

LEVELS OF ATTACHMENT DISORGANIZATION:
ITS PRECURSORS AND PATHWAYS TOWARD MALADAPTATION

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ABSTRACT

FEIHONG WANG: Levels of Attachment Disorganization: Its Precursors and
Pathways toward Maladaptation
(Under the direction of Martha J. Cox)

This dissertation research examined both the etiology of attachment disorganization and the pathways from attachment disorganization levels at 12 months to maladaptation at 36 months. Regarding the etiology of attachment disorganization, hypotheses were made that parental harsh and negative behaviors would be a significant predictor of children's attachment disorganization levels at 12 months in the Strange Situation Procedure within a diverse community sample. Additionally, moderational mechanisms were tested in the association between harsh and negative parenting and children's disorganization levels in attachment. Regarding the pathways from attachment disorganization to maladaptation at 36 months, the direct link between the two constructs were tested first, and then multiple moderational pathways were examined in the association between early attachment disorganization levels and externalizing behaviors at 36 months. This research found that harsh negative parenting was a significant predictor of children's levels of disorganization in attachment. In addition, this association was contingent on the levels of parental belief in discipline and control in that harsher and more negative parenting was significantly related to children's levels of attachment

disorganization at 12 months only when it was paired with strong parental belief in discipline and control,. In contrast, when children had difficult temperament at 6 months, it was only when parents held *very weak* beliefs in discipline and control that children were at the higher risk for attachment disorganization. When examining the pathways toward maladaptation, this research found that attachment disorganization levels was a significant predictor of children's externalizing behaviors at 36 months. This link was also contingent on the number of children at home in that higher levels of disorganization were associated with higher externalizing behaviors only when there were one or more siblings living at home. In addition, child difficult temperament at 12 months served as a unique predictor of children's externalizing behaviors at 36 months above and beyond the prediction of attachment disorganization levels which suggests multiple avenues in the development of early externalizing behaviors. In sum, this research highlights the importance of examining the specific conditions under which risk or maladaptation may arise.

To my mom in heaven, with love.

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GENERAL INTRODUCTION

A critical aspect of child attachment behaviors is their organization and coordination with the behavior of significant other people in their lives and the changing social context, rather than their sheer frequency or intensity—thus organization is a fundamental property of attachment behaviors (Sroufe, 1979; Sroufe, Egeland, Carlson, & Collins, 2005). The origin of the individual organization of these behaviors resides in the infant's primary affectional relationships with caregivers, which was defined by Bowlby as an attachment relationship (Ainsworth, 1969). One central component in Bowlby's attachment theory is the conception that attachment behaviors are organized through the operation of a control system whose activity has the predictable outcome of maintaining or restoring proximity with the caregiver. This system, Bowlby suggested, was selected for over human evolutionary history because of its promoted survival until reproductive maturity in the human environment of evolutionary adaptedness (Bowlby, 1969/1982, 1973).

Attachment Security Dimension

Within the attachment behavioral system, different attachment behaviors are organized within the individual in response to particular histories of internal and external cues, with functional equivalence of different behaviors serving similar functions and having similar meanings. For example, greeting, approaching, touching, embracing, calling, reaching, and smiling all serve the function of initiating interaction; and following, clinging, and crying behaviors all aim to avoid separations.

The flexible use of a variety of attachment behaviors, depending on the circumstances, affords the infant greater efficiency in goal-corrected responses (Ainsworth, 1969).

Individual differences in children's organization of attachment relationship were identified by Ainsworth, Blehar, Waters, & Wall (1978) in their pioneering Strange Situation procedure that allows assessing individual differences in the qualitative organization of attachment by measuring the balance between the proximity maintaining and exploratory behaviors. Specifically, the procedure is designed to activate the infant's attachment system in a graded fashion through two sets of episodes of separation from and reunion with the attachment figure (parent) following three episodes in which the infant enters a strange room, plays with toys with the parent present, and then experiences the presence of a stranger who enters the room while the parent is present. Infants' behaviors in the two episodes of reunion are typically rated with reference to their behaviors in the previous and intervening sessions and their responses to current behaviors of caregivers (Ainsworth et al., 1978; Solomon & George, 2008). Children with secure attachment (Type B) may or may not show signs of distress when separated from mothers, but readily greet her upon reunion, and return to exploration soon after being comforted. Children with insecure/avoidant attachment (Type A) show minimal distress when separated from mothers, and actively avoid their mother when reunited. During both the separation and the reunion episodes, these children tend to show an excessive focus on toys and demonstrate little interest in their mothers. Children classified as ambivalent or resistant (Type C), in contrast, show an excessive focus on mothers

with little engagement in exploration. When separated from mothers, they are overwhelmingly distressed but become angry and restless when reunited with mothers, and are not easily comforted by her (Ainsworth et al., 1978; Solomon & George, 2008).

These three types of attachment strategies are consistent, organized, effective, and stable with regard to the goal of preserving psychological security by maintaining the caregiver within a tolerable distance. They do differ, however, in the quality and flexibility of the affective displays used to achieve this goal (Main, Kaplan, & Cassidy, 1985). Thus, this classical classification system of attachment draws on stable and recurring differences in patterns of behavioral organization observable among infants in the assessment of the security dimension of attachment.

From a functional perspective, insecure/avoidant and insecure/resistant attachment are considered as equally adaptive and effective as a secure attachment since each serves equally well the more distal function of insuring survival and the attainment of reproductive maturity (Main & Hesse, 1990; Sroufe, 1988; Weinfield, Sroufe, Egeland, & Carlson, 2008). However, from a developmental perspective, security of attachment has been regarded as the optimal attachment strategy because in contrast to avoidance or resistance it does not compromise exploration of the social (for avoidant children) or physical environments. Therefore, attachment formation by the end of the first year is considered a developmental milestone that has a significant impact on children's subsequent psycho-social adjustment (Bowlby, 1973; Sroufe, et al., 2005), with secure children more likely to develop prosocial and adaptive outcomes and less prone to psychopathological and problematic

functioning in later years than their insecure peers (Berlin, Cassidy, Appleyard, 2008; Thompson, 2008; Weinfield, et al., 2008).

Attachment Organization Dimension

It should be noted that by focusing on stable attachment strategies to assess attachment security, the classical Ainsworth's classification system fails to allow for behaviors that are not yet organized, or not well organized by 12 months of age. The observation that children do differ in this regard was made when many investigators were unable to easily classify a group of children whose attachment behaviors did not fit neatly in any of the three classic attachment strategies. That is, these children's attachment behaviors did not meet the basic organizational threshold for classification into the secure, insecure/avoidant, or insecure/resistant categories. Regarding this difficulty, Main and Weston (1981) were the first to report that some children (13%) in their low risk sample behaved in ways that did not fit any of the three attachment types. When similar anomalies were observed in high risk samples, revisions of the traditional ABC classifications were suggested (see review in Lyons-Ruth, Yellin, Melnick, & Atwood, 2005).

This classification difficulty noted in both low risk and high risk samples forced a reassessment of the criteria of attachment quality and the addition of a new category of attachment called the disorganized/disoriented attachment, or type D (Main & Solomon, 1990). A common theme in these children's behavior is contradiction, disorganization and disorientation and stillness (i.e., inhibition) (Main & Hesse, 1990). For example, the children may show freezing, vigilant body posture, and apprehensive affect at the sight of the parent that reflect periodic and sudden

breakdowns in the organization of behavioral strategies. To capture this extent of attachment disorganization Main and Solomon (1990) opted to use a 9-point scale, with “1” indicating no sign of disorganization or disorientation and “9” indicating strong, extreme and severe signs of disorganization and/or disorientation. Using Main and Solomon’s procedures, children with scores below 5 on this scale are classified as non-disorganized, whereas children with scores above 5 are classified as disorganized. Those with a score of 5 can be assigned either as organized or disorganized based on the coder’s judgment. While most children with a disorganized classification are inherently insecure, some are not by the criteria otherwise used in the ABC classification. Accordingly, disorganized children can be forced into the categories of D/secure, D/avoidant, D/resistant depending on other behaviors pertaining to proximity maintenance and exploration in the Strange Situation.

Research has indicated that atypical and frightening parenting is an important precursor of infant disorganization (Lyons-Ruth et al., 2005; Main & Hesse, 1990). This parenting style appears to create for the child a situation in which the caregiver, while being the haven of safety, is also a source of alarm, leaving the infant experiencing extreme arousal and without an avenue for resolution under stress. Main and Hesse (1990) contended that these children experience fear in the presence of their caregivers as suggested by behaviors such as freezing, vigilant body postures, and apprehensive affect at the sight of the parents. It is suggested that this fear, as observed in the strange situation, may have its origin in a history of frightening interactions with the parent.

Main and Hesse (1990) further showed, using the Adult Attachment Interview (Main, Kaplan, & Cassidy, 1985), an adult representational measure of attachment, that parents of disorganized children were more likely to exhibit an Unresolved (U) state of mind due to their own unresolved experience of loss and trauma. This state of mind is characterized by the presence of brief or circumscribed bouts of disorganization or lapse in reasoning and coherence in discourse while reflecting about one's own attachment history during the interview. Parents with U state of mind may still have fear about their own unresolved loss experience and may sporadically enter into a dissociative or quasi-dissociative state. When in such a state while interacting with their child, these parents are likely to display either frightening or frightened (F/F) parenting behaviors. While frightening parenting behaviors are fear-provoking self-evidently, Main and Hesse (1990) reasoned that frightened parenting may also be fear-provoking because those frightened behaviors are often related to the parents' own traumatic experiences rather than to some aspect of the ongoing parent child interaction. Therefore, these parental behaviors are incomprehensible in origin and unpredictable in pattern, leaving their children in an irresolvable paradox, wherein the parent, as the haven of safety is also the source of fear. Furthermore, Main and Hesse (1990) proposed a mediational model in which a parental U state of mind is associated with attachment disorganization in infancy through the mediation of F/F parenting behaviors. Main and Hesse (1990) found support for this mediational model in their low risk middle class sample as well as in a few subsequent studies with higher-risk samples (Main & Hesse, 1990).

