



Published in final edited form as:

Infant Behav Dev. 2012 February ; 35(1): 83–93. doi:10.1016/j.infbeh.2011.09.002.

Security of Attachment and Quality of Mother-Toddler Social Interaction in a High-Risk Sample

John D. Haltigan,

University of Illinois at Urbana-Champaign

Brittany L. Lambert,

University of Miami

Ronald Seifer,

Brown University Medical School

Naomi V. Ekas,

University of Miami

Charles R. Bauer, and

University of Miami, Miller School of Medicine

Daniel S. Messinger

University of Miami

Abstract

The quality of children's social interactions and their attachment security with a primary caregiver are two widely studied indices of socioemotional functioning in early childhood. Although both Bowlby and Ainsworth suggested that the parent-child interactions underlying the development of attachment security could be distinguished from other aspects of parent-child interaction (e.g., play), relatively little empirical research has examined this proposition. The aim of the current study was to explore this issue by examining concurrent relations between toddler's attachment security in the Strange Situation Procedure and quality of mother-child social interaction in a high-risk sample of toddlers characterized by prenatal cocaine exposure and low levels of maternal education. Analyses of variance suggested limited relations between attachment security and quality of social interaction. Further research examining the interrelations among various components of the parent-child relationship is needed.

Keywords

Child; Attachment; Social Interaction; Prenatal Cocaine Exposure

© 2011 Elsevier Inc. All rights reserved.

Correspondence concerning this article should be addressed to Daniel Messinger, University of Miami, Department of Psychology, Flipse Building Room 341, 5665 Ponce De Leon Boulevard, Coral Gables, FL 33146. Phone: (305) 284-8443. Fax: (305) 284-4795. dmessinger@miami.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1. Introduction

The quality of children's relationships with their parents bears importantly on their subsequent development across multiple domains. In particular, children's attachment security and the quality of their social interaction with the parent are two of the most widely studied indices of the quality of the parent-child relationship. Both security of attachment and high quality social interaction (i.e., positive, sensitive, and reciprocal attention/behavioral interchanges) are indicative of adaptive social relatedness in the parent-child dyad and have been associated with favorable emotional, cognitive, and behavioral outcomes (Matas, Arend, & Sroufe, 1978; Sroufe, Egeland, Carlson, & Collins, 2005; Valentino, Cicchetti, Toth, & Rogosch, 2006). There is debate, however, concerning the association between attachment security and other aspects of the parent-child relationship. In particular, it is not clear whether parenting behaviors specifically thought to be related to attachment security are associated with more general (non-attachment) aspects of parenting behaviors, such as play, teaching, and limit-setting (Ainsworth, 1990; Belsky & Cassidy, 1994; Bowlby, 1982; Goldberg, Grusec, & Jenkins, 1999; Kerns & Barth, 1995; Pederson & Moran, 1999). Further empirical investigation is needed to determine whether attachment security should be conceptualized in broad or narrow terms.

The period between one and two years of age, in particular, is a fertile time period to explore this association between the role of attachment and more general aspects parent-child social interactions. During this period, opportunities for social interaction and experiences of sensitively-responsive caregiving behaviors continue to bear importantly on children's later social and emotional development. Social interaction, often in the context of play, provides an enjoyable context in which infants and young children can learn about their environment, practice initiating social overtures and engaging in reciprocal interchanges with the parent, practice emerging functional/motor skills, and develop a cognitive foundation on which later representational capacities are constructed (Bernstein, 1987; Naber et al., 2008; Valentino et al., 2006; Yogman, 1981). As would be expected, infants' and young children's exploration of their environment in the a supportive context of felt security (Sroufe & Waters, 1977) typically affords greater opportunities for bouts of social interaction which allows for the practicing of the aforementioned social, behavioral, and developing cognitive skills (Bowlby, 1980; Naber et al., 2008). The following section attempts to unpack the issue of the extent to which toddler attachment security is associated with more general aspects of parent-toddler social interaction, such as during play, based on previous research.

1.1 A "Broad" versus "Narrow" View of Attachment

Associations between parenting behaviors that promote security and other elements of parenting suggest a "broad" definition of attachment security. In this view, general aspects of the parent-child relationship (such as non-stressful play and social communication) are directly relevant to the parent-child attachment relationship (e.g., Pederson et al., 1990; Pederson & Moran, 1999). For example, parental-sensitive responsiveness to the child—a broad index of the quality of caregiving—is a robust if modest predictor of attachment security (de Wolff and van IJzendoorn, 1997). One possibility is that parents have a core set of interactive skills that are undergirded by the ability to accurately detect and recognize signals from their child. The ability to respond promptly and appropriately (contingently) to their child's signals in the context of positive affective mutuality (Pederson et al., 1990) may be common to both attachment security and early social interaction (Kerns & Barth, 1995). Suggestions of a direct relationship between quality of early social interaction and attachment security (e.g., Levenstein & O'Hara, 1993; MacDonald & Parke, 1984) are also consonant with findings that parent-child interactive synchrony is both an important precursor of attachment security (Isabella, Belsky, & von Eye, 1989; Isabella & Belsky, 1991) and an important component of social interactions during play (MacDonald, 1987;

Parke et al., 1989). Taken together, these studies suggest evidence for a broad definition of the attachment relationship (Pederson et al., 1990; Pederson & Moran, 1999).

By contrast, (e.g., Kerns & Barth, 1995; Goldberg et al., 1999), a “narrow” definition of attachment security implies a distinction between parenting behaviors relevant to attachment security and other parenting behaviors such as that of playmate or teacher. Bowlby’s (1969/1982) original ethological premise, for example, was that the set goal of the attachment behavioral system involved promoting infant security and protection and should be distinguished from other behavioral systems such as those serving reproduction, feeding, sociability, and exploration. Bowlby (1982) seems to espouse the narrow view when he noted:

A child seeks his attachment-figure when he is tired, hungry, ill, or alarmed and also when he is uncertain of that figure’s whereabouts; when the attachment-figure is found he wants to remain in proximity to him or her and may want also to be held or cuddled. By contrast, a child seeks a playmate when he is in good spirits and confident of the whereabouts of his attachment-figure; when the playmate is found, moreover, the child wants to engage in playful interaction with him or her. *If this analysis is right, the roles of attachment-figure and playmate are distinct.* (p. 307; italics added.)

Likewise, Ainsworth (1990) pointed out that while there are many facets to parent-child relationships, the caregiving component is the only one directly related to the protective function that Bowlby identified as the core defining feature of the attachment behavioral system (Cassidy, 2008; George & Solomon, 2008). Belsky and Cassidy (1994) also articulated this point when they noted it would be inaccurate to consider the behavior of a child’s approach to its mother to engage in peek-a-boo as an attachment behavior. That said, although both Bowlby and Ainsworth stressed the roles of threat, danger, and protection as crucial elements in attachment (Goldberg et al., 1999), they also were clear that the role of attachment figure and a more general figure (such as a playmate) were not incompatible. For example, depending on the circumstances, an individual could serve the role of both attachment figure and playmate (Bowlby 1982; Ainsworth, 1967).

