior the child produces. The important aspect is that the caregiver's behavior is a contingent response occurring only after the child engages in an action. So, the timing of the caregiver's response is important, it needs to occur quickly after the child produces some behavior.

The second important aspect of the interaction is the appropriateness or sensitivity of the caregiver's response. The caregiver's response, whether calming or enthusiastic is appropriate if it matches the child's development and

mood. Caregiver responsiveness is an interaction style that responds to something the child does in a way that does not overwhelm the child and matches the child's mood.

To assist practitioners in implementing this practice, a *Bottomlines* (Vol. 1, No. 6) report that describes the major findings from this practice-based research synthesis in nontechnical, user-friendly language has been developed. The *Bottomlines* summarizes what we know about caregiver responsiveness specifically for parents and practitioners. Also included is a lively vignette illustrating what the practice looks like for a young child and her parents.

Both the *Bridges* and *Bottomlines* reports are being used to produce practice guides that take a user step-by-step through the process of developing and implementing contingency learning games. These guides will be available to readers in either electronic versions at our website (www.researchtopractice.info) or written versions that can be obtained by writing to us at our Research and Training Center address. Practice guides are developed by our staff when research evidence supports the use of a particular practice. For this synthesis, both a written practice guide and a videotaped guide will be available.

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Author

Carol M. Trivette, Ph.D., is Co-Director and Research Scientist at the Orelena Hawks Puckett Institute, Morganton, NC; e-mail: trivette@puckett.org.

Table 1
Characteristics of the Study Participants

Study	Child Characteristics				Caregiver Characteristics			
	Sample Size	Diagnosis	Age at Assessment (months)	Percent Male	Percentages			Mean Education Level (years)
					Female	Caucasian	Married ^a	
Beckwith & Parmelee (1986)	53	Preterm, low birth weight	1, 4, 8, 9, 24, 60, 96	57				13
Beckwith & Rodning (1996)	51	Preterm, low birth weight, respiratory distress, low socioeconomic status	13, 20, 36, 60	45	100	33	55	12
Beckwith et al. (1992)	44	Preterm, low birth weight	1, 8, 24, 144	61	100			13
Crawley & Spiker (1983)	18	Down's syndrome	24	44	100	67		
Dunst & Trivette (1988)	40	Developmental disabilities, at risk for developmental disabilities						
Hann et al. (1996)	69	Environmentally at risk	13, 20, 30, 44	45	100	57	16	10
Kelly et al. (1996)	53	Environmentally at risk	13, 20, 36, 60	57	100	93	45	11
Landry et al. (2001)	103 102 77	Full term Medically low-risk preterm, very low birth weight Medically high-risk preterm, very low birth weight	6, 12, 24, 42, 54	50	100	26		12
Mahoney et al. (1998) (Study 1: Infant Health and Development Program)	298	Premature, low birth weight	24, 30, 36	50	100	50	40	58% high school or higher
Mahoney et al. (1998) (Study 2: Effects & Costs of Alternative Types of Early Intervention)	238	Delays in one or more developmental domains	12 to 48	54	100	76	75	13
Mahoney et al. (1998) (Study 3: Play and Learning Strategies Program)	42	Environmentally at risk	Mean 11.5	53	100			10
Mahoney et al. (1985)	60	Down's syndrome, Williams syndrome, hydrocephaly	12, 24, or 36	57	100	60	95	13
Moore et al. (1998)	88	Premature, very low birth weight	24, 30, 66	50	98	66	76	13