Lyons-Ruth et al. (2005), based on their clinical high risk sample, further

proposed that disorganized children may have parents with Hostile/Helpless (H/H) state of mind due to their chronic relational trauma in their own early relational experience. H/H state of mind is manifested through the parent's general contradictory emotional evaluation of a central caregiver in the AAI. These parents, when in their childhood, may not necessarily have experienced any loss or traumatic experiences as society normally would recognize. However, growing up having experienced persistently dysfunctional interactions with their own parents may have led to their internalization of this dysfunctionality and to re-enacting it in their current parenting behaviors. When parents re-enact those same dysfunctional interactive patterns with their own child, they may re-create the same confusing, alarming, and apprehensive behaviors (Lyons-Ruth et al., 2005) they (the parents) experienced as children. By repeating those same patterns, these parents leave their child in situations of stress with the same heightened arousal state and the same lack of regulatory support they themselves experienced as children. Therefore, Lyons-Ruth et al. (2005) suggested another possible mediational model in which a parental H/H state of mind is associated with attachment disorganization in infants via a transgenerational transfer of atypical parenting behaviors.

Alternatively, some researchers suggested that attachment disorganization may result from parents' systematic violation or deviancy of contingency in interacting with their children (Koos & Gergely, 2001). Given that maternal contingent responses to infants' bids and behaviors promote infants' sense of control in the external environment, such contingent responses may be lacking in some parents, who do not or are not able to provide normal contingent responses to infants by

being either profoundly disengaged from or excessively harsh with their youngsters in interaction. Raised in such caregiving environment of deviant or little contingency, infants may develop fixated bio-behavioral mechanisms with behavioral correspondence of incoherence, disorganization, and disorientation typically seen in children of attachment disorganization under situations of relational distress.

However, the contingency hypothesis has only been tested in a very small sample in which only children's affective responses in a brief Mirror Interaction Situation (MIS) at six months and their attachment categorization at 12 months were compared. In MIS, the mother and the young infant sit by each other with a screen between them so that they cannot directly see or touch each other. A one-way mirror is positioned in front of each of them, so that the two can interact through facial expressions or vocal gestures in the mirrors. In the first minute, the mother and the infant interact freely. In the second minute, the mother is asked to fixate the image of the infant but with a flat still face. In the third minute, the mother resumes free interaction with the infant and becomes animated again. This procedure is considered to be capable of capturing infant-mother interactive patterns and infants' emotional reactions to the abrupt loss of contingency in parental affect.

Currently, it is still the mediational models proposed by Main and Hesse (1990) and Lyons-Ruth et al. (2005) that have been empirically tested and replicated and thus mainly contribute to our understanding of the etiology of early attachment disorganization. Nevertheless, there are still gaps in both mediational models. As reviewed in Bernier and Meins (2008), a large proportion of variation in attachment disorganization is not accounted for by either mediational model. Also, the focus on

the meditational mechanism may have confined our exploration for other possible mechanism responsible for the link between parental factors and children's attachment disorganization. For example, a moderational model could also be possible in the association between parenting and attachment disorganization, given that some children may be more vulnerable while others may be more resilient for attachment disorganization under the same disrupted parenting (Bernier & Mains, 2008). Therefore, in my first study, I examined a specific type of parenting (harsh parenting) as related to attachment disorganization, as well as a possible moderating mechanism (i.e., parental belief in discipline and control and child difficult temperament) in this link.

Developmental Consequences of Attachment Disorganization

Regarding developmental consequences, increasing evidence is available suggesting that children with attachment disorganization are at elevated risk for psychosocial problems in early school ages, middle childhood, and adolescence compared to their non-disorganized counterparts (see meta-analysis in Fearon, Bakermans-Kranenburg, van IJzendoorn, Lapsley, & Roisman, 2010; see review in Lyons-Ruth & Jacobvitz, 2008). For example, Lyons-Ruth, Repacholi, McLeod, and Silva (1991) suggested that disorganized infants were significantly more likely to have externalizing problems at age 5. Van IJzendoorn, Schuengel and Bakermans-Kranenburg (1999) suggested that children disorganized in infancy, preschool age or early school age were more likely to be aggressive and show externalizing behaviors than their non-disorganized counterparts. Smeekens, Riksen-Walraven, & van Bakel, (2009) found that disorganization at 15 month was associated with more

externalizing problems at age 5. Munson, McMahon, & Spieker (2001) found that disorganized as well as avoidant attachment in infancy were associated with significantly higher externalizing behaviors at 4 years compared to children with early secure attachment, and this association was maintained in the subsequent five years. Lyons-Ruth, Easterbrooks, and Cibelli (1997) found that among school age children whose teachers rated them as highly externalizing, 83% had disorganized attachment as well as mental development scores below the national mean at 18 months.

In Study 2, I tested whether there was an association between early disorganization levels of attachment and externalizing behavior problems as early as 36 months. Additionally, to better understand the conditions under which such an association may exist, I examined the possible moderating mechanisms that might alter the link between early attachment disorganization and children's externalizing problems at 36 months.

Expansion on the Attachment Disorganization Dimension

The predominant focus of most research on attachment disorganization is on the binary disorganized vs. non-disorganized attachment classifications generated from dichotomizing the continuous 1-9 rating of disorganization into groups with scores of 5 or above (disorganized) and groups with scores below 5 (not disorganized). However, some published studies of attachment disorganization have used the continuous measure derived from direct observations of the child behavior in the strange situation procedure. Specifically, using the continuous 1 to 9 rating of disorganization, Owen and Cox (1997) found that marital conflict was significantly

and positively related to children's level of disorganization, a finding consistent with Main and Hesse (1990)'s postulation that a conflict ridden family environment may be alarming and frightening to children and render them few resources to regulate their arousal. Using the same continuous disorganization measure, Macfie, Fitzpatrick, Rivas and Cox (2008) found that children's level of attachment disorganization at 12 months was significantly related to parent-child role reversal at 24 months. The literature using the 1-9 rating of attachment disorganization, although limited, supports the predictive validity of the continuous variable.

There may be some advantages to the continuous variable, in that it may have greater power in multivariate analyses than the categorical attachment disorganization to detect associations with outcomes because this measure preserves the naturally occurring variation in attachment organization. Main and Solomon (1990) recognized the potential value of the 9-point scale and suggested that the nine-point scale of attachment disorganization can be utilized in addition to the D vs. non-D classification. Main and Solomon (1990) also acknowledged the uncertainty regarding whether Type D as a category has meaning comparable to the three traditional types of attachment (Type A, B, C). Thus, they suggested that while the current attachment classifications are meaningful, they are also provisional and should be kept open to conceptual revision.

It has also been suggested earlier in the literature on the organization of emotions that between the lowest and the highest degree of organization to reach motivational goals lie meaningful graded differences in the organization of the strategies to reach them (Bindra, 1955). Applying this finding to attachment behavior,

the degree of disorganization in attachment behavior would capture the relative stability of attachment motivation goals as well as the degree to which the consolidation of repeatable strategies to attain those goal has been achieved or not; an aspect of attachment "as an organizational construct" (Sroufe & Waters, 1977) that is definitely not captured by the ethologically inspired ABC/D attachment categorization. Therefore, examining the construct of attachment disorganization by exploiting the variability that naturally occurs in attachment organization as a potential precursor of later behavior outcomes is of important theoretical significance as it may also foster a more in depth understanding of the attachment phenomenon. Accordingly, I will use in all analyses proposed for studies 1 and 2 the continuous measure of attachment disorganization.

PREDICTION OF ATTACHMENT DISORGANIZATION LEVELS IN INFANCY (STUDY 1)

Introduction

Attachment disorganization is characterized by a temporary breakdown of organized behavioral strategy under attachment related stress (Main & Hesse, 1990). Accumulated evidence is currently available suggesting that children with attachment disorganization are at elevated risk for psychosocial problems of adaptation (Green & Goldwyn, 2002). Therefore, it is important to understand the etiology of attachment disorganization.

According to Main and Hesse (1990), at least a certain degree of fear is experienced by children with disorganized attachment as evidenced by their freezing, disoriented, and disorganized behaviors. This fear may originate from chronic exposure to frightening caregiving environments such as those involving parenting behaviors that are fear-provoking and atypical (Lyons-Ruth et al, 2005; Main & Hesse, 1990), or intense marital conflict (Finger, Hans, Bernstein, & Cox, 2009; Owen & Cox, 1997). Frightening/frightened (F/F) parenting may be fear-provoking, and may leave children in an irresolvable paradox, wherein the parents, as the haven of safety, are also the source of alarm (Main & Hesse, 1990). Parents who behave in hostile, fearful, and withdrawn manners to their children fail to provide regulatory support for children when they are emotionally aroused, leaving their

children disorganized under arousal from high stress (Lyons-Ruth et al., 2005). Strong marital conflict may cause the parents to appear either frightened or frightening to their children, thus leaving their children inadequate behavioral options to alleviate their experienced distress (Owen & Cox, 1997). In all these scenarios, disorganization of attachment results from fears that exceed the coping capabilities of the young child and the absence of regulatory support from the parent that may help resolve those fears.

