

Relationship Between Parental Contingent-Responsiveness and Attachment Outcomes

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The relationship between parental contingent-responsiveness and attachment outcomes was examined in 13 studies including 962 infants and their parents. Parental contingent-responsiveness refers to parental behavior emitted in response to child behavior that functions as a reinforcement influencing child behavior outcomes. Parental contingent-responsiveness was assessed prior to the child reaching 8 months of age, and child attachment was assessed between 12 to 15 months of age. Findings indicated a discernable relationship between parental contingent-responsiveness and attachment outcomes for young children. The results suggest that early parental contingent-responsiveness is an important determinant of later secure child attachment.

Purpose

The purpose of this practice-based research synthesis is twofold: (1) to test Gewirtz and Pelaez-Nogueras's (1992) assertion that parental contingent-responsiveness is an important determinant of secure attachment and (2) to assess the magnitude of the relationship between parental contingent-responsiveness and attachment outcomes for young children. Parental contingent-responsiveness refers to parental attention and responsiveness to child behavior, where parental behavior functions as a reinforcement influencing attachment as well as other child behavior (Gewirtz & Peláez-Nogueras, 1992). According to Ainsworth (1989), secure attachment is an affectional bond between an infant and adult that includes two key elements: (1) the infant seeking out the attachment figure in times of distress and need and (2) the infant having the ability and confidence to engage in activities separate from the attachment figure.

Whereas previous syntheses on the determinants of secure attachment have focused primarily on the relationship between multiple aspects of maternal sensitivity and attachment outcomes (e.g., De Wolff & van IJzendoorn, 1997; Goldsmith & Alansky, 1987), this synthesis focuses on the importance of parental contingent-responsiveness (Gewirtz & Peláez-Nogueras, 1992; Lamb & Easterbrooks, 1981) as an explicit component of sensitivity contributing to variations in attachment outcomes. The conduct of the synthesis is guided by a framework that focuses on the degree to which variations in parental contingent-respon-

siveness are associated with variations in types of child attachment (Dunst, Trivette, & Cutspec, 2002). This approach to synthesizing research evidence differs from more traditional approaches to the integration of research findings by its explicit focus on disentangling and unpacking the characteristics, features, and elements of environmental variables (Babbie, 1995; Bronfenbrenner, 1992) that are associated with behavioral or developmental differences.

Background

The term attachment refers to the affective and emotional bond that develops between an infant and his or her parents resulting from the social interactions and transactions that occur early in a child's life (Ainsworth & Bell, 1970). According to Egeland and Erickson (1999) "attachment is a pattern of interaction that develops over time as the infant and caregiver interact, particularly in the context of the infant's needs and bids for attention and comfort" (p. 5). Caregiver responsiveness to these requests is viewed as one factor increasing the likelihood that the infant will

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develop an understanding of the relationship between his or her behavior and caregiver consequences (Peck, 2003). The development of the attachment relationship is generally recognized as one of the most important features of human social and emotional development strengthening the parent/child relationship (Lamb, Ketterlinus, & Fracasso, 1992).

The development of secure attachment consistently has been found to be related to enhanced cognitive, social, and emotional development throughout childhood and early adolescence (Bukatko & Daehler, 2001; Fagot & Kavanagh, 1993; Hazen & Durrett, 1982; Matas, Arend, & Sroufe, 1978; Sroufe, Egeland, & Kreutzer, 1990). For example, children who develop secure attachments have been found to have advantages in cognitive functioning during childhood and lasting into the middle childhood and adolescent years (Jacobsen, Edelstein, & Hofman, 1994), are more socially competent with their peers during toddlerhood (Waters, Wippman, & Sroufe, 1979), and demonstrate less expression of negative emotions during toddlerhood (Kochanska, 2001).

The attachment construct has been examined as either a predictor (i.e., independent variable) of child developmental outcomes or as an outcome (i.e., dependent variable) of other child or caregiver behaviors. In this synthesis, parental contingent-responsiveness is examined as one determinant or antecedent of secure attachment. Maternal variables identified as affecting security of attachment include, but are not limited to, responsiveness to distress (Del Carmen, Pedersen, Huffman, & Bryan, 1993), warmth and involvement (Bates, Maslin, & Frankel, 1985), and appropriate levels of stimulation (Feldstein, Crown, Beebe, & Jaffe, 1995). Differences in the development of attachment patterns have been attributed, in part, to the mother's style of interaction and responsivity to infant signals (Ainsworth, Bell, & Strayton, 1971, 1972, 1974; Lamb, Bornstein, & Teti, 2002).

Description of the Practice

The extent to which different attachment patterns are shaped or influenced by different person and environmental variables has been the focus of attention by a number of researchers. Parental behavior manifested during parent-child interactions and in response to different child behaviors has been implicated as a factor influencing attachment outcomes (Ainsworth et al., 1971, 1972, 1974; Ainsworth, Blehar, Waters, & Wall, 1978; Gewirtz, 1961; Gewirtz & Peláez-Nogueras, 1991; Goldsmith & Alansky, 1987). Maternal sensitivity has by far been the parental behavior most studied as a determinant of attachment outcomes (De Wolff & van IJzendoorn, 1997; Goldsmith & Alansky, 1987).