^a Married or living with partner

Table 2
Characteristics of Research Design

Study	Research Design ^a	Definition	Caregiver Interaction				Outcomes	
			Observation			Reliability Data ^e	Cognitive/Linguistic ^f	Social/Emotional ^g
			Location ^b	Length ^c	Type ^d			
Beckwith & Parmelee (1986)	PD ¹	Caregiver responsiveness to infants' signals defined as contingent/reciprocal interaction	H	60	N	Y	<i>Stanford-Binet</i> at age 5 years <i>WISC-R</i> at age 8 years	
Beckwith & Rodning (1996)	PD ²	Dyadic verbal reciprocity (mother responds vocally to infant vocalization) Maternal sensitivity (degree to which the mother follows or adopts the child's topic in play)	L		V	Y	<i>Bayley</i> at 13 & 20 months <i>RLS</i> at 36 months <i>McCarthy</i> at age 5 years	Pro-social problem-solving at age 5 with <i>Rubin</i>
Beckwith et al. (1992)	PD ²	Maternal responsiveness (sensitive, contingent responding)	H	60	N	Y	<i>WISC-R</i> and <i>WRAT</i> at age 12 years	Teacher perception of behavior problems in school at age 12 with the <i>Rutter</i>
Crawley & Spiker (1983)	CS	Maternal responsiveness (degree to which mother's responses reflect awareness of child's cues or signals)	H	20	V	Y	<i>Bayley</i> at 24 months	Social responsibility (degree to which child responds to mother's initiations) Positive affect (expresses positive feeling toward mother)
Dunst & Trivette (1988)	CS	Contingent responsiveness	C	20	V	N	<i>Bayley</i> Expressive and receptive language	
Hann et al. (1996)	PD ¹	Maternal positive and negative affect Maternal responsiveness (contingent verbal responsiveness to child)	L		V	Y	<i>Stanford-Binet</i> at 36 months <i>PPVT</i> assessed child's receptive language at 44 months	Positive and negative child affect
Kelly et al. (1996)	PD ²	Mother's responsiveness (mother's ability to lead and follow the child in sensitive, responsive ways) Dyadic verbal reciprocity (infant vocalizes, mother responds in sensitive and appropriate manner)	L		V	Y	<i>PLS</i> at 36 months <i>WPPSI</i> at age 5 years	
Landry et al. (2001)	PD ²	Maternal responsiveness (prompt and appropriate responses showing sensitive contingent responses to children's cues)	H	70	N	Y	<i>Bayley</i> assessed at 6, 12, and 24 months <i>Stanford-Binet</i> assessed at age 3½ and 4½ years	Child social responsiveness was the sum of points assessed for various positive social behaviors.

Table 2, continued

Study	Research Design ^a	Definition	Caregiver Interaction				Outcomes	
			Observation			Reliability Data ^e	Cognitive/Linguistic ^f	Social/Emotional ^g
			Location ^b	Length ^c	Type ^d			
Landry et al. (2001), continued		Maternal stimulation (frequency with which mothers used verbal or nonverbal behavior directed toward the child)						
Mahoney et al. (1998) (Study 1)	RE ¹	Maternal responsiveness (effectiveness, responsiveness, and sensitivity)			V	N	<i>Bayley</i> at 24 months <i>Stanford-Binet</i> at 36 months	
Mahoney et al. (1998) (Study 2)	RE ¹	Maternal responsiveness (effectiveness, responsiveness, and sensitivity)			V	N	<i>BDI</i> at 24 and 36 months	
Mahoney et al. (1998) (Study 3)	RE	Maternal responsiveness (effectiveness, responsiveness, and sensitivity)			V	N	<i>DASI-II</i>	
Mahoney et al. (1985)	CD	Maternal responsiveness (sensitivity, degree of comfort, appropriate teaching, enjoyment, responsiveness, playfulness, and approval)	H	10	V	Y	<i>Bayley</i>	Measures of child's enjoyment and expressiveness
Moore et al. (1998)	PD ²	Amount of appropriate responsiveness (reflects the timing and appropriateness of parents responding to child's cues) Responsiveness (parent responds promptly and appropriately to even subtle cues of the child)	C	10	V	Y	<i>BDI</i> at age 2 years <i>Stanford-Binet</i> at age 5½ years	

^a Research designs included the following: RE = Randomized experimental, CD = Cohort design, CS = Cross sectional, PD = Panel design, ¹ = Longitudinal study covering 2 years or less, ² = Longitudinal study covering more than 2 years

^b Locations of caregiver-child observation included the following: H = Home, C = Clinic, L = Laboratory

^c Length = Number of minutes parent and child were observed

^d Type of data collection included: V = Videotaped, N = Naturalistic Observation

^e Reliability: Y = Reliability data was available on the maternal responsiveness observations, N = Reliability data was not available on the maternal responsiveness observations

^f *Bayley* = *Bayley Scales of Infant Development* (Bayley, 1969), *BDI* = *Battelle Developmental Inventory* (Newborg et al., 1984), *DASI-II* = *Developmental Activities Screening Inventory-II* (Fewell & Langley, 1984), *McCarthy* = *McCarthy Scales of Children's Abilities* (McCarthy, 1972), *PLS* = *Preschool Language Scale* (Zimmerman et al., 1979), *PPVT* = *Peabody Picture Vocabulary Test* (Dunn, 1965), *RLS* = *Reynell Language Scales* (Reynell & Huntley, 1971), *Stanford-Binet* = *Stanford-Binet Test* (Terman & Merrill, 1973), *WISC-R* = *Wechsler Intelligence Test* (Wechsler, 1974), *WPPSI* = *Wechsler Preschool and Primary Scale of Intelligence* (Wechsler, 1967), *WRAT* = *Wide Range Achievement Test* (Jastak & Jastak, 1978)

^g *Rubin* = *Rubin Social Problem Solving* (Rubin, 1982), *Rutter* = *Rutter Child Behavior Scale* (Rutter et al., 1976)