Other researchers have provided additional support for this narrow view of the attachment relationship based on evidence that attachment security shows only modest or limited associations with other indexes of the parent-child relationship or more general (non-distress related) sensitive-responsiveness on the part of the parent (Atkinson, Niccols, Paglia, Coolbear, Parker, Poulton, et al., 2000; de Wolff & van IJzendoorn, 1997; Goldsmith & Alansky, 1987; Seifer, Schiller, Sameroff, Resnick, & Riordan, 1996). Of particular relevance, Belsky, Rovine, and Taylor’s (1984) factor analysis of parent-infant interactions at one, three, and nine months found support for the differentiation of the occurrence of reciprocal, affiliative interactions relevant to social interaction (play; including vocalizing, stimulation, and affection), from variables more putatively associated with a narrow view of infant attachment security (infant fussing/crying and maternal soothing). Relatedly, although Egeland and Farber (1984) found that maternal sensitivity during a standardized play assessment at six months was related to infant attachment security at 12 months, it was only one of three (out of 12) social interaction variables that differentiated 12-month infant attachment classifications (of note, only one social interaction variable was associated with attachment security at 18 months in this study; Lamb, Thompson, Gardner, Charnov, & Estes, 1984). Kerns and Barth (1995) also found few associations between quality of physical interactions during play and concurrent attachment as measured using the Waters and Deane (1985) attachment Q-set. They suggested that the lack of associations between these two aspects of the parent-child relationship support the idea of a narrow view of attachment or an “independent components hypothesis”. Overall, this view implies that there

are few connections between the broader array of mother-child interactions, such as that during play, and the parent-child attachment relationship (Ainsworth, 1990; Bowlby, 1982; Hinde, 1976).

1.2 The Potential Impact of Social and Contextual Adversity

In the presence of conditions of increased social and/or contextual risk (e.g., parental maltreatment, depression, prenatal drug exposure, low socioeconomic status [SES]), the general parent-child relationship and the attachment relationship are often adversely affected (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Crittenden, 1985; Garbarino, Kostelny, & Barry, 1997; Radke-Yarrow, Cummings, Kuczynski, & Chapman, 1985; Rodning, Beckwith, & Howard, 1989; Valentino et al., 2006). More specifically, recent evidence suggests that prenatal substance abuse may moderate the association between child behavior and the parent-child interaction and attachment (Eiden, Edwards, & Leonard, 2002; Eiden, Granger, Schuetze, & Veira, 2011). This suggests that risk factors may moderate associations between the attachment and play components of the parent-child relationship. However, the direction of associations between the attachment and social-interactive (social play) components of the parent-toddler relationship under various risk conditions are not clear-cut. There is a relatively small body of research—particularly in very high risk samples—that has attempted to disentangle these aspects of the parent-child relationship.

1.3 The Current Study

The Maternal Lifestyle Study (MLS) is a longitudinal, prospective investigation of the impact of prenatal cocaine and/or opiate exposure on child outcome (Bauer et al., 2002, Lester et al., 2002). Previous reports using multi-site and single-site data from the MLS have separately examined the attachment patterns of children prenatally exposed to cocaine (Seifer et al., 2004) and the quality of mother-child social interaction in children prenatally exposed to cocaine (Uhlhorn, Messinger, & Bauer, 2005). Seifer et al. (2004) found no association between cocaine exposure and attachment status in the four-site MLS sample. All participants in the current sample were used in the Uhlhorn et al. (2005) study of children at the Miami MLS site. Uhlhorn et al. (2005) found no association between prenatal cocaine exposure and interactive behaviors between mothers and children during social play.

Previous research has been equivocal regarding the impact of prenatal cocaine use on attachment security and disorganization. Some research (e.g., Rodning et al., 1989) indicates that children prenatally exposed to illicit drugs exhibit lower quality organization of play behaviors and higher rates of insecure attachment patterns than children with no prenatal drug exposure while other investigations have not found such differences (Seifer et al., 2004). In the current study, we were interested in exploring this issue further by examining attachment security (and disorganization) and mother-toddler play in the context of high social-contextual risk, as indexed by prenatal exposure to cocaine and level of maternal education. More specifically, we are interested in exploring how the relationship between the parent-child interaction and attachment security may be moderated by these risk factors. The MLS provided a valuable source of data to explore this question which has to our knowledge not been specifically addressed in prior work examining associations between parent-child interaction and attachment security (e.g., Egeland & Farber, 1984; Gaensbauer et al., 1985).

2. Methods

2.1 Participants

Participants consisted of 117 mothers and children who were enrolled at the Miami site of the four-site Maternal Lifestyle Study (MLS) who had a Strange Situation classification and

mother-child interaction data, as well as an eligible parent (see below). All of the children were born at a large, urban county hospital and subjects were matched on race, sex, and gestational age (Lester et al., 2002, Messinger et al., 2004). Approximately 30.8% of the current sample was born prematurely. Premature birth was not associated with prenatal cocaine exposure or child attachment classification. At the child's 18-month visit, there were 156 paired Strange Situation Procedures and mother-child interactions. Of these, 33 were excluded because the caregiver was a non-biological mother, a biological mother who had recently regained child custody, a user of opiates, or if the assessment had technical problems preventing coding. An additional 6 were excluded because secure-insecure attachment classifications could not be made, producing a final sample of 117 mother-child dyads. None of the excluded children were classified as disorganized.

Cocaine exposure status was determined by maternal admission during a structured interview in the hospital after delivery and/or a positive screen for meconium metabolites confirmed with gas chromatography/mass spectroscopy (Lester et al., 2001). Of the 117 mother-child dyads included in this study, 45 (38.5%) were in the cocaine-exposed group. Seventy-two (61.5%) mother-child dyads were in the comparison group, which was determined by both a negative self-report of cocaine use during pregnancy and a negative meconium toxicology screen. The groups were comparable on all child characteristics (i.e., sex, gestational age, and birth weight). Groups were also contrasted on maternal demographic characteristics (i.e., race, marital status, maternal education, and SES) collected at the child's 1-month visit. SES was indexed using the standard algorithm described by Hollingshead (1975), as modified for low-income caregivers (LaGasse et al., 1999). The exposed and comparison groups were comparable on all maternal characteristics except maternal age; mothers in the comparison group were significantly younger than mothers in the exposed group (see Table 1).

2.2 Procedure

This study was approved by the local Institutional Review Board. The study was explained in full by MLS staff and informed consent was obtained from all mothers. At the child's 18-month visit, the Strange Situation Procedure and the mother-child social interaction were administered and coded by examiners masked to cocaine exposure status. The Strange Situation was completed before the mother-child social interaction.

2.2.1 The Strange Situation Procedure—The Strange Situation (Ainsworth & Wittig, 1969; Ainsworth et al., 1978) is an 8-episode procedure used to assess attachment behavior in early childhood. These episodes include brief periods of interaction between the mother and child, interaction between the child and an unfamiliar examiner (“stranger”), and separation of the child from the mother followed immediately by a reunion episode. Classification of attachment was completed by trained raters who met or exceeded the reliability criteria of $\kappa = .80$ with the gold standard examiner (see Seifer et al., 2004, for a detailed description of reliability training and criteria). Classification of infants into attachment categories was determined using the standard Ainsworth et al., (1978) scoring system for the traditional classifications of secure (B) avoidant (A) and resistant (C) and their subcategories as well as Main and Solomon's (1990) scoring system for attachment disorganization (D).