Findings from a number of research syntheses indi-

cate that the relationship between maternal sensitivity and attachment is not nearly as strong as attachment theory predicts (De Wolff & van IJzendoorn, 1997; Goldsmith & Alansky, 1987), suggesting the contributions of other factors to attachment outcomes. Inspection of available evidence indicates that this may be due, in part, to a failure to operationally differentiate between different aspects of maternal sensitivity as determinants of attachment (De Wolff & van IJzendoorn, 1997; Peck, 2003; Rosen & Rothbaum, 1993). This appears to be the case because sensitivity has variously been defined (see De Wolff & van IJzendoorn, 1997) and attempts to unpack and isolate the effects for different aspects of sensitivity has not yet been done.

The focus of this practice-based research synthesis is to determine if different aspects of sensitive responsiveness have reinforcement value in ways consistent with an operant explanation of the consequences of parental contingent-responsiveness. Parental contingent-responsiveness refers to the adult behavior emitted in response to child behavior (Lamb & Easterbrooks, 1981) and refers to how parental responses function as a reinforcement influencing child behavior and outcomes (Gewirtz & Peláez-Nogueras, 1992). Stated differently, parental behavior that is contingent on and emitted in response to child behavior should influence the production of child behavior.

According to Gewirtz (1961; 1972a; Gewirtz & Peláez-Nogueras, 1992), attachment is the process by which child behavior is cued and reinforced by environmental stimuli available from or provided by the behavior of an attachment figure. For example, an infant who smiles at her parent and stretches her arms out toward the parent may experience being picked up and hugged. In such instances, parental contingent-responsiveness would be expected to function as a reinforcement (intervention or environmental variable) shaping the development of a secure attachment relationship (Gewirtz, 1972a, 1972b). Consequently, the temporal and contingent relationship between the infant and parents' behavior may be important because it allows the infant to learn the relationship (contingency) between his or her own behavior and the behavior of an interactive partner (Ainsworth et al., 1971; Lamb & Easterbrooks, 1981).

Based on Gewirtz's (1961; 1972a; 1972b; Gewirtz & Peláez-Nogueras, 1992) assertion that parental contingent-responsiveness is an important determinant of attachment outcomes, a search for relevant studies of the relationship between parental contingent-responsiveness and attachment outcomes was conducted. The focus of our synthesis is the extent to which parental contingent-responsiveness is warranted as an intervention practice for strengthening the parent/child relationship.

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Search Strategy

Search Terms

Identification of relevant studies was accomplished using the following search terms: contingent or contingency, contingent-responsiveness or responsiveness, contingent pacing, operant learning, social expectancy, infant expectations, and responsive parenting. The term attachment was used as a Boolean condition to delimit the search results.

Sources

A computer-assisted bibliographic database search was conducted using Psychological Abstracts online (PsycINFO), Educational Resource Information Center (ERIC), Social Science Citation Index (SSCI), MEDLINE, Cochrane Database of Systematic Reviews (Cochrane DSR), Cochrane Database of Abstracts of Reviews of Effects (Cochrane DARE), Cochrane Controlled Trials Register (Cochrane CTR), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Master File Premier, ISI Web of Science, InfoTrac One File, InfoTrac Expanded Academic ASAP, and Academic Search Elite. An online search via the Google search engine, as well as archival and hand searches of relevant journal articles were also conducted. Examinations of the reference sections of studies of attachment were also reviewed to identify other relevant investigations.

Selection Criteria

Studies were included in the research synthesis if they met the following criteria: (1) one or more aspects of contingent-responsiveness was measured and related to attachment outcomes, (2) contingent-responsiveness was measured in the context of parents interacting with their children in their home or in a laboratory situation, and (3) the first measurement period of contingent-responsiveness occurred before the time the child was 8 months of age and before attachment was measured.

Exclusion criteria. It was necessary to exclude certain studies during the initial phase of the search process. Studies were excluded if: (1) responsiveness was combined with other measures or constructs in the analyses and not analyzed separately (e.g., maternal responsiveness was summed with infant affect to produce a composite measure of mutuality), (2) attachment was measured but over-

all attachment classification (e.g., secure, insecure, avoidant) was not analyzed or only insecure attachment was the outcome examined, (3) contingent-responsiveness was inferred by the absence of responsiveness or the presence of unresponsiveness, and (4) contingent-responsiveness was measured concurrently with attachment.