While fear is deemed the common result of both F/F parenting and atypical parenting, there is heterogeneity in both the F/F parenting and atypical parenting coding systems. For example, parents could be both frightening and frightened on the F/F parenting coding system, or both intrusive-negative and withdrawn on the atypical parenting coding system. However, the mechanism leading to the disorganized attachment may be different with different specific parenting behaviors. Identifying the parenting behaviors with homogenous indicators and examining the specific mechanism involved in the association with children's attachment disorganization may be of both theoretical and empirical importance.

Negative Harsh Parenting

Both the F/F parenting and atypical parenting coding systems included indicators that suggest the parent may behave harshly to their children. Harsh and negative parenting has been found to be significantly related to children's attachment disorganization in a high risk maltreatment sample (Carlson, Cichetti, Barnett, & Braunwald, 1989). However, studies have not asked if attachment disorganization may arise in the context of harsh and negative parenting among children not

sampled from high risk populations. Given that 13% to 15% of children in a community sample also have early attachment disorganization, harsh parenting may be a possible precursor in normative community samples, even without identified maltreatment. For the young child, parental harsh behavior may also be a source of fear, and parents who endorse such a parenting practice may not be inclined to function as a source of comfort when their child is so aroused. Because this pathway to attachment disorganization has rarely been examined in a community sample, one of the major goals of the proposed study is to examine this hypothesis.

Specifically, what appears to be inherent in harsh and negative parenting is the parents' intrusive imposition of their own agenda on their children and their harsh and negative response to the child. The linkage between intrusive and hostile parenting and later internalizing and externalizing behaviors has long been established (e.g., Chorpita & Barlow, 1998; Rubin, Burgess, Dwyer & Hastings, 2003), suggesting the detrimental impact of such a parenting style on children's regulatory functions. More related, Lyons-Ruth et al. (1991) found that parents who were highly intrusive and imposing were more likely to have disorganized children, especially the disorganized/insecure subtype, and hostile intrusive behaviors are one indicator of atypical parenting as associated with the hostile/helpless state of mind among parents with children classified as D/insecure (Lyons-Ruth, et al., 2005). In addition, it was found that harsh affect directed toward the child tends to co-occur with intrusive behavior (Mills-Koonce, et al., in press; Mills-Koonce, Propper, Garipey, Blair, Garrett-Peters, & Cox, 2007) suggesting that a combination of harsh affect, controlling, and intrusive behavior might be, indeed, frightening to the young child.

From the contingency theory's perspective, this frightening experience can be further understood as a result of parents' systematic violation or deviancy of contingency in interacting with their children. According to the contingency detection theory (Gergely & Watson, 1999; Koos & Gergely, 2001), infants are prewired with a "contingency detection module" which undergoes a developmental shift from self-oriented to other-oriented contingency seeking at around 3 months, which corresponds with the start of an attachment relationship with the infants' initial preference of human faces. Under normal conditions, mothers respond to infants' cooing and movement which facilitates the establishment in infants of a sense of control in the external environment. However, when mothers do not provide contingent responses to infants, or when the contingency in the caregiving environment is deviant, infants may develop a defensive fixation that can be characterized as a "flickering contingency switch". This "flickering contingency switch" is dysfunctional because, rather than a consolidation of a consistent other-oriented contingency expectation and seeking, it represents a competition between two dominant routes of contingency seeking, both self oriented and other oriented. Thus, under situations of relational distress, children with such dual contingency detection models online are more likely to display incoherent and disorganized behaviors indicative of attachment disorganization.

In Koos and Gergely (2001), the contingency hypothesis was applied to the situation where parents suddenly withdrew from the interaction with their six month old infants during the MIS, thus providing no contingency at all to infants' bids and coos for a couple of minutes. Infants experiencing such sudden withdrawal were

more likely to show dissociative behaviors in the Strange Situation at 12 months and be classified as disorganized in attachment than those who had not experiencing sudden maternal withdrawal during the mirror interaction situation at 6 months. In the context of high intrusiveness and negativity, normal contingency patterns may be violated, not through disengagement and withdrawal, but through excessive emotionally charges and overwhelming imposition of parents' agenda on children that are not contingent on children's own behaviors and affect.

Parental Belief in Discipline and Control

Not all caregivers, however, display a persistently harsh and negative parenting style. According to Bernier and Meins (2008)'s threshold hypothesis, other factors may be involved that set thresholds for displaying such behaviors more or less regularly. The extent to which parents believe that discipline and control is good parenting practice may be such a threshold factor. A parent who strongly believes in discipline and control may more readily behave harshly when she perceives a need for it. Parents who endorse this belief strongly may be more prone to harsh controlling behavior and more likely to maintain this parenting style consistently.

The literature on the relation between parenting beliefs and behaviors confirms that parenting beliefs may reinforce, promote, and encourage the use of parenting behaviors that are aligned with specific beliefs (Sigel & McGillicuddy-De Lisi, 2002; Tudge, Hogan, Snezhkova, & Etz, 2000). A recent study on the interaction between parenting behaviors and different parental beliefs as related to children's behavior outcomes at 36 months found that sensitive parenting buffered children from internalizing symptoms only when the parents had low to moderate beliefs in the

danger of “spoiling” children by responding to their signals of need (Barnett, Shanahan, Deng, Haskett, & Cox, 2010). Thus, following Bernier and Meins' (2008) threshold hypothesis, negative and harsh parenting may put children at an elevated risk for disorganized attachment especially when parents also have strong belief in discipline or control. Strong parental belief in discipline and control is significantly, but only moderately, associated with harsh parenting behaviors (Bugental & Johnston, 2000; Reis, 1993), but no research has examined whether and how harsh and negative parenting and parental belief in discipline and control may *jointly* predict children's disorganization levels in attachment. Therefore, the second goal of the current study is to test the moderation effect of parental belief in discipline and control in the link between harsh negative parenting and children's level of disorganization in attachment.

Child Difficult Temperament

Besides the caregiving context, researchers have examined whether differences in children's temperament may account for disorganized attachment in some children. But this research has yielded mixed findings. On the one hand, it was found that infants who are disorganized with one caregiver are not necessarily disorganized in relation to another caregiver (Main & Solomon, 1990), suggesting that child factors such as temperament may not play a major role in disorganization of attachment. In addition, a meta-analysis did not find a significant association between child temperament and disorganized attachment in infancy (van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999). On the other hand, it was found that disorganized 12-month-olds experienced much higher stress reactivity as indexed by

high cortisol concentration 10 to 15 minutes after the end of the Strange Situation in comparison to their non-disorganized counterparts (Hertsgaard, Gunnar, Erickson, & Nachmias, 1995). And another study reported that attachment disorganization is related to neonatal irritability and high temperamental emotionality (Spangler & Grossmann, 1999), a finding that suggests the need to examine attachment disorganization both in its relational and predispositional aspects.

Regarding the predispositional aspect, Bernier and Meins' (2008) threshold hypothesis further suggests that child temperament may be differentially related to their disorganization levels given different parental thresholds. Therefore, children with difficult temperament, when also experiencing harsh parenting or a strong parental belief in discipline and control, may be more likely to have higher levels of attachment disorganization than those who do not experience such parental proclivities. Alternatively, given similar parental dispositions for punitive parenting or proneness to endorse belief in discipline and control, children of very difficult temperament may be more likely to display disorganized attachment strategies under the stress of separation and reunion in the strange situation.

Furthermore, research on child temperament suggests that there are individual differences in both reactivity and regulation that are constitutionally based and expressed as differences in emotionality, motor activity, and attention (Rothbart & Derryberry, 1981). Given that it is the relative balance between reactivity and regulation that determines child temperament, it is somewhat surprising that previous studies that examined the contribution of this child factor to attachment disorganization considered either only reactivity (Marshall & Fox, 2005) or the

regulation component (Braungart-Rieker, Garwood, Powers, & Wang, 2001) instead of their relative balance within the child. Because reactive children show individual differences in regulation as early as infancy (e.g., Hill-Soderlund & Braungart-Rieker, 2008), a difficult temperament is better indexed by the combination of high reactivity and low regulation rather than either aspect in isolation. A highly reactive child lacking the constitutional advantage of regulation might be more vulnerable to parental harsh and negative behaviors and/or parental belief in discipline and control than a more or less reactive child but with more capability to regulate this reactivity. Alternatively, parents may be more prone to apply harsh and negative parenting or to strengthen a belief in discipline and control when they have to deal with a very fussy and difficult child on a daily basis. Therefore, the third goal of this proposed study is to examine the possible effects of an interaction between difficult temperament and harsh negative parenting, and another between difficult temperament and parental belief in discipline and control as predictors of children's disorganization in attachment.