For data analysis, our primary attachment classification variable was the secure-insecure grouping (i.e., B vs. A & C). Sixteen toddlers had a primary attachment classification of A and 5 toddlers had a primary attachment classification of C. All toddlers with a primary attachment classification of D ($n = 14$) received an insecure secondary classification; thus, these toddlers are treated as insecure in secure vs. insecure groupings. The use of this

grouping allowed us to avoid low cells sizes in substantive analyses and increased our power to detect attachment differences among the mother, child, and dyadic behavior variables. We also evaluated relations between the mother-child social interaction variables and the disorganized/not-disorganized attachment grouping.

2.2.2 Social Interaction—This procedure was a 10-minute unstructured play session in which the dyad was provided with a set of standardized, attractive, age-appropriate toys and the mother was instructed to play with her child as she normally would at home. Mother, child, and dyadic interactive behaviors were later coded. The coded behaviors have been described in previous work with toddlers in the second year of life and were based on those that can be readily observed in free-play (e.g., see Uhlhorn et al., 2005). Of note, given toddlers' increases in representational, motoric, and agentic capacities during first half of the second year, social interaction between mother and child may differ characteristically from social interaction during the first year of life when the dyadic relationship is less reciprocal and infants behavioral and cognitive capacities are still limited (Casby, 2003). That being said, our focus in the present report was on the socio-affective nature of the interaction (positive and mutual) rather than on the particular mediums during which such interaction occurs (i.e., feeding/changing behavior, toy play, etc.). Mother behaviors included positive vocalization to child, negative vocalization to child, request to child, smile to child, and toy offer to child. Child behaviors included smiling at mother, gazing at mother, offering a toy to mother, and initiation of coordinated joint attention with the mother. Mother and child behaviors were coded as frequency counts. Dyadic behaviors included the proportions of mother requests fulfilled by the child, mother toy offers fulfilled by the child, and child toy offers fulfilled by the mother. We also examined maternal sensitivity. Maternal sensitivity was rated on a scale from 1 (highly insensitive) to 9 (highly sensitive) using Ainsworth's Sensitivity Rating Scale (Ainsworth et al., 1974). Sixteen percent of the procedures were double-coded for reliability. Intra-class correlation coefficients for all measures of social interaction were high ranging from 0.75 (proportion of maternal requests fulfilled) to 0.96 (number of maternal requests). The intra-class correlation coefficient for maternal sensitivity was 0.78.

2.3 Composite Variable Creation

While previous work has analyzed the aforementioned toddler-parent social interaction variables by categorizing the raw variables into maternal, child, and dyadic categories (Uhlhorn et al., 2005), we used the individual behavior variables to create a set of mean composite variables to represent patterns of social interaction between children and mothers. More specifically, variables that were significantly correlated and that represented a priori theoretically specific patterns of social interaction were combined to create six composites. Correlations between child, mother, and dyadic social interaction variables are reported in Table 2.

First, *child attention initiation* refers to a composite of child gazes at the mother and coordinated joint attention episodes. The *dyadic positivity/mutuality* refers to a composite of child smiles at the mother and mother smiles at the child. Third, *mother positive responsiveness* refers to a composite of mother positive vocalizations, mother negative vocalizations (reverse scored), and ratings of maternal sensitivity. *Child directiveness/mother compliance* refers to a composite of child toy offers and the proportion of child toy offers fulfilled by the mother. Lastly, two composites were created for *mother directiveness/child noncompliance*. *Mother instrumental directiveness/child noncompliance* refers to a composite of the frequency of mother toy offers and the proportion of mother toy offers fulfilled by the child. *Mother verbal directiveness/child noncompliance* refers to a composite of the frequency of mother verbal requests and the proportion of mother requests fulfilled by

the child. All composites were created by transforming values of all individual interactive behavior variables into z scores and summing the appropriate z scores for each composite. There were negative correlations between the mother toy offers and child compliance and between mother requests and child compliance. The z scores for child compliance were multiplied by -1 prior to summing; thus, these composites reflect the mother's behavior and the child's noncompliance.

3. Results

3.1 Associations between Attachment Classification and Risk Factors

The distribution of secure and insecure, as well as disorganized/not disorganized attachment classifications is presented in Table 3. Chi-square tests revealed no significant differences between cocaine exposure groups for these attachment classifications (see Seifer et al., 2004 for similar, full-sample MLS attachment results). There were also no significant associations between maternal education groups for these attachment classifications.

3.2 Associations between Attachment Classification and Mother-Child Social Interaction

3.2.1 Secure versus Insecure Attachment Classification—To determine whether the mother-child social interaction composites differed by child attachment security, prenatal drug exposure, and maternal education, 2 (attachment security: secure vs. insecure attachment) x 2 (prenatal cocaine exposure: exposed vs. nonexposed) x 2 (maternal education: < 12 years vs. \geq 12 years) ANOVAs were conducted. There were no significant main effects or interaction effects of attachment security, prenatal cocaine exposure, and maternal education on child attention initiation, dyadic positivity/mutuality, mother positive responsiveness, child directiveness/mother compliance, and mother verbal directiveness/child noncompliance.

There was a significant main effect of attachment classification on mother instrumental directiveness/child noncompliance, $F(1, 109) = 5.33, p < .05, \eta_p^2 = .05$. Mothers and their insecurely attached toddlers displayed more instrumental directiveness/noncompliance than mothers and their securely attached toddlers. This main effect was qualified by a two-way interaction between attachment security and maternal education on mother instrumental directiveness/child noncompliance, $F(1, 109) = 4.82, p < .05, \eta_p^2 = .04$. Bonferroni adjusted tests of simple effects indicated that for mothers with lower levels of educational attainment, there were no significant differences between secure and insecure toddlers. For more educated mothers, mothers and their insecurely attached toddlers displayed more directiveness/noncompliance than mothers of securely attached toddlers, $p < .01$. Marginal means are presented for these effects in Table 4.

3.2.2 Disorganized versus Not Disorganized Attachment Classification—

Results of 2 (attachment security: disorganized vs. not disorganized) x 2 (prenatal cocaine exposure: exposed vs. nonexposed) x 2 (maternal education: < 12 years vs. \geq 12 years) ANOVAs indicated that there were no significant main effects or interaction effects of these variables on child attention initiation, dyadic positivity/mutuality, or child directiveness/mother compliance.