Two studies that assessed the relationship between parental contingent-responsiveness and secure attachment were initially included in the synthesis but were subsequently excluded (Blehar, Lieberman, & Ainsworth, 1977; NICHD Early Child Care Research Network, 1997). In both studies, measures of contingent-responsiveness were assessed at specific child ages but the data were combined across ages for purposes of data analyses. Therefore, age specific relationships between contingent-responsiveness and attachment outcomes could not be discerned.

Search Results

Table 1 includes selected characteristics of the study participants and the periods of data collection for both parental contingent-responsiveness and child attachment. Table 2 includes the procedure utilized for assessing parental contingent-responsiveness and the measure of parental contingent-responsiveness used in each study.

Participants

Thirteen ($N = 13$) studies including 962 participants met the selection criteria and were included in the research synthesis. Study participants ranged in age from 1 to 10 months at the time contingent-responsiveness was first measured. The children's mothers were the interactive partners in all the studies.

Nine of the studies reported gender information for the children. Just over half ($N = 362$, 51%) of participants in these studies were males and 49% ($N = 358$) were females. The majority of child participants ($N = 728$, 76%) were typically developing, while 24% ($N = 234$) were identified as at risk for one or more reasons (low SES, adopted infants).

Contingent-Responsiveness

Three types of measurements or independent variables were used to assess the relationship between parental contingent-responsiveness and attachment (see Table 2). The measurements included: (1) parental contingent-responsiveness to child behavior (response contiguity) (De Wolff & van IJzendoorn, 1997), (2) the affective quality of parental contingent-responsiveness to child behavior (response quality) (Ainsworth, 1973), and (3) parent-child mutual responsiveness (three-step contingent-responsiveness) (Belsky, Taylor, & Rovine, 1984). Response contiguity was measured in five studies, response quality was measured in seven studies, and the three-step procedure was used in two studies. Two of the three procedures were used in eight studies.

Response contiguity was defined as the promptness

or frequency of parental responses to the infant's signals (De Wolff & van IJzendoorn, 1997). Response contiguity is distinguished from other measures of contingent-responsiveness by the absence of any qualitative assessment or measurement of parental behavior (De Wolff & van IJzendoorn, 1997). Response contiguity included measures of the percentage, frequency, or rate of parental contingent responses to child behavior as observed or recorded by the investigators. For example, Volker, Keller, Lohaus, Cappenberg, and Chasiotis (1999) used Watson's Responsiveness Index (Watson, 1979) to measure response contiguity.

Response quality was defined as the affective or emotional quality of maternal contingent-responsiveness to child behavior noted during mother-child interactions (Ainsworth, 1973). Quality of parental contingent-responsiveness was measured using Likert rating scales in all seven studies using this type of measure. One study (Fish, 2001) also used a parent self-reporting rating scale in addition to investigator ratings. The response quality measures differed from response contiguity measures by the inclusion of both *qualitative* and *quantitative* assessments of maternal contingent-responsiveness as opposed to just quantitative aspects of contingent-responsiveness.

Three-step contingent-responsiveness was defined as a sequence of interactions between mother and child where three or more contingent exchanges occur between mother and child (Belsky, Taylor et al., 1984). Stated differently, the production of behavior by the parent is contingent or dependent on the child's production of behavior, which in turn influences parent responsiveness. An example of a three-step contingent-response exchange between mother and child would be: Infant vocalizes to its mother, the mother vocalizes to the infant in response, and the infant then smiles (Belsky, Taylor et al., 1984). Three-step contingent-responsiveness has also been described as "interactional turn-taking" where "*responsiveness and mutual involvement are implicit* to this 'three-step' behavioral category" (Isabella & Belsky, 1991, p. 375, emphasis added). Three-step contingent-responsiveness included measures where occurrences of interactional turn-taking between mother and child were observed and recorded by investigators.

Setting

Parental contingent-responsiveness was observed or measured during parent-infant interaction in the home (N = 8) or laboratory (N = 3), or in both settings in the same study (N = 1). The setting for one study was not specified. Parental contingent-responsiveness was observed on more than one occasion in six of the studies.

Interactional context. Parental contingent-responsiveness was observed and measured during: (1) naturalistic and unstructured daily routines and/or free play in the

home (N = 6), (2) naturalistic but structured, semi-structured, or standard activities in the home (N = 2), (3) structured procedures in the laboratory (N = 2), or (4) unstructured play in the laboratory (N = 2). One study had a structured observation but the setting was not specified, and two studies had an in-home observation but the context was not specified. Observations were videotaped (N = 9), audiorecorded (N = 1), and/or detailed notes or checklists were used by the investigators (N = 4) during the observations. One study did not report their data collection methods.

Outcomes

The Strange Situation procedure (Ainsworth et al., 1978) was used in all studies to measure attachment outcomes (see Table 2). The Strange Situation procedure assesses the security of the mother-infant attachment relationship through the infant's reactions to the mother in response to a series of brief separations and reunions (Goldsmith & Alansky, 1987).