Hypotheses

In sum, given the literature reviewed above, I have four major hypotheses. First, I hypothesize that harsh negative parenting is significantly associated with attachment disorganization. Second, I hypothesize that harsh controlling parenting is differentially related to children's attachment disorganization, depending on parents' belief in discipline and control. Specifically, I expect that harsh and negative parenting is more strongly related to attachment disorganization when parents also hold stronger as opposed to weaker beliefs in the importance of discipline and

control. Third, I hypothesize that children's difficult temperament may interact with harsh parenting in predicting children's attachment disorganization. That is, I expect that harsh parenting is more strongly related to attachment disorganization when the child is also very difficult in temperament. In this scenario, parents may resort to very harsh and negative behaviors to gain control over the highly reactive child who cannot be easily soothed. Alternatively, the difficult child, when experiencing high level of harsh and negative parenting that are alarming, may be highly aroused but lack the constitutionally based regulation to resolve the alarm, resulting in attachment disorganization. Fourth, I hypothesize that children's difficult temperament may interact with parental beliefs in discipline and control in predicting levels of attachment disorganization. Specifically, I expect that temperamental difficulty is more strongly related to children's attachment disorganization when parental belief in discipline and control is high. This interaction is expected because a difficult child might be more easily alarmed and frightened facing a parent who strongly believes in discipline and control.

Method

Sample

Participants of this study were drawn from the longitudinal Durham Child Health and Development (DCHD) Study in North Carolina. Two hundred and six families from varied socio-demographic backgrounds were originally recruited when the children were 3 months old through parenting classes, phone invitation based on the child's birth record, and fliers in the hospital. Efforts were made so that the participating children were typically developing children without any medical histories

before or after birth. Efforts also were made to have relatively equal representation of both African and European American families in the longitudinal study based on maternal report of ethnicity. In the current study 148 children were scored for levels of disorganization in attachment. Direct maximum likelihood estimation with assumption of data missing at random was used for the covariates and/or predictors (Arbuckle, 1996). Direct ML has less strict assumptions about the randomness in the missing data compared to listwise and pairwise deletion. In addition, it is more efficient, yields fewer convergence failures, results in relatively unbiased estimates of effects, and has near-optimal rates of Type 1 error (Enders & Bandalos, 2001).

In this subsample of 148 children, 51% were males and 49% were females; 62.2% had a score of disorganization at 1, 22.3% had a score of disorganization between 2 and 4, and 15.5% scored at 5 or above. The mean of disorganization level was 2.3 with a range of 1 to 8. The mean maternal education was 14.5 years at 6 months of child age with a range of 8 to 20 years of education. At 6 months, 15 (10%) of the participants missed maternal report of education level, 27 (18%) missed the composite measure of difficult temperament, 18 (12%) had missing data on the negative harsh parenting composite, and 24 (16%) had missing data on the parental belief in discipline and control subscale.

Procedures

When children were 3 months old, mothers responded to the demographics questionnaire at a home visit. When children were 6 months old, mothers responded to the individual demographics questionnaire, the Revised Infant Behavior Questionnaire, and the Parents' Opinion Survey at a home visit. During the home

visit, mothers and children were also filmed in a semi-structured free-play interaction for 10 minutes, in which mothers were asked to play with their children as they normally would. A set of toys including a plastic phone, musical stacking rings, and an electronic board were provided to the mothers to use if they wished. At 12 months of age, each participating pair of mother and infant was filmed in the Strange Situation. In the first six minutes of the Strange Situation, mother and child were led into the unfamiliar play room by the research assistant. The mother was instructed to put the child down near the toys and to take a seat that was provided for the mother. She was told to respond to the child as she normally would. In the next 3 minutes, an unfamiliar female adult joined the mother and the child, sitting in another chair in the room and at first was silent after greeting the mother, then spoke to the mother quietly for a minute, and then tried to engage the child in play for a minute. The mother was then signaled to leave the room, leaving the infant with the stranger. If the child was not too distressed the mother returned three minutes later, and the stranger left the room. After three minutes of reunion in which the mother was asked to reengage the child in play and return to her chair, the mother was again signaled to leave, leaving the infant alone. The stranger returned first, and then the mother returned. The last reunion lasted three minutes and the mother was asked to try to reengage the child in play.

Measures

Covariates. Given the literature that suggests gender (Carlson et al., 1989) and socio-economic differences (Carlson et al., 1989) in attachment disorganization, child gender and maternal education were controlled in all analyses.

Negative harsh parenting. Negative intrusive parenting was measured by a 10 minute parent-child interaction during a free-play session at 6 months. Toys were available but not necessary for use during the play. Parents' behaviors were coded on seven constructs based on the manual developed by Cox and Crnic (2003). They are intrusiveness, sensitivity, detachment, cognitive stimulation, animation, positive regard, negative regard. Based on factor analysis, these variables were formed into two composites. In this study, the composite "Negative intrusive parenting" was used. It is a composite of intrusiveness and negative regard. Intrusiveness indexes the extent to which the parent imposes her own agenda on the child behavior such that the interaction is adult centered. Negative regard for the child indexes the extent to which the parent shows negative affect to the child, being dismissing and harsh to the child, etc. The rating for each sub-scale ranges from 1 to 5, with 1 suggesting not characteristic at all and 5 suggesting highly characteristic of the parent.

Parental belief in discipline and control. This variable was based on parents' responses on the Parent Opinion Survey (PBS; Luster, Rhoades & Haas, 1989) at 6 months. PBS is a measure of the attitudes and beliefs that parents hold about parenting practices that are desirable and effective. A subscale of parental belief in discipline and control was created based on four items that tap the extent that the parent believes that discipline and control will serve her child well. For example, one item under this subscale asks to what degree the parent agrees with the statement that "parents should be strict with their one year old babies or they will be difficult to manage later on". The rating for the items ranges from 1 (strongly disagree) to 6 (strongly agree) with the higher score indicating the stronger belief in discipline and

control. The Cronbach α is .68.

Child difficult temperament at 6 months. This construct was assessed using parents' responses at 6 months to the Infant Behavior Questionnaire-Revised (IBQ-R; Rothbart, 1981), one of the classic measures of children's temperament. There were six subscales on the original IBQ for children of 3-12 months old. They are activity level, soothability, fear, distress to limitations, smiling and laughter, and duration of orienting. Parents were asked to rate the frequency of certain temperamental behaviors that have occurred in their children for the past one or two weeks. The IBQ-R was a refinement of the original IBQ with eight new subscales assessing the broad dimensions of reactivity and regulation. The internal consistency ranged from .70 to .90 on the different subscales (Gartstein & Rothbart, 2003). Parents were asked to rate on a 7-point likert scale the extent to which their infants act in specific ways in multiple routine situations such as feeding, bathing, exposure to novel places and new people, etc. In the DCHD study, parents were asked to respond to four subscales from the IBQ-R including 1) distress to limitations and 2) fear which are believed to reflect reactivity level, as well as 3) soothability and 4) falling reactivity/rate of recovery from distress which are believed to reflect the regulation aspect of infants' temperament. For the present purpose, difficult temperament was assessed through a composite of these four subscales of the IBQ-R by averaging infants' scores on distress to limitations, fear, reflected soothability and reflected falling reactivity/rate of recovery from distress.

Attachment disorganization. This construct was assessed through a continuous 9-point scale of attachment disorganization (Main & Solomon, 1990) which indexes

the extent of disorganization based on children's behaviors in the Strange Situation at 12 months. A rating of "1" indicates no signs of attachment disorganization at all, and "9" indicates definite assignment for attachment disorganization with severe, extreme, and frequent signs of disorganization and/or disorientation. Examples of behavioral indicators of disorganization include freezing, vigilant body posture, apprehensive affect at the sight of the parent, etc. Two coders coded 20% of the sample with inter-rater reliability of .90.

Data Analysis Plan

Descriptive statistics such as means, standard deviations, univariate distributions and correlations were first produced for each of the variables of interest in the present study. Multivariate outliers were then inspected to detect any possible influential cases in the model. To make sure the data meets the assumptions of regression analysis, sets of diagnostic analysis were also run to evaluate residual normality, linearity of residuals against independent variables, independence of observation, and homoscedasticity of the data in the sample. Lastly, multiple regressions were run in Mplus 5.2. The selection of the Mplus program was predominantly based on two reasons. First, the Mplus program, by default, uses direct maximum likelihood estimation for missing data with the assumption of missing at random (Arbuckle, 1996; Muthén & Muthén, 1998-2007). Second, the Mplus program has the option of "maximum likelihood parameter estimates with standard errors and chi-square test statistics that are robust to non-normality" (MLR) (p.484, Muthén & Muthén, 1998-2007). Given the non-normality feature of in the outcome variable attachment disorganization level and its residuals, this program

has the capability of retaining the original variability in the construct of attachment disorganization while also being robust to the non-normality problem in the distribution of the actual and residual values of this outcome variable.

Specifically, in the first regression model, only the control variables (gender and maternal education at 6 months) were entered to estimate the portion of variance in disorganization levels accounted for by these control variables. In the second regression model, three main predictors (negative parenting, parental belief in discipline and control and child difficult temperament) were entered besides the control variables to examine the main effect of these variables after accounting for the control variables. These first models were designed to assess main effects. In the final model, three two-way interaction variables (the interaction between harsh parenting and parental belief in discipline and control, between harsh parenting and child difficult temperament, and between parental belief in discipline and control and child difficult temperament) were added to the main effects model to test possible moderation effects. Significant moderational effects were probed through an online procedure created by Preacher, Curran, & Bauer (2006).

Results

Descriptive Statistics

Regarding the univariate distributions, all the continuous control and predictor variables had relative normal distributions with skewness and kurtosis within ± 1 . However, the outcome variable of attachment disorganization levels at 12 months had preponderance of value of 1 with skewness equal to 1.4 and kurtosis equal .84 (see the histograms on the diagonals of Figure 1).