There was no main effect of attachment classification on mother instrumental directiveness/child noncompliance. There was a main effect of maternal education on mother instrumental directiveness/child noncompliance, $F(1, 108) = 14.26, p < .001, \eta_p^2 = .12$. More educated mothers and their toddlers displayed more directiveness/noncompliance (marginal mean = 0.72) than less educated mothers and their toddlers (marginal mean = -0.87). Similar to the organized secure-insecure analyses, this was qualified by a significant two-way interaction

between attachment classification and maternal education, $F(1, 108) = 18.14, p < .001, \eta_p^2 = .14$. Among less educated mothers, Bonferroni adjusted tests of simple effects indicated that mothers and their toddlers classified as not disorganized displayed more instrumental directiveness/noncompliance than mothers and their toddlers who were classified as disorganized, $p < .01$. Among more highly educated mothers, mothers and their disorganized toddlers displayed more instrumental directiveness/noncompliance than mothers and their toddlers who were classified as not disorganized, $p < .01$.

Although there were no significant main effects on mother verbal directiveness/child noncompliance, there was a significant two-way interaction between attachment classification and maternal education, $F(1, 108) = 6.13, p < .05, \eta_p^2 = .05$. Among less educated mothers, Bonferroni adjusted tests of simple effects indicated that mothers and their toddlers who were classified as not disorganized engaged in more verbal directiveness/noncompliance than mothers and their disorganized toddlers, $p < .05$. There were no significant effects for disorganized versus not disorganized toddlers of more educated mothers. Lastly, for mother positive responsiveness, there were no significant main effects; however, there was a significant two-way interaction between disorganized classification and maternal education on mother positive responsiveness, $F(1, 108) = 4.85, p < .05, \eta_p^2 = .04$. Among less educated mothers, there was no significant difference in positive responsiveness for mothers of disorganized and not disorganized toddlers. For more educated mothers, Bonferroni adjusted tests of simple effects indicated that mothers of toddlers classified as not disorganized showed more positive responsiveness than mothers of disorganized toddlers, $p = .05$. See Table 4 for marginal means.

4. Discussion

The extent to which parenting behaviors related to attachment security are associated with other more general (non-attachment) aspects of parenting behaviors, such as play and limit-setting is not entirely clear. A broader view suggests that parental responses to children's attachment signals (such as crying, clinging, and following) that are sensitive and responsive likely generalize to other facets of the parent-child relationship such as mother-child interaction in a non-stressful free-play situation. However, a narrow view of attachment organization conceptualizes the parent-child attachment relationship as distinct from other components of the relationship such as routine caregiving and play. To evaluate the merits of a broad versus narrow understanding of attachment, the current study examined relations between attachment security and the social-affective quality of nonstressful mother-child interaction in a high-risk sample.

Overall, there was only one main effect of attachment security on the social-affective quality of play interaction, and this effect was qualified by an interaction with mother educational level. However, there were, in fact, multiple interaction effects in which associations between attachment security and play interaction variables were contingent on mother education level. These interaction effects involving mothers' educational attainment are discussed below and point to the importance of contextual risk in influencing how different domains of the parent-child relationship, such as play and attachment security/disorganization, are or are not associated with one another. In general, the current findings suggest that attachment and social interaction quality were sufficiently independent and their association was conditioned by features of mother's interaction style indexed by mother education level, supporting a more narrow conceptualization of attachment security.

In the current study, the only observed main effect of attachment security was observed for mother instrumental directiveness and child noncompliance. This composite consisted of two correlated variables—mother toy offers to the toddler and the toddler's probability of

not taking the object. Higher levels of this composite were observed in dyads with insecurely attached toddlers than securely attached toddlers, suggesting that mothers of insecurely attached toddlers were more persistent in their object-mediated overtures to relatively non-receptive toddlers. An interaction effect, however, moderated this association. This effect was driven by dyads in which mothers had higher education levels, while dyads in which mothers had lower education levels showed no effect. Thus, mothers with higher education levels and their insecurely attached toddlers engaged in expectable patterns of mother persistence and toddler non-responsivity (perhaps indexing avoidance or resistance). This pattern is consonant with the idea that direct, instrumental (i.e., object-mediated) maternal behaviors may serve to shift the focus of interaction away from salient attachment-relevant affect during social interaction (Bailey et al., 2007).

In analyses contrasting toddlers based upon attachment disorganization, maternal instrumental directiveness and toddler noncompliance was also directly associated with maternal education. More specifically, dyads containing mothers with higher education levels dyads engaged in more maternal directiveness and toddler non-compliance than dyads containing mothers with lower education levels. However, this education effect was contextualized by an interaction with attachment disorganization. In dyads involving more educated mothers, there were higher levels of the composite indexing mother directiveness and child noncompliance among toddlers with disorganized as opposed to not disorganized attachment status. This element of the interaction effect with attachment disorganization paralleled that with attachment security. Surprisingly, in dyads containing less educated mothers, there were lower levels of the composite indexing mother directiveness and child noncompliance among toddlers with disorganized rather than not disorganized attachment status. It appears that higher education levels were associated with a high level of mother engagement that was manifested in a persistent style of offering objects that was associated with a high level of toddler refusal or ignoring. In this context, the composite was associated with both insecure and disorganized attachment.

A similar interaction effect was found for the composite indexing mother verbal directiveness and toddler noncompliance. Levels of this composite were higher among not disorganized than disorganized toddlers, but only in dyads containing mothers with lower levels of educational attainment. It appears that among mothers with low educational levels, low levels of composites indexing verbal directiveness and child noncompliance (i.e., higher mother disengagement and child noncompliance) were associated with toddler disorganization. Although the substantive meaning of these interactions is difficult to decipher, what is clear, however, is that the association of attachment (dis)organization and a characteristic of mother-toddler interaction varied by mother's education level. It is consonant with our theoretical understanding that dyadic interaction characterized by higher levels of mother persistence (and perhaps control) and lower levels of toddler compliance should be higher among toddlers with disorganized than not disorganized attachment styles. Taken together, these findings suggest multiple pathways through which maternal education may influence mother-child social interaction, and indirectly, attachment disorganization.

There was also an interaction between attachment disorganization and mother education level with respect to mother positive responsiveness. It was not surprising that more highly educated mothers exhibited less positive responsiveness, as indexed by maternal sensitivity and quality of mother vocalizations to the toddler, to disorganized toddlers than to other toddlers. This is consonant with the suggestion that disorganized attachment is associated with lower levels of mother positivity, although it is unclear why this effect would not be suppressed in dyads containing mothers with low education levels. Particularly with regard to attachment disorganization, the current results should be interpreted cautiously given our small sample of children with disorganized attachment ($n = 14$). Future research is necessary to better

understand the association between disorganized attachment and other domains of children's socioemotional functioning, including further assessment of parent behaviors that likely accompany disorganized attachment in children (e.g., dissociative behaviors) and their association with child social and emotional development.