Children's attachment patterns were rated from the Strange Situation procedure as either: (1) secure (N = 13), (2) avoidant, insecure-avoidant, or anxious-avoidant (N = 11), (3) resistant, insecure-resistant, or anxious-resistant (N = 11), (4) disorganized or disoriented (N = 3), or (5) unclassifiable (N = 1). In this review, all insecure categories were combined to form one insecure group for each individual study. The focus of analysis was on the relationship between parental contingent-responsiveness to secure versus insecure attachment.

Relationship Between Contingent-Responsiveness and Attachment

The relationship between maternal contingent-responsiveness and secure attachment was ascertained in two ways. First, the number of times investigators reported a positive relationship between contingent-responsiveness and secure attachment was ascertained by findings included in each report regardless of the method used by the investigators to draw conclusions from their studies. Second, the magnitude of effect (Cohen's *d*) between variations in contingent-responsiveness and secure versus insecure attachment was used as an index of the effect size estimates or degree of association between the independent and dependent measures. Sufficient information was available in 11 of 13 studies to calculate Cohen's *d* effect sizes.

Research Designs

All studies included in this synthesis used prospective longitudinal designs where one or more measures of parental contingent-responsiveness were related to subsequent attachment classifications. In six of the studies, parental contingent-responsiveness was used as an independent variable and related to subsequent attachment

outcomes, and in seven studies, attachment outcomes were used as a grouping (independent) variable and the contingent-responsiveness measures were used as dependent measures. To be assured that this difference did not affect study findings, we performed preliminary analyses using the two types of studies as a grouping variable and the effect sizes as the dependent measures. The mean effect sizes were $d = 0.61$ ($SD = .26$, 95% confidence interval = .39 to .83) when contingent-responsiveness was the independent variable and $d = 0.58$ ($SD = .39$, 95% confidence interval = .37 to .79) when contingent-responsiveness was the dependent variable, $t(22) = .16$, $p = 0.87$, $d = 0.068$.

Synthesis Findings

Table 3 summarizes the findings from the studies regarding the relationship between parental contingent-responsiveness and attachment outcomes. The 13 studies included 39 “tests” of the relationship between maternal contingent-responsiveness and subsequent attachment outcomes. The investigators reported statistically significant relationships between measures for 23 (59%) of the 39 tests. However, in studies (85%) for which effect sizes were reported or could be calculated, the mean effect size was $d = .59$ ($SD = .35$, 95% confidence interval = .44 to .74), indicating that contingent-responsiveness was moderately related to secure attachment.

To further understand the influence of maternal contingent-responsiveness on secure versus insecure attachment, the synthesis authors examined the extent to which the relationship between maternal contingent-responsiveness and attachment outcomes differed as a function of the type of contingent-responsive measure utilized and the timing (child age) at which contingent-responsiveness was assessed. This was done because previous research indicates that how antecedents of attachment are measured (De Wolff & van IJzendoorn, 1997) and the timing of the antecedent measures (Atkinson et al., 2000) influences the magnitude of the relationship with attachment outcomes.

Type of Contingent-Responsiveness Measure

Table 4 shows the findings for the analyses of the relationship between type of response-contingent measure and attachment outcomes. The two different procedures for ascertaining the relationship between contingent-responsiveness and secure versus insecure attachment produced identical results. Both response contiguity and response quality were associated with discernable differences in attachment outcomes, whereas the three-step procedure did not distinguish between attachment outcomes. Additionally, both sets of results indicated that response quality appears to have value-added effects in terms of differentiating between secure- versus insecure-attachment outcomes as reflected by both the percentage

of significant relationships reported by the investigators and the magnitude of the effect size for the influence of response quality on attachment outcomes. These findings suggest the relative importance of the quality of contingent-responsiveness as a determinant of subsequent attachment outcomes.

Age-Related Differences

Table 5 shows the relationship between the child age at which contingent-responsiveness was measured and attachment outcomes. The effect sizes were larger when contingent-responsiveness was measured at younger ages, and the magnitude of the relationship showed a downward trend across the three child age levels used as the grouping variable. These findings suggest the relative importance of early contingent-responsiveness experiences as a determinant of subsequent secure attachment.

Rival Explanations

A number of threats to internal validity (Campbell & Stanley, 1963; Cook & Campbell, 1979) and rival explanations (Yin, 2000) could explain the study findings. In longitudinal studies of the sort reviewed in this paper, *maturational* would be a primary threat. However, the data presented in Table 5 suggest that this is not the case. The relationship between parental contingent-responsiveness and secure attachment was strongest when contingent-responsiveness was measured at young child ages. If maturation influenced the results, the relationship between contingent-responsiveness and secure attachment would have been expected to have steadily increased and been strongest from 7 to 9 months of age which was not the case.