The two control variables (child gender and maternal education at 6 months) were not significantly correlated. Child gender was also not significantly correlated with any of the predictor variables. However, maternal education at 6 months was significantly and negatively correlated with harsh negative parenting at 6 months ($r = -.41, p < .001$), parental belief in discipline and control at 6 months ($r = -.38, p < .001$), and child difficult temperament at 6 months ($r = -.38, p < .001$). These correlations suggest that higher maternal education was related to less harsh negative parenting, less parental belief in discipline and control, and less difficult child temperament at 6 months.

Among the predictor variables, harsh negative parenting was significantly and positively correlated with parental belief in discipline and control at 6 months ($r = .2, p < .05$) and child difficult temperament at 6 months ($r = .16, p < .05$).

Lastly, the outcome variable (attachment disorganization levels at 12 months) was significantly and negatively correlated with child gender ($r = -.18, p < .05$), suggesting girls had lower disorganized scores than boys. Attachment disorganization levels at 12 months was also significantly and positively correlated with harsh negative parenting at 6 months ($r = .25, p < .01$), indicating that higher attachment disorganized scores at 12 months was associated with higher harsh and negative parenting at 6 months (see Table 1 for means, standard deviations and bivariate correlations among all variables).

Diagnostics

Prior to the final multiple regression analyses of the data, data was examined to see if there were multivariate outliers and if the assumptions of residual normality,

linearity, homoscedasticity and independence of observation for multiple linear regression modeling were met. Since the Mplus program is majorly a model building program with few functions for regression data diagnostics, the regression diagnostic analysis was conducted in SAS9.2 with a reduced sample of no missingness (N=107) as an approximation of the data characteristics in the complete sample with missingness (N=148) as used in the Mplus program.

Possible multivariate outliers were screened by using DFFITS (Belsley, Kuh, & Welsch, 1980) statistic, a global measure of influence that compares the difference in the regression model fits between retaining and deleting a specific case. A case with DFFITS bigger than 1 is conventionally considered a potential influential case with a relatively small sample. For a large sample, the cutoff of DFFITS is set as $abs(dffits) > 2 * \sqrt{k+1/n}$ (Cohen, Cohen, West, & Aiken, 2003). Given that this is a relatively small sample, a DFFITS value of 1 was used as the screening criterion, and two observations had such a value that exceeded the conventional cutoff of 1. These two observations, thereafter, were temporarily taken out of the sample and regression models were rerun based on the reduced sample. However, the parameter estimates remained the same and the significant interaction effects still held. Thus this observation was retained in the final analysis.

The skewness and kurtosis of the standard residuals of the outcome variable were 1.37 and 2.06 respectively based on the sample without missingness (N=107). The histogram and QQ plot of the standardized residuals also consistently suggested a lack of normality in the residual distribution of the regression model and this was the major reason for the use of MLR estimator in the Mplus program.

Regarding the bivariate relationships, the scatterplots of the standardized residuals against each independent variable did not suggest any strong violation of linearity assumption although outliers did occur, in consistent with the normality screening as described above. The scatterplot of the standardized residuals against the standardized predicted outcome variable, although not perfect, did not suggest strong violation of the assumptions of independence of observation and homoscedasticity in the data either (see Figure 1 for these scatterplots).

Prior to the regression analysis, all the independent continuous variables were grand mean centered for the sake of better interpretation of the results and easier probing of the significant interactions. Another benefit of centering the variables is that it can reduce multicollinearity in regression analysis (Aiken & West, 1991).

Multiple Linear Regression Analyses in Mplus

This study used the Mplus program to fully exploit its capability of maximum likelihood estimation functioning with a missing at random assumption. Therefore, the sample size was maximized (N=148). In addition, the program can accommodate non-normality in the data with the MLR estimator.

Because the linear regression analysis in Mplus did not involve any latent variables and any measurement model, and all the paths in the regression models were estimated, the Mplus program estimated a fully saturated structural model with ideal model fit statistics which did not give substantial evaluation of the model fit as it normally does for other model estimation involving latent variables, measurement model, or manipulation of path equivalence or suppression. Therefore, model fit statistics were not reported in this study.

Three regression models were run separately in Mplus with MLR estimator and MAR assumption. In the control model, only child gender and maternal education at 6 months were used to predict children's levels of attachment disorganization at 12 months. This model explained 3.5% ($p=.207$) of the variation in children's levels of attachment disorganization at 12 months and child gender was a significant predictor of this outcome variable ($b=-.707$, $p=.029$), which suggested that boys were significantly more likely to have higher disorganized scores than girls.

In the main effects model, in addition to the two variables in the control model, the three main predicting variables were added subsequently. They were harsh negative parenting at 6 months, parental belief in discipline and control at 6 months, and child difficult temperament at 6 months. This model explained 11.3% of variation in children's levels of attachment disorganization at 12 months ($p=.028$). As hypothesized, after controlling for the demographic variables and the other two predicting variables, harsh and negative parenting at 6 months significantly and uniquely predicted children's levels of attachment disorganization ($b=.605$, $p=.005$), which suggested that higher harsh and negative parenting are significantly associated with higher levels of attachment disorganization in children.

Lastly, in the moderation model, three interaction terms were added to the main effect model. They were the interaction between harsh negative parenting and parental belief in discipline and control at 6 months, harsh negative parenting and child difficult temperament at 6 months, and parental belief in discipline and control and child difficult temperament at 6 months. This model explained 22.3% of the variation in children's attachment disorganization levels ($p=.001$). As hypothesized,

there were significant interactions between harsh negative parenting and parental belief in discipline and control at 6 months ($b=.654$, $p=.013$), as well as between child difficult temperament at 6 months and parental belief in discipline and control ($b=-.66$, $p=.006$). However, the hypothesized interaction between harsh negative parenting and child difficult temperament was not significant ($b=-.386$, $p=.279$). See Table 2 for a summary of the results from regression analysis in Mplus.

Online probing of the significant interactions between harsh negative parenting and parental belief in discipline and control at 6 months, as well as between parental belief in discipline and control and child difficult temperament at 6 months were conducted based on the regression coefficients and covariance matrixes estimated in Mplus for the interaction model. Regarding the moderated relationship between harsh negative parenting and attachment disorganization levels, the two way interaction graph (Figure 2) indicated that when parental belief in discipline and control was at a very low level (2 SD below the mean of this variable), higher harsh negative parenting did not lead to higher attachment disorganization levels. However, when parents held a mean level or a very high level (2SD above the mean) of belief in discipline and control, higher harsh negative parenting was related to significantly higher attachment disorganization levels. To identify the significant region of the moderation by parental belief in discipline and control, a graph of the significance band for this interaction was probed (Figure 3) which suggested that the simple slope or effect of harsh negative parenting was significant when parental belief in discipline and control was at the mean level or above ($\geq -.0265$). Thus, the probing of the region of significance further supported that harsh negative parenting was

significantly related to attachment disorganization levels only when parents held at least a mean level of belief in discipline and control. To replicate this finding with a better representation of the data points in the current sample, 25% quantile, Median, and 75% quantile were used as the anchoring points for the probing of such an interaction which generated similar results.

Regarding the moderated relationship between child difficult temperament and attachment disorganization levels at 12 months, the two-way interaction probing indicated that when parents held very low belief (2 SD below the mean) in discipline and control, higher difficult temperament was related to higher attachment disorganization levels (Figure 4). When parents held mean level of belief in discipline and control, higher difficult temperament was related to a marginal increase in attachment disorganization levels. However, when parents held a very high and strong belief in discipline and control, higher difficult temperament was related to lower attachment disorganization levels. To pinpoint the region of significance of such a moderation effect, a plot of the significance band was plotted which suggested that when parental belief in discipline and control was lower than $-.6108$ (around half SD below the mean) or above 1.8226 (around 1.5 SD above the mean), the relationship between child difficult temperament and attachment disorganization levels was significant (Figure 5). As such, on the one hand, higher difficult temperament was significantly related to higher attachment disorganization levels when parents held relatively low level of belief in discipline and control (lower than around half SD below the mean); on the other hand, higher difficult temperament was related to lower attachment disorganization levels when parents held relatively

high belief in discipline and control (above 1.5 SD higher than the mean level). Again, to replicate this finding with a better representation of the data points in the current sample, 25% quartile, Median, and 75% quartile were used as the anchoring points to probe this interaction, which generated consistent results.

Discussion

The goal of this study was to investigate the role of maternal harsh negative parenting on children's levels of attachment disorganization at 12 months and some moderational mechanisms involved in this linkage, controlling for children's gender and maternal education at 6 months. Given the literature suggesting frightening/frightened or atypical parenting as a robust predictor of children's attachment disorganization, I hypothesized that within a diverse community sample, harsh and negative parenting at 6 months would be significantly related to children's levels of attachment disorganization at 12 months because such behaviors may potentially elicit fear in infants who cannot escape nor comprehend such harshness and negativity from their immediate caregivers and thus become more likely to have disorganized attachment relationships by 12 months. Second, I hypothesized that harsh negative parenting would be differentially related to children's attachment disorganization depending on parents' belief in discipline and control such that harsh and negative parenting would be more strongly related to attachment disorganization when parents also held strong beliefs in the importance of discipline and control. This is because strong parental beliefs in discipline and control may render harsh and negative parenting more likely to occur, and parents with such strong beliefs are also less likely to comfort their distressed children, leaving their children with few

behavioral coping options and thus more likely to develop disorganized behaviors. Third, I hypothesized that children's difficult temperament would interact with harsh parenting in predicting children's attachment disorganization such that harsh parenting would be more strongly related to attachment disorganization when the child was also difficult in temperament. In this scenario, parents may resort to very harsh and negative behaviors to gain control over a highly reactive child who cannot be easily soothed. Fourth, I hypothesized that children's difficult temperament may interact with parental beliefs in discipline and control in predicting levels of attachment disorganization such that an easily aroused and poorly regulated child might be more easily alarmed and disorganized when facing a parent who strongly believes in discipline and control.