In addition, it is noteworthy that secure and insecure toddlers were not differentiated by the maternal responsiveness composite, as Ainsworth's maternal sensitivity scale differentiated secure and insecure infants in Egeland and Farber's (1984) study of high-risk mothers and their six month old infants. One possibility is that sensitivity to infants' behaviors during play at six months, when infants are less mobile and more dependent on the caregiver for social stimulation and emotion regulation is more relevant to attachment security (Hinde, 1982; Isabella, 1999) than is sensitivity during play at later developmental ages, when toddlers show more initiation and self-direction in their play (Casby, 2003). At eighteen months of age, sensitivity during play may reflect an increasingly dyadic partnership between the parent and child, who is both more autonomous and able to regulate his emotions as well as being less reliant on the parent for consistent social interaction. More generally, an explanation for the lack of association between quality of mother-child social interaction and attachment security may concern the degree of continuity and discontinuity in early sensitive-responding to infant and child (attachment) behaviors (Lindhiem, Bernard, & Dozier, 2011; Pianta, Sroufe, & Egeland, 1989) that is thought to lead to the development of a secure working model of the parent (reflected in secure patterns of behavior in the Strange Situation). Mothers who foster secure attachments in their children through sensitive-responding to their child's attachment behaviors in the first year of life may not necessarily be high-quality (i.e., positive and responsive; Ainsworth, 1990; Kerns & Barth, 1995) social partners and playmates during the second year of life, particularly in samples such as the one studied here, characterized by substantial levels of biological and contextual risk which may be associated with discontinuities in parental sensitivity and responsiveness across time (Pianta, Sroufe, & Egeland, 1989).

In interpreting the findings more generally, it is important to note that a specific type of parent-child interaction—social interaction in a nonstressful, unstandardized play situation—was considered in this study. The indices of the quality of mother-child social interaction included theoretically and empirically informed composites of behaviors such as maternal positive or negative vocalizations, children's smiles and coordinated joint attention bouts with their mother, and also behaviors which indexed dyadic responsiveness and mutuality, such as the mother offering the child an object and the child's noncompliance with this offer. This operationalization of early social interaction is consonant with the concepts of 'positive mutuality' (Kiser et al., 1986) and 'affective quality' (Zaslow, Rabinovich, Suwalsky, & Klein, 1988) in parent-child interaction. We intentionally did not assess more complex forms of mother-child interaction, such as children's symbolic play with their mother, as our focus was on the social-affective nature of early interaction between parent and child. We may have observed positive associations had we been able to examine parent-child interactions specifically related to parental responses to children's distress, more consonant with a narrow view definition of the attachment relationship (Goldberg et al., 1999). This limitation should be addressed in future research which may benefit from examining dyads in settings that elicit distress and/or frustration in children (e.g., competing demands task) when assessing mother-child interaction.

In addition to exploring associations between quality of mother-child social interaction and attachment security, we explored how prenatal cocaine exposure might influence the association of these two parenting components. Maternal cocaine use during pregnancy did not moderate the associations between toddlers' attachment security and the quality of mother-child social interaction. We previously reported an absence of significant cocaine

exposure effects on mean levels of the mother-toddler interaction variables reported here (Uhlhorn et al., 2005). In addition, the full-MLS sample exhibited no associations between maternal psychopathology or postnatal substance use (controlling for prenatal substance use) and child attachment security at 18 months of age and no interactions between parent-report measures (e.g., caregiver flexibility and caregiver engagement) and exposure status for child attachment outcomes (Seifer et al., 2004). The current findings also indicate that cocaine exposure had no direct effects on composite indices of interaction on the association of toddler attachment and mother-toddler free-play interactions.

5. Conclusions and Limitations

There are two primary limitations of the current project that merit consideration in the current study. First, the project was constrained by the available data, which was restricted to a single time point and did not include observations of sensitivity to distress. Consequently, we do not know whether earlier maternal sensitivity to infant distress (or non-distress) was associated with the attachment security of children in this project. In addition, we were not able to ascertain the stability of social interactions, limiting our ability to determine if these were stable features of the dyads. Finally, we did not consider subsequent social and emotional outcomes, we do not know whether security of attachment and, more generally, high quality emotionally positive social interaction influence later social and emotional adaptation in the same manner. As Belsky and Cassidy (1994) note, different aspects of the parent-child relationship (i.e., attachment figure vs. playmate) may be associated with different social and emotional outcomes across development. It is also important to consider that the Ainsworth Scale which comprised, in part, our mother positive responsivity composite, is one coding system used to assess maternal sensitivity. Other coding systems may assess maternal sensitivity slightly differently, in turn, yielding different results (e.g. NICHD ECCN, 1999). Of particular note, the Maternal Behavior Q-set (MBQS: Pederson & Moran, 1999), based on the Q-sort technique (Block, 1961) has shown promising ability in its ability to consistently predict secure/insecure attachment classification (Behrens, Parker, and Haltigan, in press).

In conclusion, the lack of association between child attachment security and emotionally positive, high quality mother-child social interaction during toddlerhood in a sample characterized by high biological and contextual risk should serve as a reminder that questions regarding the breadth of the attachment relationship warrant further inquiry. Our findings should be considered cautiously with respect to how security of attachment may influence or be related to other facets of the mother-child relationship, such as social interaction more broadly, which do not immediately bear upon aspects of the child's attachment behaviors that are presumed to serve a more directly ethological function (Goldberg et al., 1999). This point is of specific importance in light of the extreme biological and social risk of our participants. In samples characterized by high social and biological risk mutuality and positivity in social interaction is often lacking (Farran & Ramey, 1980). The development of secure attachments in the absence of high-quality social interaction suggests a potential protective factor in these at-risk toddlers and their mothers.

Future research should continue to examine the limits of influence of parenting behaviors that serve the child's attachment behavioral system and whether and how they are related to the mother-child relationship in general. Importantly, future research should carefully consider various design and implementation issues, such as considering the importance of different parent-child interactions in different contextual circumstances (Isabella, 1999) and the developmental timing of these procedures, given that the extent to which non-attachment components of caregiving contribute to attachment security is likely to vary with age (Bretherton, 1980; Hinde, 1982). It may also be important to consider father-child social

interactions and child attachment security (Braungart-Rieker & Karrass, 1999), as it has been suggested that for fathers, sensitivity during play, rather than sensitivity to distress or other attachment-specific cues may be the most accurate measure of the quality of the father-child relationship (Grossman, Grossman, Kindler, & Zimmermann, 2008; Notaro & Volling, 1999). Such research will help to both: (a) identify the caregiving behaviors most important to the development attachment security; and (b) more precisely delineate the specific adaptive outcomes of sensitivity and shared positivity in parent-child social interactions.

Acknowledgments

This study was supported by the National Institute of Drug Abuse and the Eunice Kennedy Shriver National Institute of Child Health and Human Development through cooperative agreements U10 DA 024118 and U10 HD 36790; contract N01-HD-2-3159 and supplemental funding from the National Institute of Mental Health, the Administration on Children, Youth, and Families, and the Center for Substance Abuse Treatment.