The nature of the *testing* situations of the studies in this synthesis could also confound the outcomes. Parent-child interaction was measured by observation in each of the studies, and some studies had multiple observations ($N = 6$). The process of testing and retesting via observation methods could influence parental behavior. Parental behavior could improve as an effect of parenting experiences and of being repeatedly observed. However, the effects of testing on the outcomes are diminished because the investigators measured many other aspects of parenting behavior in addition to contingent-responsiveness. Testing may have also been a potential threat due to observer bias because so few studies reported inter-rater reliability for the data collected during observations.

Conclusions

Findings from this practice-based research synthesis indicate that parental contingent-responsiveness early in a child’s life is related to secure attachment outcomes. The contention that both the *quantity* and *quality* of parental responses contribute to strengthening the parent-child re-

lationship (i.e., secure child attachment) is supported by findings from studies that observed maternal responsiveness to infant behavior during parent-child interactions. Findings from this synthesis support Gewirtz and Pelaez-Nogueras' (1992) contention that contingent-responsiveness is an environmental (intervention) factor accounting for variations in and the development of attachment outcomes.

The results from the current synthesis indicate a larger magnitude of effect between parental behaviors and secure attachment than those reported in a previous synthesis of parental contingent-responsiveness as a determinant of attachment (De Wolff & van IJzendoorn, 1997), indicating that parental contingent-responsiveness may contribute independently to subsequent attachment outcomes. The larger effect sizes may be explained, in part, by the fact that many of the studies included in the previous meta-analysis did not meet the inclusion criteria for the current review, and some of the previous studies included variables other than contingent-responsiveness in their definition of sensitive responsiveness.

Previous reviews found that the more contiguous the time between independent and dependent measures, the stronger the relationship between the antecedents of subsequent attachment outcomes (Atkinson et al., 2000). In the present review the relationship between parental contingent-responsiveness and secure attachment was the strongest when response quality and response contiguity were measured between 1 and 6 months of age (see Table 5). These results indicate that the timing between measurements may be less important than what happens during parent-child interactions.

Implications for Practice

Findings reported in this synthesis have a number of implications for practice. First, results from this synthesis indicate that parents' responsiveness to their infants' behavior functions as an intervention shaping and influencing child development and strengthening the parent/child relationship. This appears to be the case because parents who try to understand what their children are wanting and needing, and who are responsive and supportive of their children's attempts to communicate, influence children's understanding and realization that they can count and depend on their parents to "be there" when needed.

Second, findings from this research synthesis indicate that parents' responsiveness to wide ranges of behavioral and emotional cues provides children the kinds of opportunities that promote children's understanding of the interconnectedness between themselves and their parents. These kinds of opportunities typically happen naturally as part of everyday life, and are precisely the kinds of experiences Bronfenbrenner (1992) claims are important contexts of competency-enhancing learning opportunities.

Third, efforts to strengthen parents' understanding of the importance of contingent-responsiveness would perhaps best be achieved by encouraging parent/child play that involves reciprocity and mutuality between interactive partners. Lap games such as peek-a-boo, "I'm gonna get you," and the like would seem appropriate for promoting parent responsiveness to child behavior.

Fourth, and perhaps most important, parents' use of contingent-responsiveness as an intervention should be fun and enjoyable for both the child and parent. Interactive episodes, whether planned or by happenstance, should be characterized by "your turn/my turn" features that are mutually reinforcing to both partners.

Finally, it should be remembered that it is not necessary or desirable for every child behavior to be responded to in a contingent manner. Children need to experience enough contingent-responsiveness to come to feel they can depend on and expect parent "interactions" in times of need and desire.

How can this synthesis be used to inform practice? Armed with knowledge about parental contingent-responsiveness and its influence on attachment outcomes, parents can maximize their interactions with their child. To assist parents in implementing this practice, a *Bottomlines* (Vol. 2, 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 parental contingent-responsiveness with 1- to 12-month-old children specifically for parents and practitioners. Also included is a lively vignette illustrating what the practice looks like for a young child and his or her parents and caretakers.

Both the *Bridges* and *Bottomlines* reports are being used to produce practice guides that take a practitioner or parent step-by-step through the process of developing and implementing parental contingent-responsiveness interventions. These guides will be available to readers in either electronic versions at our website (www.researchtopractice.info) or print copies 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, a printed guide and a related video will be available.

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Table 1
Selected Characteristics of the Study Participants and the Timing of the Parental Response-Contingent and Infant