Table 3
Major Findings of the Caregiver-Child Interaction Scales

Study	Cognitive Development		Social-Emotional Consequences	
	Cognitive/Linguistic Outcomes ^b	Credibility ^a	Positive Behavior	Credibility ^a
Beckwith & Parmelee (1986)	At 5 and 8 years of age children who received consistently responsive caregiving interaction scored significantly higher in cognitive development.	H		
Beckwith & Rodning (1996)	Using multiple regression, maternal responsiveness accounts for significant variance at 36 months expressive (beta = .47) and receptive (beta = .39) language development.	H	Maternal responsiveness at 20 months accounted for a significant amount of the variance in 5-year-old prosocial problem-solving ability.	H
Beckwith et al. (1992)	Children who received lower maternal responsiveness during infancy and early adolescence had significantly lower IQ scores and arithmetic achievement scores at 12 years of age.	H	Maternal responsiveness related to teacher perceptions of fewer behavior problems at school after covarying out maternal education.	H
Crawley & Spiker (1983)	Maternal responsiveness measure correlated (.68) with MDI.	M	Maternal responsiveness significantly correlated (.62) with social responsivity of the child.	M
Dunst & Trivette (1988)	Contingent responsiveness not related to progress on the <i>Bayley</i> after the effects of personal characteristics (education level, age), family characteristics (socioeconomic status, income), child characteristics (age, sex), child diagnosis (level of retardation, diagnostic group), and social support. Responsiveness was related to language development after the effects of the sets described above were removed.	L		
Hann et al. (1996)	Using multiple regression, at 13 months maternal responsiveness accounted for variance (25%) in 44-month <i>PPVT</i> score after demographic risk was taken out. At 20 months maternal positive verbal responsiveness accounted for variance (19%) in 44-month <i>PPVT</i> score after demographic risk score was taken out.	H	No measures of maternal responsiveness at 13 months were related to positive or negative child affect at 20 months.	L
Kelly et al. (1996)	Mother responsiveness at 20 months accounted for significant variance in <i>PLS</i> auditory score and <i>WPPSI</i> IQ. Findings held even after the mother's IQ was controlled.	H		
Landry et al. (2001)	High maternal responsiveness when child is young (early) followed by low maternal responsiveness when child is older (late) does not have as strong a positive effect on cognitive outcomes as high-early and high-late maternal responsiveness. However, the high-early/low-late maternal responsive pattern has a better effect on cognitive development than a low-early/low-late pattern of maternal responsiveness.	H	Social growth was faster when early maternal responsive styles were used consistently.	H
Mahoney et al. (1998) (Study 1)	Responsiveness at 30 months accounted for 13% of variance at 24 months, intervention accounted for 4%, and directiveness was negatively related to <i>Bayley</i> scores. Responsiveness at 30 months accounted for 25% of the variance at 36 months, interventions accounted for 4%, and directiveness was negatively related to <i>Stanford-Binet</i> scores.	L		
Mahoney et al. (1998) (Study 2)	Maternal responsiveness was a significant predictor of <i>BDI</i> at 24 months (beta = .40) and 36 months (beta = .25).	M		
Mahoney et al. (1998) (Study 3)	Maternal responsiveness accounts for 10% of variance in <i>DASI-II</i> scores.	L		

Table 3, continued

Study	Cognitive Development		Social-Emotional Consequences	
	Cognitive Outcomes	Credibility ^a	Positive Behavior	Credibility ^a
Mahoney et al. (1985)	Maternal responsiveness factor correlated .41 with MDI	M	Maternal responsiveness was correlated .56 with child enjoyment.	M
Moore et al. (1998)	Maternal responsiveness was a significant predictor of IQ at age 5½ after removing medical problems, maternal education, and <i>BDI</i> at age 2 using multiple regression analyses.	H		

^a Study credibility refers to the degree to which variations in outcome measures were reported in enough detail to ascertain the effect: L = Low credibility, M = Moderate credibility, and H = High credibility. (See text for a more complete description of the credibility ratings.)

^b *Bayley* = *Bayley Scales of Infant Development* (Bayley, 1969), *BDI* = *Battelle Developmental Inventory* (Newborg et al., 1984), *DASI-II* = *Developmental Activities Screening Inventory-II* (Fewell & Langley, 1984), *PLS* = *Preschool Language Scale* (Zimmerman et al., 1979), *PPVT* = *Peabody Picture Vocabulary Test* (Dunn, 1965), *Stanford-Binet* = *Stanford-Binet Test* (Terman & Merrill, 1973), *WPPSI* = *Wechsler Preschool and Primary Scale of Intelligence* (Wechsler, 1967)