My hypotheses were mostly supported. First of all, I found that harsh negative parenting is significantly associated with children's attachment disorganization levels at 12 months controlling for child gender and maternal education at 6 months, while holding constant parental belief in discipline and control and child difficult temperament at 6 months. In addition, I found that harsh and negative parenting is more strongly related to attachment disorganization when parents also hold stronger level of beliefs in the importance of discipline and control. When parents endorse a very low belief in discipline and control, higher levels of harsh and negative parenting as observed in the ten-minute parent-child interaction are not significantly related to higher levels of attachment disorganization. Furthermore, I found that child difficult temperament, while not a significant predictor of attachment disorganization levels, interacts significantly with parental belief in discipline and control in prediction

of children's levels of attachment disorganization at 12 months. However, in contrast to my hypothesis I found that higher difficult temperament is significantly related to higher attachment disorganization levels only when parents basically do not believe in discipline and control as a proper parenting strategy. When parents endorse a strong belief in discipline and control, however, higher child difficult temperament is significantly related to lower attachment disorganization levels. When parents' belief in discipline and control is neither too strong nor too weak (mean level), child difficult temperament is not significantly related to children's attachment disorganization levels at 12 months. Thus, the hypothesized interaction between harsh negative parenting and child difficult temperament was not supported by the analysis, but an unexpected interaction of another nature was found.

The finding that harsh negative parenting is a significant predictor of children's attachment disorganization levels is consistent with the literature that suggests the detrimental role of parenting that is atypical and fear-provoking (Main & Hesse, 1990; Lyons-Ruth et al., 2005). Given that the previous studies that have investigated the association between parenting and children's attachment disorganization were based on clinical samples or trauma-ridden samples where extremely atypical or unusual parenting may be over-represented, this finding extends the literature in suggesting that even within a normative diverse community sample, and with parenting behavior that is more commonly seen, albeit harsh and negative, children are at higher risk for higher levels of attachment disorganization. Thus, examining these negative but not so unusual or atypical parenting behaviors may be an avenue to understanding why within normative samples, there are still around 15% of

children who form disorganized attachments at 12 months (van IJzendoorn, et al., 1999). This finding suggests that some parenting behaviors (e.g., showing negative affect; being harsh in tone), although common, may still be fear-provoking for young children whose regulation of distress is heavily dependent on a warm and caring caregiver. Thus, exposure to mothers' high negative and harsh parenting behaviors may leave some children extremely distressed without a ready solution and thus result in high attachment disorganization levels in the Strange Situation by 12 months. This finding regarding the main effect of harsh negative parenting represents an addition to the literature on the negative impact of varied adverse parenting on children's attachment disorganization (Main & Hesse, 1990; Lyons-Ruth, et al., 2005; Out, Bakermans-Kranenburg, & IJzendoorn, 2009).

However, as Bernier and Meins (2008) reasoned, not all children of parents with frightened/frightening or atypical parenting are disorganized, and there may be varied conditions under which adverse parenting may be more or less detrimental in children's development of disorganized attachment behaviors. Indeed, further examination of the mechanism responsible for the link between harsh negative parenting and higher attachment disorganization levels suggests that, consistent with Bernier and Meins (2008)'s threshold hypotheses in the etiology of attachment disorganization, parental belief in discipline and control may have served as a threshold such that harsh negative parenting may set the stage for attachment disorganization only when the caregiver endorses relatively high beliefs in the value of discipline and control (at least at the mean level of such belief). When parents basically do not believe in discipline and control in their socializing and parenting

behaviors (2 SD below the mean level), harsh and negative parenting, no matter how high, is not related to children's attachment disorganization levels.

It is possible that a parent who endorses the value of discipline and control may more readily behave harshly when she sees the need for it. Thus, the harsh and controlling behaviors the parent displays, triggered by a firm belief in discipline and control, may appear quick and sudden and even disconnected with the ongoing interaction for a young child not yet cognitively equipped to comprehend the purpose and meaning of such abrupt harshness from a person who he/she normally depends on. In this scenario, the common harsh and negative expressions, when further supported by a strong belief that discipline and control are needed to serve their children right, may result in a frightening display from a child's perspective, a display that is equivalent to those described by Main and Hesse (1990) in prediction of children's formation of attachment disorganization. Facing such frightening parenting behaviors, children as young as 6 months, can neither escape from nor comprehend and cope with the parental behavior with adequate behavioral options and thus are at high risk for disorganized attachment later on.

Alternatively, the parent who has a strong belief in discipline and control may more consistently behave harshly over time, thus stabilizing her harsh parenting behaviors in the interaction with her child. In this scenario, the young child may be frequently bombarded by parental harshness and negativity, and the parent may have little inclination to comfort the child given her belief that the harshness is needed to teach the child a lesson. Thus, the child may be left in a chronic alarming state without immediate external help to regulate distress, resulting in highly

disorganized attachment behaviors in the Strange Situation. This scenario lends evidence to Solomon and George's (1999) "failure to terminate" hypothesis and Lyons-Ruth, Bronfman, and Atwood's (1999) "relationship diathesis model", both of which theorized that children may become disorganized when parents are not able or available to modulate the fear of children successfully. Translating such findings into preventative efforts against children's development of attachment disorganization, it may be important and cost-effective to pinpoint parents who not only tend to show highly harsh and negative parenting behaviors but also have strong beliefs in discipline and control, and to help these parents improve their parenting behaviors and set reasonable beliefs about parenting their children.

Using Bernier and Meins (2008)'s threshold hypothesis, I also hypothesized that a child temperamental factor may serve as a threshold factor in the link between harsh negative parenting and children's attachment disorganization at 12 months. However, this moderational effect was not supported by the study. Given that child difficult temperament was measured at 6 months based on mother report, this construct may capture mothers' perception of child temperament rather than an objective evaluation of the child's quality of reactivity and regulation. Indeed, my correlational analysis did show that harsh negative parenting and child difficult temperament are significantly related. Therefore, it is possible that these two constructs are confounded already by 6 months, when the harsh negative behaviors of a mother is already a result of handling a child the mother perceives as having a difficult temperament; or alternatively, the mother's perception of the child's difficult temperament may be a response to parenting that is harsh and negative. Bell (1968)

has called attention to child effects on parenting and suggested that parenting may be influenced by child characteristics. The mutual reinforcement of negativity between parent and child also has been documented in early childhood (Larsson, Viding, Rijdsdijk, & Plomin, 2008). Thus, the failure to identify the moderational role of child difficult temperament may suggest an alternative treatment of this construct. For example, children's difficult temperament perhaps should be measured at an earlier time point based on observation rather than maternal report in addressing the question of possible threshold effects on harsh negative parenting as related to levels of attachment disorganization. The direct link between neonatal irritability and attachment disorganization has been established by Spangler and Grossmann (1999). Furthermore, given evidence of bidirectionality between parent and child negativity, a mediational pathway could also be formulated such that highly difficult temperament early in life may elicit high levels of parental harshness and negativity as a way of controlling the parent-child interaction. This high harshness may trigger extreme fear and escalate difficulty in the child, resulting in a breakdown of coherent attachment strategies and high levels of disorganized attachment behaviors in the Strange Situation at 12 months. In addition to behavioral indices of child characteristics, physiological differences have been reported in children of disorganized attachment under attachment stress at 12 months (Hertsgaard et al., 1995) which could be an even more objective assessment of child constitutional qualities. These are promising research directions in examining the moderating or mediating mechanisms involving the parenting environment and child characteristics as precursors of attachment disorganization.

While child difficult temperament at 6 months was not found to interact with harsh negative parenting behaviors in the prediction of children's levels of attachment disorganization, this study, as hypothesized, did support the significant interaction of difficult temperament with parental belief in discipline and control at 6 months. However, the specific direction of this interaction contradicted in the present study what had been hypothesized. To illustrate, contrary to of the common notion that "worst things go together" (i.e., highly difficult temperament combined with a strong belief in discipline and control would predict high levels of attachment disorganization), this study found that higher difficult temperament is associated with higher attachment disorganization only when parents *do not* hold a strong belief in discipline and control. When parents hold strong beliefs in discipline and control, higher difficult temperament is associated with lower levels of attachment disorganization. The direction of interaction between child difficult temperament and parental belief in discipline and control, unlike the exacerbating effect of parental belief on parental harshness as discussed earlier, suggests that within the dynamic of parent and child, it is "goodness of fit" (Thomas & Chess, 1977) that is most relevant to children's attachment outcomes. Previous studies have yielded findings in support of the "goodness of fit" proposition. For example, Park, Belsky, Putnam, and Crnic (1997) found that it is insensitive and intrusive parental care, rather than sensitive and supportive parenting that reduces inhibition in three-year-old first-born boys. In this case, sensitive care actually fosters the continuity of inhibition in the first three years. Cornell and Frick (2007) found that authoritarian parenting, a type of parenting that involves high level of discipline and control and that is generally

considered an inferior and less optimal socializing practice than authoritative parenting (Baumrind, 1971), supported the development of guilt and conscience for fearless and uninhibited children. When parents applied less consistent discipline, fearless and uninhibited children tended to show lower levels of empathy and guilt. In addition, Bates, Pettit, Dodge, and Ridge (1998), reported that children with temperamental resistance to control are at higher risk for externalizing behaviors when their mothers exert lower rather than higher levels of control on their children. In the same vein, it is possible that for children of difficult temperament, parents who hold strong beliefs in discipline and control are more likely to impose structure and organization that may compensate for the lack of modulation and organization often displayed among children high in reactivity and low in regulation. In turn, this imposition may buffer these children from developing higher levels of disorganized attachment by 12 months. Consistent with this explanation, the socialization literature considers control as a necessary part of parenting to facilitate harmonious interactions by defining and sanctioning deviance and modifying actions that would not be otherwise inhibited (Grusec, 2011). Additionally, parental control functions to promote children's competence and self-management (Maccoby, 2007). Thus, strong parental belief in discipline and control may facilitate parents' supply of external management to children who are difficult and weak in self-management.