Study	T ^a	N ^b	Child Age (months)	Child Gender		Child Diagnosis	Parental Contingent-Responsiveness ^d		Infant Attachment ^e
				M	F		Measurement Occasion	Measurement Procedure	
Anisfield et al. (1990)	1	49	3	26	23	Low SES	X	RC	
	2	49	13	26	23				X
Belsky et al. (1984)	1	54	1	NR ^c	NR	Typical	X	RC, TS	
	2	55	3	NR	NR		X	RC, TS	
	3	50	9	NR	NR		X	RC, TS	
	4	60	12-13	NR	NR				X
Braungart-Rieker et al. (2001)	1	94	4	44	50	Typical	X	RQ	
	2	94	12	44	50				X
	3	94	13	44	50				X
Fish (2001)	1	98	4	51	47	Low SES	X	RQ	
	2	NR	9	NR	NR		X	RQ	
	3	95	15	NR	NR				X
Grossman et al. (1985)	1	49	2	NR	NR	Typical	X	RQ	
	2	NR	6	NR	NR		X	RQ	
	3	NR	10	NR	NR		X	RQ	
	4	49	12	NR	NR				X
Isabella (1993)	1	32	1	16	16	Typical	X	RQ	
	2	32	4	16	16		X	RQ	
	3	32	9	16	16		X	RQ	
	4	32	12	16	16				X
Isabella (1998)	1	32	1	16	16	Typical	X	RQ	
	2	32	4	16	16		X	RQ	
	3	32	9	16	16		X	RQ	
	4	32	12	16	16				X
Juffer et al. (1997)	1	90	6	44	46	Adopted infants	X	RQ	
	2	90	9	44	46		X	RQ	
	3	90	12	44	46				X
Kochanska (1998)	1	112	8-10	56	56	Typical	X	RQ	
	2	108	13-15	55	53				X
Lamb et al. (1987)	1	40	6	NR	NR	Typical	X	TS	
	2	40	14	NR	NR				X
Lewis & Feiring (1989)	1	174	3	83	91	Typical	X	RC	
	2	174	12	83	91				X

Table 1, continued

Study	T ^a	N ^b	Child Age (months)	Child Gender		Child Diagnosis	Parental Contingent-Responsiveness ^d		Infant Attachment ^e
				M	F		Measurement Occasion	Measurement Procedure	
Raval et al. (2001)	1	96	6	NR ^c	NR	Typical	X	RC	X
	2	96	12	NR	NR				
Volker et al. (1999)	1	54	3	33	21	Typical	X	RC	X
	2	43	12	27	16				

^aT: Measurement period

^bN: Represents the number of study participants that were included in the longitudinal assessment of parental contingent-responsiveness and infant attachment.

^cNR: The information was not reported by investigators.

^dParental contingent-responsiveness was measured using one or more measurement procedures: (1) RC: Response-contiguity (De Wolff & van IJzendoorn, 1997), (2) TS: Three-step contingent-responsiveness (Belsky, Taylor, & Rovine, 1984), and (3) RQ: Response Quality (Ainsworth, 1973).

^eThe X indicates the time period at which infant attachment was measured.

Table 2
Experimental Procedure, Independent Variables, and Dependent Variables

Study	Experimental Procedure	Independent Variables	Dependent Variables ^a				
			B	A	C	D	U
Anisfield et al. (1990)	Mother-infant interaction was videotaped in the lab in an unstructured situation at 3 months for 15 minutes.	Ten minutes of videotape were analyzed at 2-sec intervals for: 1) RC ^b : proportion of mother alone following infant-alone vocalizations, and co-acting following infant-alone vocalizations were added together.	X	X	X		
Belsky et al. (1984)	Mother-infant interaction was observed in the home during daily routines at 1, 3, and 9 months of age for 45 minutes.	A continuous 15-sec time-sampling procedure was utilized to code: 1) RC: maternal responsive vocalization to infant vocalization; 2) TS ^c ; 3) RC to distress; 4) RC to infant vocalization.	X	X	X		
Braungart-Rieker et al. (2001)	Parent-infant interaction was observed in the lab in a structured situation at 4 months of age for 1.5 minutes.	Data from observation was rated with a scale every 10 seconds for: 1) RQ ^d : parent's ability to perceive infant's signals accurately and vary their behavior appropriately (contingent responding, appropriate levels of stimulation).	X	X	X		
Fish (2001)	Mother-infant interaction was observed in a lab during structured and free play at 4 and 9 months of age.	Data from observations was rated using time sampling and rating scales for: 1) RQ: change in sensitivity over time measured at 4 & 9 months (summed index of maternal sensitivity included contingent responding); 2) RQ: mother-reported responsiveness to crying.	X	X	X	X	
Grossman et al. (1985)	Mother-infant interaction was observed & audiorecorded in the home (context of observation was not specified) at 2, 6, and 10 months of age, for 45-60 minutes per visit.	Data from observations was coded and rated using various scales for: 1) RQ to infant signals.	X	X	X		
Isabella (1993)	Mother-infant interaction was observed in the home during daily routines, at 1, 4, and 9 months of age, 3 visits per age for a period of 30 minutes per visit.	Data from observations was coded using rating scales for: 1) RQ: sum of observer ratings of sensitivity and cooperation, and ratings from observation scales including sensitivity, appropriateness of response, & positive affect.	X	X	X		
Isabella (1998)	Mother-infant interaction was observed in the home during daily routines and a semi-structured play at 1, 4, and 9 months of age, for 3 visits per age for a period of 30 minutes per visit.	Data from observations was coded using rating scales for: 1) RQ: naturalistic – sum of sensitivity, appropriateness of response, & positive affect; 2) RQ: play – sum of sensitivity, appropriateness of response, & positive affect	X	X	X		
Juffer et al. (1997)	Mother-infant interaction was videotaped in the home in a free-play situation at 6 months of age for 8 minutes.	Data from observations was rated with a scale for: 1) RQ: mother's ability to respect her child's autonomy and mother's ability to perceive her baby's signals correctly and respond to them promptly.	X	X	X		
Kochanska (1998)	Mother-infant interaction was videotaped in the home during standard routines at 8 to 10 months of age (M = 56.81 minutes).	Data from observation was rated with a scale for each 60-s segment for: 1) RQ: maternal responsiveness to child events.	X	X	X	X	X
Lamb et al. (1987)	Mother-infant interaction was observed in the home (context of observation was not specified) at 6 months of age for a minimum of 40 minutes.	A 15-sec observe/10-sec record format was conducted to record: 1) TS: mother-infant contingent response.	X	X	X		
Lewis & Feiring (1989)	Mother-infant interaction was observed in the home during typical routines at 3 months of age for 2 hours.	Data from observation was coded at 10-sec intervals for: 1) RC: maternal behavior following and linked to behavior emitted by the infant.	X	X	X		