References

- Ainsworth, MDS. *Infancy in Uganda: Infant care and the growth of love*. Baltimore: Johns Hopkins University Press; 1967.
- Ainsworth MDS. Patterns of infant-mother attachments: Antecedents and effects on development. *Bulletin of the New York Academy of Medicine*. 1985; 61:771–791. [PubMed: 3864510]
- Ainsworth, MDS. Some considerations regarding attachment theory and assessment relevant to attachments beyond infancy. In: Greenberg, MT.; Cicchetti, D.; Cummings, EM., editors. *Attachment in the Preschool Years*. Chicago: University of Chicago Press; 1990. p. 463-488.
- Ainsworth, MDS.; Bell, SM.; Stayton, DJ. Infant-mother attachment and social development: 'socialization' as a product of reciprocal responsiveness to signals. In: Richards, MPM., editor. *The integration of the child into a social world*. Cambridge: Cambridge University Press; 1974. p. 99-135.
- Ainsworth, MDS.; Blehar, MC.; Waters, E.; Wall, S. *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Erlbaum; 1978.
- Ainsworth, MDS.; Wittig, B. Attachment and exploratory behavior of one-year-olds in a Strange Situation. In: Foss, BM., editor. *Determinants of Infant Behavior*. Vol. 4. London: Methuen; 1969. p. 113-136.
- Atkinson L, Niccols A, Paglia A, Coolbear J, Parker KCH, Poulton L, Guger S, Sitarenios G. A meta-analysis of time between maternal sensitivity and attachment assessments: Implications for internal working models in infancy/toddlerhood. *Journal of Social and Personal Relationships*. 2000; 17:791–810.
- Bailey HN, Moran G, Pederson DR, Bento S. Understanding the transmission of attachment using variable – and relationship – centered approaches. *Development and Psychopathology*. 2007; 19:313–343. [PubMed: 17459173]
- Bauer CR, Shankaran S, Bada HS, Lester B, Wright LL, Krause-Steinrauf H, et al. The Maternal Lifestyle Study: Drug exposure during pregnancy and short-term maternal outcomes. *American Journal of Obstetrics and Gynecology*. 2002; 186:487–495. [PubMed: 11904612]
- Behrens K, Parker AC, Haltigan JD. Maternal sensitivity assessed during the strange situation procedure predicts children's reunion behaviors. *Infant Behavior and Development*. in press.
- Belsky, J.; Cassidy, J. Attachment: Theory and evidence. In: Rutter, M.; Hay, D.; Baron-Cohen, S., editors. *Developmental principles and clinical issues in psychology and psychiatry*. Oxford, England: Blackwell; 1994. p. 373-402.
- Belsky J, Fearon RMP. Infant-mother attachment security, contextual risk, and early development: A moderational analysis. *Development and Psychopathology*. 2002; 14:293–310. [PubMed: 12030693]
- Belsky J, Rovine M, Taylor G. The Pennsylvania Infant and Family Development Project III: The origins of individual differences in infant-mother attachment. *Child Development*. 1984; 55:718–728. [PubMed: 6734313]

- Bernstein, V. Screening for socio-emotional impairment in infants born to teenage mothers. Paper presented at the poster session of the biennial meeting of the SRCD; Baltimore, MD. April. 1987
- Blehar MC, Lieberman AF, Ainsworth MDS. Early face-to-face interaction and its relation later infant-mother attachment. *Child Development*. 1977; 48:182–194.
- Block, J. *The Q-Sort method in personality assessment and psychiatric research*. Springfield, IL: Charles C. Thomas Publisher; 1961.
- Bowlby, J. *Attachment and loss: Vol. I: Attachment*. New York: Basic Books; 1982.
- Bowlby, J. *Attachment and loss: Vol. II: Separation: Anxiety and anger*. New York: Basic Books; 1973.
- Bowlby, J. *Attachment and loss: Vol. III: Loss*. New York: Basic Books; 1980.
- Braungart-Rieker JM, Karrass J. Parent protection in context. *Journal of Family Psychology*. 1999; 13:488–491.
- Bretherton, I. Young children in stressful situations: The supporting role of attachment figures and unfamiliar caregivers. In: Coelho, GV.; Ahmed, PI., editors. *Uprooting and development*. New York: Plenum Press; 1980. p. 179-210.
- Carlson V, Cicchetti D, Barnett D, Braunwald K. Disorganized/disoriented attachment relationships in maltreated infants. *Developmental Psychology*. 1989; 25:525–531.
- Casby MW. The development of play in infants, toddlers, and young children. *Communication Disorders Quarterly*. 2003; 24(4):163–174.
- Cassidy, J. The nature of the child's ties. In: Cassidy, J.; Shaver, PR., editors. *Handbook of Attachment*. 2. New York: Guilford Press; 2008. p. 3-22.
- Clarke-Stewart KA, Umeh BJ, Snow ME, Pederson JA. Development and prediction of children sociability from 1–2 ½ years. *Developmental Psychology*. 1980; 16:290–302.
- Crittenden PM. Maltreated infants: Vulnerability and resilience. *Journal of Child Psychology and Psychiatry*. 1985; 26:85–96. [PubMed: 3972934]
- de Wolff MS, van Ijzendoorn MH. Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*. 1997; 68:571–591. [PubMed: 9306636]
- Egeland B, Farber E. Infant-mother attachment: Factors related to its development and changes over time. *Child Development*. 1984; 55:753–771. [PubMed: 6734316]
- Eiden RD, Granger DA, Schuetze P, Veira Y. Child behavior problems among cocaine-exposed toddlers: Indirect and interactive effects. *Development and Psychopathology*. 2011; 23:539–550.
- Eiden RD, Edwards EP, Leonard KE. Mother-infant and father-infant attachment among alcoholic families. *Development and Psychopathology*. 2002; 14:253–278. [PubMed: 12030691]
- Farran DC, Ramey R. Social class differences in dyadic involvement during infancy. *Child Development*. 1980; 51:254–257. [PubMed: 7363739]
- Gaensbauer TJ, Harmon RJ, Culp AM, Schultz LA, van Dooninck WJ, Dawson P. Relationships between attachment behavior in the laboratory and the caretaking environment. *Infant Behavior and Development*. 1985; 8:355–369.
- Garbarino, J.; Kostelny, K.; Barry, F. Value transmission in an ecological context: The high risk neighborhood. In: Grusec, J.; Kuczynski, L., editors. *Parenting and children's internalization of values: A handbook of contemporary theory*. New York: Wiley; 1997. p. 307-332.
- George, C.; Solomon, J. The caregiving system: A behavioral systems approach to parenting. In: Cassidy, J.; Shaver, PR., editors. *Handbook of Attachment*. 2. New York: Guilford Press; 2008. p. 833-856.
- Goldberg S, Grusec JE, Jenkins JM. Confidence in protection: Arguments for a narrow definition of attachment. *Journal of Family Psychology*. 1999; 13:475–483.
- Goldsmith HH, Alansky JA. Maternal and infant temperamental predictors of attachment: A meta-analytic review. *Journal of Consulting and Clinical Psychology*. 1987; 55:805–816. [PubMed: 3320116]
- Grossman, K.; Grossman, KE.; Kindler, H.; Zimmermann, P. A wider view of attachment and exploration: The influence of mothers and fathers on the development of psychological security from infancy to young adulthood. In: Cassidy, J.; Shaver, PR., editors. *Handbook of Attachment*. 2. New York: Guilford Press; 2008. p. 857-879.