On the other hand, when parents see little value in discipline and control, their reaction to temperamental difficulty could be withdrawal or detachment, when, in fact, regulation and structure is in urgent need. With prolonged absence of maternal regulation and modulation, a temperamentally difficult child may miss the opportunity

to learn how to regulate and organize him/herself and his/her relationship with the caregiver, leading to higher levels of attachment disorganization. Indices of atypical parenting include severe withdrawal and detachment according to Lyons-Ruth et al. (2005). While it remains to be determined whether parents with very low beliefs in discipline and control are indeed detached and withdrawn in their interaction with a highly difficult child, it is possible that unconditional disbelief in the need for discipline and control in parents signals a lack of contingency in the parent-child interaction that may contribute to children's attachment disorganization.

Parental deviancy from contingency includes both under-engagement (such as being withdrawn and disengaged) and over-engagement (such as being excessively harsh and negative). As explained in the introduction section, deviancy from contingency is believed to disrupt the development of children's built-in contingency detection mechanism that normally switches from a self-oriented perfect contingency detection module (mirroring pattern) to an other-oriented less-than-perfect contingency module (interaction pattern) by around three months. This normative developmental shift facilitates the infant's acquisition of a sense of contingent control over the environment (Gergely, 2000; Koos & Gergely, 2001). However, for infants who experience deviant contingent parenting, such control becomes fragmented and costs extra effort (Koos & Gergely, 2001).

Therefore, for children of temperamental difficulty, the contingency they need are strong structures and regulations by their caregivers. When parents fail to provide external help and regulation, they are at elevated risk for exceeding their own capacity for coping just as Lyons-Ruth, et al. (2005) and Solomon and George (1999)

have suggested.

On the other hand, when children are temperamentally easy, the contingency they need may just be gentle discipline which may be enough to redirect these children's behavior (Kochanska, 1993, 1995). When parents still believe strongly in discipline and control given child temperamental easiness, they may become a source of alarm and fear for these children. This may account for the reversed relationship between difficult temperament and attachment disorganization levels when parents held strong beliefs in discipline and control.

In sum, this study has meaningfully contributed to the literature in several ways. First, this study identified harsh and negative parenting as a possible factor in children's development of attachment disorganization, which provides an avenue to understand attachment disorganization within a normative community samples. Second, it explored the significant moderating role of parental belief in discipline and control in the link between harsh negative parenting and attachment disorganization, as well as the link between child difficult temperament and attachment disorganization. Literature on parental cognition as related to attachment disorganization has predominantly focused on parental state of mind that may be either directly related to children's attachment disorganization or related through the mediation of adverse parenting behaviors. The finding of the active role of parental disciplinary beliefs in both linkages highlights the importance of paying attention to another level of parental cognition—parental belief in discipline and control, in the etiology of attachment disorganization. The significant moderational mechanisms found in this study also indicate that we should not be confined by the classical

meditational models as we seek to understand the etiology of attachment disorganization. Third, this study suggests that child temperament, while orthogonal to attachment disorganization in itself as some literature has indicated, can be a potential contributor to attachment disorganization under certain conditions of parental beliefs.

Nevertheless, this study has limitations. For example, the sample was drawn originally with the purpose of maximizing diversity (equal representation of ethnicity and SES status) and convenience. Therefore, the generalizability of the findings awaits replication in other samples.

DISORGANIZED ATTACHMENT AT 12 MONTHS and MODERATIONAL PATHWAYS TO EXTERNALIZING BEHAVIOR at 36 MONTHS (STUDY 2)

Introduction

An early disorganized attachment relationship with a parent has been found to be a robust and early predictor of children's psychosocial problems in early school ages, middle childhood, and adolescence (see meta-analysis in Fearon et al., 2010; see review in Lyons-Ruth & Jacobvitz, 2008). A common theme in the behaviors of children with attachment disorganization (Type D) is contradiction, disorganization, and disorientation (Main & Hesse, 1990). Researchers suggest that children's disorganized attachment relationship may reflect a history of caregiving that is frightening/frightened, atypical, or conflict-ridden (Lyons-Ruth et al., 2005; Main & Hesse, 1990; Owen & Cox, 1997). Since the identification of the disorganized type of attachment quality, it was found that it was disorganized children who were at the highest risk for maladaptation and psychopathology (Green & Goldwyn, 2002) rather than their insecure, but organized, peers.

One major form of developmental maladaptation in children of early disorganization is externalizing behaviors. For example, Kochanska (2001) reported that disorganized infants displayed more anger by 33 months than their non-disorganized counterparts. Van IJzendoorn and colleagues (1999)' meta-analysis of

12 studies of both normative and high-risk samples found that children classified as disorganized (with the infant, preschool, or school-age assessment procedures) were more likely than other children to have aggressive and externalizing behavior problems during preschool and early school ages. Lyons-Ruth et al. (1991) found that disorganized infants were highly aggressive in preschool.

Such established linkage between early attachment disorganization and later externalizing behaviors may be supported by the transformation in children's disorganized relationship over time with their parents featured by lack of protection, reassurance, and predictability. To illustrate, with their increasing cognitive, linguistic and motor capabilities, these early disorganized children may figure out ways to control their caregiving environment so that the closeness to their caregivers can be maximally achieved and their interaction with their parents may be more predictable. Indeed, it was found that children who formed disorganized attachment in infancy may start to show controlling behaviors with parents between 24 months and 30 months (Jacobvitz & Hazen, 1999), and such controlling behaviors are conspicuous by age 6 (Main & Cassidy, 1988; Wartner, Grossmann, Fremmer-Bombik, & Suess, 1994; van IJzendoorn et al., 1999). One way of controlling their external caregiving environment is being bossy and punitive to the caregiver so as to break the cycle of disorganized and unpredictable interactions and win control over the caregiving environment. These developed interactional strategies may then be carried over to their interactions in other social settings (Jacobvitz & Hazen, 1999). At the extreme of carrying such punitive relational strategies over to the other social interactions, these children may behave aggressively and show externalizing symptoms. Indeed,

externalizing behaviors are more apparent in disorganized children who later develop controlling/punitive relationship with their parents in preschool and early school ages. For example, in Jacobvitz and Hazen's (1999) case studies of three disorganized children, the child who developed controlling punitive behaviors between 24 months and 30 months displayed aggressive behaviors toward peers in preschool ages, and controlling punitive children at early school age showed higher externalizing problems than secure children (Moss, Cyr, & Dubois-Comtois, 2004).

Despite these findings, few studies have examined whether infants' level of disorganization at 12 months predicts externalizing behaviors as early as 36 months, an age when some children may start the early-onset problem behavior trajectory while others show decreases in their problem behaviors (Moffitt, 1993). For example, Keller, Spieker, and Gilchrist (2005) found a normative declining trajectory of problem behaviors from 24 months to 54 months as well as a high problem trajectory. In the high problem trajectory, children already had significantly higher mean T scores and significantly more above clinical cutoff scores on CBCL externalizing scales at 36 months as compared to their same-age counterparts in the typical declining trajectory. The only two studies that did examine attachment disorganization and problem behaviors at 36 months or included the 36 month time point in the problem behavior trajectory did not find being disorganized in attachment to be significantly related to elevated risk on externalizing behaviors at 36 months (Belsky & Fearon, 2002b) or to a higher likelihood of being in the problem trajectory group during the preschool years including 36 months (Keller et al., 2005). This non-significant prediction of Type D attachment of preschool problem behaviors contrasts

sharply with previous findings on significantly elevated risk of Type D attachment for problem behaviors at later ages (i.e., from five years old on as reported by Lyons-Ruth, Bronfman, & Atwood, 1999). This contradiction raises the question of whether Type D attachment as a categorical variable reflecting a group of children who gain a score above 5 on level of attachment disorganization may have enough power to demonstrate its relation with problem behaviors that just start consolidating at 36 months. It may be that the continuous score indexing children's level of disorganization in attachment, given that it constitutes a range of variability, is more sensitive in detecting the association of disorganization and children's level of externalizing behaviors at the early preschool age. There has been evidence that a continuous measure of attachment disorganization is significantly related to parent-child role reversal at 24 months (Macfie et al, 2008) which, in turn, predicts children's externalizing and attention problems and problematic peer relationships during preschool ages (Macfie, Houts, McElwain, & Cox, 2005) and middle childhood (Sroufe, Bennett, Egeland, Urban, & Shulman, 1993). It remains important to consider whether a continuous measure of children's level of disorganization can predict externalizing behaviors at 36 months. This is the first goal of the current study.