Table 2, continued

Study	Experimental Procedure	Independent Variables	Dependent Variables				
			B	A	C	D	U
Raval et al. (2001)	Mother-infant interaction videotaped (location of observation was not specified) during a divided attention task at 6 months of age.	Data from observation was coded using an event sampling scheme for: 1) RC: percent of maternal response to clear infant signals; 2) RC: percent of maternal response to possible infant signals; 3) RC: total maternal responsiveness; 4) RC: maternal response latency (time in seconds from offset of infant signal to onset of maternal response); 5) RC: percent of maternal response to safety issues; 6) RC: percent of maternal response to infant distress.	X	X	X	X	
Volker et al. (1999)	Mother-infant interaction was videotaped in the home during a free-play situation at 3 months of age for a 15 minute.	Data from observation was coded for: 1) RC: maternal behavioral contingency to infant communications.	X	X	X		

^aThe Strange Situation procedure (Ainsworth et al., 1978) was used to measure attachment in each study. Attachment outcomes were classified as: B = secure attachment; A = avoidant, insecure avoidant, anxious avoidant; C = resistant, insecure resistant, anxious resistant; D = disorganized or disoriented; U = unclassifiable.

^bRC: Response contiguity (De Wolff & van IJzendoorn, 1997).

^cTS: Three-step contingent responsiveness (Belsky, Rovine, & Taylor, 1984).

^dRQ: Response quality (Ainsworth, 1973).

Table 3
Relationship Between Parental Responsiveness and Infant Attachment Outcomes

Study	Independent Variables	Attachment Consequence	d	Attachment Contrasts ^a
Anisfield et al. (1990)	RC	Maternal responsivity measured at 3 months was related to secure attachment at 13 months.	1.15	B vs. A + C
Belsky et al. (1984) ^b	RC: responsive vocalization	Maternal responsive vocalization measured at 3 months, but not 1 or 9 months, was related to secure attachment at 12 months.	—	A vs. B vs. C
	TS	Three-step interaction measured at 1 month, but not 3 or 9 months, was related to secure attachment classifications at 12 months.	—	A vs. B vs. C
	RC to distress	Maternal responsiveness to distress measured at 3 & 9 months, but not 1 month, was related to secure attachment at 12 months.	—	A vs. B vs. C
	RC to infant vocalization	Maternal responsiveness to infant vocalization measured at 9 months, but not 1 or 3 months, was related to secure attachment classifications at 12 months.	—	A vs. B vs. C
Braungart-Rieker et al. (2001)	RQ	Maternal sensitivity measured at 4 months was related to secure attachment at 12 months.	.63	B vs. A + C
Fish (2001)	RQ: change in sensitivity	A composite measure of maternal change in sensitivity, measured at 4 & 9 months, was related to secure attachment at 15 months.	.43	B vs. A + C + D
	RQ: mother-reported responsiveness to crying	Mother-reported responsiveness to crying measured at 4 months was related to secure attachment at 15 months.	.47	B vs. A + C + D
Grossman et al. (1985) ^b	RQ: to infant signals	Maternal sensitivity measured at 2 & 6 months, but not 10 months, was related to secure attachment at 12 months.	—	A vs. B vs. C
Isabella (1993) ^c	RQ: sensitive responsivity	Sensitive responsivity measured at 1 month was related to secure attachment at 12 months.	1.04	B vs. A + C
	RQ: sensitive responsivity	Sensitive responsivity measured at 4 months was related to secure attachment at 12 months.	.90	B vs. A + C
	RQ: sensitive responsivity	Sensitive responsivity measured at 9 months was related to secure attachment at 12 months.	.75	B vs. A + C
Isabella (1998)	RQ: naturalistic	A composite measure of sensitive responsivity measured at 1 month was related to secure attachment at 12 months.	.87	B vs. A + C
	RQ: naturalistic	A composite measure of sensitive responsivity measured at 4 months was related to secure attachment at 12 months.	1.12	B vs. A + C
	RQ: naturalistic	A composite measure of sensitive responsivity measured at 9 months was related to secure attachment at 12 months.	.87	B vs. A + C
	RQ: play	Sensitive responsivity measured at 1 month was not related to secure attachment at 12 months.	.54	B vs. A + C
	RQ: play	Sensitive responsivity measured at 4 months was not related to secure attachment at 12 months.	.70	B vs. A + C
	RQ: play	Sensitive responsivity measured at 9 months was not related to secure attachment at 12 months.	.18	B vs. A + C
Juffer et al. (1997) ^c	RQ	Sensitive responsiveness measured at 6 months was related to secure attachment at 12 months.	.39	B vs. A + C
Kochanska (1998)	RQ	Maternal responsiveness measured at 8-10 months was not related to secure attachment at 13-15 months.	.14	B vs. A + C + D + U
Lamb et al. (1987)	TS	Mother-infant contingent response measured at 6 months of age was not related to secure attachment at 14 months.	.30	B vs. A
Lewis & Feiring (1989)	RC	Maternal responsivity measured at 3 months was related to less secure attachment at 12 months.	-.20	B vs. A + C