- Hinde, RA. Attachment: Some conceptual and biological issues. In: Murray Parkes, C.; Stevenson-Hinde, J., editors. *The Place of Attachment in Human Behavior*. New York: Basic Books; 1982. p. 60-76.
- Hinde RA. On describing relationships. *Journal of Child Psychology and Psychiatry*. 1976; 17:1–19. [PubMed: 1249137]
- Hollingshead, AB. *Four factor index of social status*. New Haven, CT: Yale University Press; 1975.
- Isabella RA. Confidence in protection: Comment on Goldberg et al. (1999). *Journal of Family Psychology*. 1999; 13:501–503.
- Isabella RA, Belsky J. Interactional synchrony and the origins of infant-mother attachment: A replication study. *Child Development*. 1991; 62:373–384. [PubMed: 2055128]
- Isabella RA, Belsky J, von Eye A. The origins of infant-mother attachment: An examination of interactional synchrony during the infant's first year. *Developmental Psychology*. 1989; 25:12–21.
- Kerns KA, Barth JM. Attachment and play: Convergence across components of parent-child relationships and their relations to peer competence. *Journal of Social and Personal Relationships*. 1995; 12:243–260.
- Kiser LJ, Bates JE, Maslin CA, Bayles K. Mother-infant play at six months as a predictor of attachment security at thirteen months. *Journal of the American Academy of Child Psychiatry*. 1986; 25:68–75. [PubMed: 3950270]
- LaGasse LL, Seifer R, Wright LL, Lester BM, Tronick EZ, Bauer CR, et al. The Maternal Lifestyle Study (MLS): The caretaking environment of infants exposed to cocaine/opiates. *Pediatric Research*. 1999; 45:247A. [PubMed: 10022598]
- Lamb, M.; Bornstein, MH.; Teti, DM. *Development in infancy: An introduction*. 4. Mahwah, NJ: Erlbaum; 2002.
- Lamb ME, Thompson RA, Gardner WP, Charnov EL, Estes D. Security of infantile attachment as assessed in the strange situation: Its study and biological interpretation. *The Behavioral and Brain Sciences*. 1984; 7:127–171.
- Lester BM, el Sohly MA, Wright LL, Smeriglio VL, Verter J, Bauer CR, et al. The maternal lifestyle study: Drug use by meconium toxicology and maternal self-report. *Pediatrics*. 2001; 107:309–317. [PubMed: 11158464]
- Lester BM, Tronick EZ, LaGasse L, Seifer R, Bauer C, Shankaran S, et al. The Maternal Lifestyle Study (MLS): Effects of substance exposure during pregnancy on neurodevelopmental outcome in 1-month-old infants. *Pediatrics*. 2002; 110:1182–1192. [PubMed: 12456917]
- Levenstein, P.; O'Hara, J. The necessary lightness of mother-child play. In: MacDonald, K., editor. *Parent-child play: Descriptions and implications*. Albany, NY: State University of New York Press; 1993. p. 221-237.
- Lindhiem O, Bernard K, Dozier M. Maternal sensitivity: Within-person variability and the utility of multiple assessments. *Child Maltreatment*. 2011; 16:41–50. [PubMed: 21131634]
- MacDonald K. Parent-child physical play with rejected, neglected and popular boys. *Developmental Psychology*. 1987; 23:705–711.
- MacDonald K, Parke RD. Bridging the gap: Parent-child play interaction and peer competence. *Child Development*. 1984; 55:1265–1277. [PubMed: 6488955]
- Main, M.; Solomon, J. Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In: Greenberg, MT.; Cicchetti, D.; Cummings, M., editors. *Attachment in the preschool years: Theory, research, and intervention*. The University of Chicago Press; Chicago: 1990. p. 121-160.
- Matas L, Arend RA, Sroufe LA. Continuity of adaptation in the second year: The relationship between quality of attachment and later competence. *Child Development*. 1978; 49:547–556.
- Messinger DS, Bauer CR, Das A, Seifer R, Lester BM, Lagasse LL, et al. The maternal lifestyle study: Cognitive, motor, and behavioral outcomes of cocaine- exposed and opiate-exposed infants through three years of age. *Pediatrics*. 2004; 113:1677–1685. [PubMed: 15173491]
- Moss E, Cyr C, Dubois-Comtois K. Attachment at early school age and developmental risk: Examining family contexts and behavior problems of controlling-caregiving, controlling-punitive, and behaviorally disorganized children. *Developmental Psychology*. 2004; 40:519–532. [PubMed: 15238040]

- Naber FBA, Bakermans-Kranenburg MJ, van Ijzendoorn MH, Swinkels SHN, Buitelaar JK, Dietz C, et al. Play behavior and attachment in toddlers with autism. *Journal of Autism and Developmental Disorders*. 2008; 38:857–866. [PubMed: 17896172]
- NICHD Early Child Care Research Networks. Child care and mother-child interaction in the first three years of life. *Developmental Psychology*. 1999; 35:1399–1413. [PubMed: 10563730]
- Notaro PC, Volling BL. Parental responsiveness and infant-parent attachment: A replication study with fathers and mothers. *Infant Behavior and Development*. 1999; 22:345–352.
- Parke, RD.; MacDonald, KB.; Burks, VM.; Carson, J.; Bhavnagri, N.; Barth, JM., et al. Family and peer systems: In search of the linkages. In: Kreppner, K.; Lerner, M., editors. *Family Systems of Life-span Development*. Hillsdale, NJ: Erlbaum; 1989. p. 65-92.
- Pederson DR, Moran G. The relationship imperative: Argument for a broad definition of attachment. *Journal of Family Psychology*. 1999; 13:496–500.
- Pederson DR, Moran G, Sitko C, Campbell K, Ghesquire K, Acton H. Maternal sensitivity and security of infant-mother attachment: A Q-sort study. *Child Development*. 1990; 61:1974–1983. [PubMed: 2083509]
- Pianta RC, Sroufe LA, Egeland B. Continuity and discontinuity in maternal sensitivity at 6, 24, and 42 months in a high-risk sample. *Child Development*. 1989; 60:481–487. [PubMed: 2924663]
- Radke-Yarrow M, Cummings M, Kuczynski L, Chapman M. Patterns of attachment in two-and-three-year-olds in normal families and families with parental depression. *Child Development*. 1985; 56:884–893. [PubMed: 4042751]
- Rodning C, Beckwith L, Howard J. Characteristics of attachment organization and play organization in prenatally drug-exposed toddlers. *Development and Psychopathology*. 1989; 1:277–289.
- Roggman LA, Langlois JH, Hubbs-Tait L. Mothers, infants, and toys: Social play correlates of attachment. *Infant Behavior and Development*. 1987; 10:233–237.
- Seifer R, LaGasse LL, Lester B, Bauer CR, Shankaran S, Bada HS, et al. Attachment status in children prenatally exposed to cocaine and other substances. *Child Development*. 2004; 75:850–868. [PubMed: 15144490]
- Seifer R, Schiller M, Sameroff AJ, Resnick S, Riordan K. Attachment, maternal sensitivity, and infant temperament during the first year of life. *Developmental Psychology*. 1996; 32:12–25.
- Sroufe, LA.; Egeland, B.; Carlson, E.; Collins, WA. *The development of the person: The Minnesota Study of Risk and Adaptation from Birth to Adulthood*. New York: Guilford Press; 2005.
- Sroufe LA, Waters E. Attachment as an organization construct. *Child Development*. 1977; 48:1184–1199.
- Uhlhorn SB, Messinger DS, Bauer CR. Cocaine exposure and mother-toddler social play. *Infant Behavior and Development*. 2005; 28:62–73.
- Valentino K, Cicchetti D, Toth SL, Rogosch FA. Mother-child play and emerging social behaviors among infants from maltreating families. *Developmental Psychology*. 2006; 42:474–485. [PubMed: 16756439]
- Waters, E.; Deane, F. *Monographs of the Society for Research in Child Development*. Vol. 50. 1985. Defining and assessing individual differences in attachment relationships: Q-methodology and the organization of behavior in infancy and early childhood. In I. Bretherton & E. Waters (Eds.), *Growing points of attachment theory and research*; p. 41-65.
- Waters E, Wippman J, Sroufe LA. Attachment, positive affect, and competence in the peer group: Two studies in construct validation. *Child Development*. 1979; 50:821–829. [PubMed: 498856]
- Yogman MW. Games fathers and mothers play with their infants. *Infant Mental Health Journal*. 1981; 2:241–248.
- Zaslow MJ, Rabinovich BA, Suwalsky JTD, Klein RP. The role of social context in the prediction of secure and insecure/avoidant infant-mother attachment. *Journal of Applied Developmental Psychology*. 1988; 9:287–299.

Research Highlights

1. We found limited relations between attachment security and quality of social interaction in an at-risk sample of toddlers and their mothers.
2. This suggests caution in adopting a broad view of the parent-child attachment relationship that equates security of attachment in toddlerhood with more general features of the parent-child interaction.
3. The development of secure attachments in the absence of high-quality social interaction suggests a potential protective factor for at-risk toddlers.

Table 1

Child and mother characteristics

Variable	Exposed Group (N = 45)	Comparison Group (N = 72)	p
Sex, <i>n</i> (%)			
Male	24 (53.3%)	38 (52.8%)	.953
Gestational age (weeks), <i>n</i> (%)			
24–27	2 (4.4%)	4 (5.6%)	.810
28–32	4 (8.9%)	4 (5.6%)	
33–37	7 (15.6%)	15 (20.8%)	
38–42	32 (71.1%)	49 (68.1%)	
Birth weight (grams), <i>mean</i> (<i>sd</i>)	2781.49 (916.75)	2820.56 (917.45)	.823
Race, <i>n</i> (%)			
African American	34 (75.6%)	57 (79.1%)	.105
Caucasian	5 (11.1%)	1 (1.4%)	
Hispanic	5 (11.1%)	13 (18.1%)	
Other	1 (2.2%)	1 (1.4%)	
Marital status, <i>n</i> (%)			
Married	7 (15.6%)	19 (26.4%)	.260
Never married	36 (80.0%)	52 (72.2%)	
Divorced or Widowed	2 (4.4%)	1 (1.4%)	
Maternal age (years), <i>n</i> (%)			
18–25	8 (17.8%)	40 (55.6%)	0.000**
26–35	30 (66.7%)	27 (37.5%)	
36–49	7 (15.6%)	5 (6.9%)	
Maternal education, <i>n</i> (%)			
Less than high school	26 (57.8%)	32 (44.4%)	.161
High school graduate or more	19 (42.2%)	40 (55.6%)	
SES, <i>mean</i> (<i>sd</i>)			
Index of social prestige	30.48 (10.14)	28.32 (8.62)	.221

Note: N.S. = Not significant.

**
p < .001.

Table 2

Correlations between child, mother, and dyadic social interaction variables

	<i>Child</i>			<i>Mother</i>				<i>Dyad</i>					
	Gaze	Toy offer	JA	Smile	Request	Toy offer	Pos. Voc.	Neg. Voc.	Smile	Sensitivity	Child response to mother request	Child response to mother toy offers	Mother response to child toy offers
<i>Child</i>													
Gaze													
Toy offer	.44**												
JA	.32**	.07											
Smile	.44**	.35**	.12										
<i>Mother</i>													
Request	.01	-.07	.04	.09									
Toy offer	.15	.44**	-.05	.12	.11								
Pos. voc.	.18*	.23*	.02	.16	.03	-.07							
Neg. voc.	.05	-.05	-.11	.03	.19*	.05	.06						
Smile	.20*	.11	.15	.38**	.05	-.07	.39**	-.01					
Sensitivity	.18	.18	.19*	.16	-.14	.01	.22*	-.22*	.24*				
<i>Dyad</i>													
Child response to mother request	.07	.09	-.06	.002	-.31**	-.09	.13	-.17	.13	.22*			
Child response to mother toy offers	.15	.16	.13	.12	.05	-.26*	.09	-.09	-.02	.14	.11		
Mother response to child toy offers	.06	.37**	-.004	.14	-.08	.08	.16	.04	.11	.21*	.09	.03	

Note: JA: joint attention; pos. voc: positive vocalizations; neg. voc.: negative vocalizations.

p < .01*
p < .05

Table 3

Frequencies of secure, insecure, disorganized, and not disorganized attachment classifications by risk group

18-Month Attachment Group	Exposed	Non-Exposed	Totals
Secure	31 (68.9%)	51 (70.8%)	82 (70.1%)
Insecure	14 (31.1%)	21 (29.2%)	35 (29.9%)
Total	45 (38.5%)	72 (61.5%)	117
Disorganized	6 (13.3%)	8 (11.3%)	14 (12.1%)
Not Disorganized	39 (38.2%)	63 (61.8%)	102 (87.9 %)
Total	45 (38.8%)	71 (61.2%)	116

Note. Of the 117 participants with a secure or insecure classification, 1 was missing a corresponding disorganized or not disorganized classification. Thus, for disorganized versus not disorganized analyses, the total sample included 116 participants.

Table 4

Marginal means for attachment and attachment by maternal education effects in ANOVA analyses

	Insecure	Secure
<i>Mother instrumental directiveness/child noncompliance (main effect)</i>		
	0.42 (n = 35)	-0.31 (n = 82)
<i>Mother instrumental directiveness/child noncompliance (interaction effect)</i>		
< 12 years education	-0.16 (n = 18)	-0.20 (n = 40)
≥12 years education	1.01 (n = 17)	-0.43 (n = 42)
	Disorganized	Not disorganized
<i>Mother instrumental directiveness/child noncompliance (interaction effect)</i>		
< 12 years education	-1.71 (n = 7)	-0.03 (n = 50)
≥12 years education	1.67 (n = 7)	-0.23 (n = 52)
<i>Mother verbal directiveness/child noncompliance (interaction effect)</i>		
< 12 years education	-1.16 (n = 7)	0.32 (n = 50)
≥12 years education	0.61 (n = 7)	-0.26 (n = 52)
<i>Mother positive responsiveness (interaction effect)</i>		
< 12 years education	0.63 (n = 7)	-0.29 (n = 50)
≥12 years education	-1.23 (n = 7)	0.30 (n = 52)