Table 3, continued

Study	Independent Variables	Attachment Consequence	d	Attachment Contrasts ^a
Raval et al. (2001)	RC: percent of response to clear infant signals	Maternal responsiveness measured at 6 months was not related to secure attachment at 12 months.	.26	B vs. A + C + D
	RC: percent of response to possible infant signals	Maternal responsiveness measured at 6 months was related to secure attachment at 12 months.	.93	B vs. A + C + D
	RC: total maternal responsiveness	Total responsiveness measured at 6 months was related to secure attachment at 12 months.	.72	B vs. A + C + D
	RC: response latency ^d	Maternal responsiveness measured at 6 month was related to insecure attachment at 12 months.	.58	B vs. A + C + D
	RC: to safety issues ^d	Maternal responsiveness measured at 6 months was related to insecure attachment at 12 months.	.06	B vs. A + C + D
	RC: to infant distress ^d	Maternal responsiveness measured at 6 months was related to secure attachment at 12 months.	.77	B vs. A + C + D
Volker et al. (1999) ^d	RC: maternal behavioral contingency	Maternal behavioral contingency measured at 3 months was related to secure attachment at 12 months.	.58	B vs. A + C

^aAttachment contrasts: These indicate where the relationship of parental contingent-responsiveness was tested with attachment outcomes. B is secure, and A, C, D, and U are insecure.

^bInsufficient data was included in the reports to calculate effect sizes.

^cThese studies provided effect sizes in their reports. For the remaining studies, effect sizes were calculated by the authors of this synthesis from available data in the original research reports.

^dThese effect sizes are estimates.

Table 4
Relationship Between Type of Contingent-Response Measure and Investigator-Reported and Effect-Size Results

Contingent-Responsiveness Type of Measure	Investigator-Reported Results		Effect Sizes ^c			
	Number of Comparisons ^a	Percent of Significance ^b	Number of Comparisons	Mean	SD	95% Confidence Interval
Three Step Procedure ^d	4	25	1	.30	–	–
Response Contiguity	18	50	9	.54	.43	.21 - .87
Response Quality	17	76	14	.65	.30	.47 - .82

^aNumber of tests between each parental contingent-responsiveness measure and attachment outcomes across all studies.

^bPercent of significant positive relationships between parental contingent-responsiveness measures and secure attachment reported by investigators.

^cEffect sizes, Cohen's *d*, were calculated where sufficient data was reported by investigators.

^dStandard deviations and confidence intervals were not calculated because only one study provided sufficient information to calculate an effect size for the three-step procedure variable.

Table 5
*Relationship Between Timing of Measuring Contingent-Responsiveness
 and Investigator-Reported and Effect-Size Results*

Child Age (Months) at Time Contingent- responsiveness was measured	Investigator-Reported Results		Effect Sizes ^c			
	Number of Comparisons ^a	Percent of Significance ^b	Number of Comparisons	Mean	SD	95% Confidence Interval
1-3	15	53	6	.66	.49	.15 - 1.18
4-6	15	67	13	.60	.30	.42 - .78
7-9	9	56	5	.47	.33	.07 - .88

^aNumber of tests between each parental contingent-responsiveness measure and attachment outcomes across all studies.

^bPercent of significant positive relationships between parental contingent-responsiveness measures and secure attachment as reported by investigators.

^cEffect sizes, Cohen's *d*, were calculated where sufficient data was reported by investigators.