Additionally, it remains to be determined whether early attachment quality operates as a protective or risk factor as related to subsequent behavior adaptation or maladaptation via interactions with other risk or protective factors within the parent-child relationship and beyond (Carlson & Sroufe, 1995; Erickson, Sroufe, & Egeland, 1985; Greenberg, 1999). In this context few studies have considered

whether disorganization is associated with externalizing outcomes in the same way depending on other conditions, such as the underlying security or insecurity of the attachment relationship, child difficult temperament while the attachment relationship is established, the later supportiveness of maternal care, and the overall demographic risk of the childrearing environment. Thus, my second goal in this study is to test the moderating roles of these four factors in the link between levels of early attachment disorganization and externalizing problems at 36 months.

Moderation by the Security Dimension of Attachment

The security dimension of attachment refers to individual differences in organized attachment strategies as indexed by the original three-way classification system, i.e., B-secure, A-avoidant, and C-resistant attachment types (Ainsworth et al, 1978). All three types of attachment strategies are consistent, organized, and stable with regard to the goal of maintaining proximity to the caregiver and felt security, although they differ in the level of flexibility in behavioral strategies, attention, and emotional expression they allow the child to display (Main, Kaplan, & Cassidy, 1985). There is consensus that children with secure attachment are much more likely to show prosocial and adaptive outcomes than their insecure peers (Sroufe et al., 2005), whereas children of insecure/avoidant or insecure/resistant attachment are more likely to develop behavior problems than their secure counterparts (Belsky & Fearon, 2002a, 2002b; Keller et al., 2005; Burgess, Marshall, Rubin, & Fox, 2003).

Given the relatively higher risk for later poor outcome of insecure attachment as compared to secure attachment, it is possible that the association between levels of disorganization and externalizing behaviors would be stronger for insecure children

as compared to those who are securely attached. Although such a hypothesis has not been tested specifically in this way before, studies have examined whether for children of disorganized attachment, having a sub-category of secure vs. insecure attachment would be associated with different caregiving environments and behavioral outcomes (Lyons-Ruth, Alpern, & Repacholi, 1993). When children are assigned Type D, they are also assigned a forced category that best represents the children's strange situation behavior in general. This is because children may be disorganized temporarily, but may otherwise behave in a consistent, organized fashion. For example, a child may be assigned a D category due to her fleeting trance-like and disoriented behavior at the reunion session with the parent, but otherwise may approach the parent and seek proximity without any avoidance and resistance. This child will be categorized as D/secure in attachment quality. For disorganized children who otherwise show patterns of avoidance and/or resistance during the Strange Situation, the D/insecure category is used including D/avoidant and D/resistant types.

There is indirect evidence suggesting that disorganized children with underlying secure versus insecure attachment may differ in their parenting contexts. In Main and Hesse's (1990) low-risk middle class sample, 62% of the disorganized children were D/secure children. Parents of these children as compared to parents of children who were not D were more likely to have unresolved loss experiences due to death or divorce which contributed to the unresolved state of mind in these parents. Consistently, parents of D/secure children were reported to have momentary frightening or frightened parenting behaviors (Main & Hesse, 1990) or

withdrawn and low involving parenting styles (Lyons-Ruth et al, 1991). In contrast, in a low-income and maltreating sample, 73% of the disorganized children were of the insecure subtype (Carlson, et al., 1989) and in Lyons-Ruth et al.'s (1991) clinical high risk sample, two thirds of the identified disorganized children were of the insecure subtype. Parents of these children were found to more often have out-of-home care experience in childhood compared to the parents of children who were classified as D/secure (Lyons-Ruth et al.,1999), and they also were more likely to have hostile/helpless state of mind due to chronic relational trauma (Lyons-Ruth et al., 2005). Lyons-Ruth et al. (1991) demonstrated that compared to parents whose children were D/secure, parents of D/insecure children were more intrusive and involving in interaction with their children and showed more confusing and alarming affect and behaviors to their children. In addition, parents of D/insecure children were reported to have multiple psychosocial problems such as depression, psychiatric hospitalization, and maltreatment, whereas, no such psychosocial problems were reported for parents of D/secure children (Lyons-Ruth et al., 1991).

However, the relatively favorable context of D/secure children does not seem to make those children less vulnerable to problem behaviors later in comparison to their D/insecure counterparts. Specifically, both D/secure and D/insecure children were reported to show significantly higher aggressive behaviors in the classroom than their non-disorganized peers at age 5. And both subtypes had higher externalizing behavioral symptoms at age 7 than their non-disorganized counterparts (Lyons-Ruth et al., 1993). The only difference in the behavioral outcome was that, whereas D/insecure children had both significantly higher externalizing and

internalizing behaviors, D/secure children had only significantly higher externalizing behavior problems at age 7. Otherwise, the risk for behavioral maladaptation appeared comparable between the D/secure and D/insecure children.

The lack of differentiation in the later adaptation or maladaptation between D/secure and D/insecure children, on the one hand, gives support to the general literature that disorganized children are at elevated risk of behavior problems regardless of their sub-classifications (Green & Goldwyn, 2002) compared to their organized counterparts. However, the limited cell size in Lyons-Ruth et al. (1993) study and the lack of replication of the findings of Lyons-Ruth et al. (1993) prevent a definite conclusion that being otherwise secure or insecure does not make a difference in the association between attachment disorganization and later behavioral problems. In addition, since the disorganization dimension indicates a continuum from no disorganized behaviors to many disorganized behaviors, it is important to examine whether the continuous measure of disorganization is moderated by its security dimension in the prediction of children's later behavioral problems. Therefore, as a partial replication of Lyons-Ruth et al.'s (1993) findings, I examined how being secure or insecure may moderate the association between levels of attachment disorganization and children's later externalizing behaviors at 36 months. I expected that it was for the avoidant and/or resistant children that the higher disorganization scores are more highly associated with externalizing problems as compared to secure children. For secure children, this association may not be as strong. Nevertheless, given the small percentage of children who had relatively moderate to high levels of attachment disorganization in the current

sample, I acknowledge the possibility that I may lack the power to truly test the interaction between the two dimensions. However, from a theoretical point of view, it is important to test such a hypothesis.

Moderation by Child Difficult Temperament

Temperament is defined as individual differences in the reactive and regulatory qualities of children that are constitutionally based (Rothbart & Sheese, 2007). Early individual differences in children's reactivity and regulation have been linked to children's later outcomes consistently and are more predictive of children's suboptimal adaptation than optimal functioning (Rothbart & Bates, 2006). For example, Moffitt (1993) indicated that later antisocial behavior may be initially manifested in infancy and early childhood as difficult temperament. Bates, Bayles, Bennett, Ridge and Brown (1991) reported that children with high externalizing behaviors during the early school years were more likely to have been difficult at 6 months, and resistant to parental control at 13 and 24 months. However, Newman et al. (2005) cautioned that biological factors should not be considered in isolation and independent from the environmental factors surrounding the individual. Indeed, Judi et al. (2009) suggested that children with difficult temperament are less likely to develop externalizing behaviors in early childhood given a positive environment factors such as sensitive parenting or having older siblings, as compared to those without such positive environmental buffers.

With regard to the role of children's temperament in the study of attachment relationships and children's later development, researchers have gradually come to believe that children's attachment and temperament complement and interact with

each other in contributing to children's developmental and social emotional outcomes (Vaughn, Bost, & van IJendoorn, 2008). In this line of research, the attachment construct was often investigated along its security dimension. No research has examined how and whether the organizational dimension of attachment would interact with child temperament in predicting children's behavioral outcomes. Although being disorganized in attachment predicts later externalizing behavioral problems (Lyons-Ruth & Jacobvitz, 2008), not all children with early attachment disorganization necessarily develop such outcomes in later years. It is possible that children's constitutional differences may function as a threshold factor and thus condition such a prediction (Bernier & Meins, 2008). Such constitutional differences may be present in the subtypes of disorganized children in preschool ages, i.e., controlling punitive vs. controlling caregiving with the former more likely to show externalizing behaviors whereas the latter more likely to show internalizing problems. It is possible that children with temperamental difficulty would be more likely to rebel and become punitive in the interaction with the caregiver whereas children of easy temperamental quality would be more likely to please the caregiver in interaction. Using a continuous measure, it is similarly possible that for children with different levels of attachment disorganization by the end of first year, there are already temperamental differences that may put them at different levels of risk for externalizing behaviors at 36 months. That is, children with higher levels of attachment disorganization would develop externalizing behaviors only when they also show a very difficult temperament at 12 months. Therefore, this study aimed to test if children's levels of difficult temperament would moderate the link between

attachment disorganization levels and children's externalizing behaviors at 36 months.

Moderation by Maternal Sensitivity at 24 Months

There is a consensus that parenting serves a crucial role in children's behavioral adjustment (e.g., Campbell, 1995; Rothbaum & Weisz, 1994). Earlier studies (e.g., Campbell, Shaw, & Gilliom, 2000; Deater-Deckard, Ivy, & Petrill, 2006; Kochanska, 2002; NICHD ECCRN, 2004) suggest that warm, supportive, and sensitive parenting during the first years of a child's life are associated with fewer externalizing behavior symptoms in later ages. This is because children's behavioral regulation starts with a heavy dependence on the responsiveness and sensitivity of the parents to children's needs and emotional expression in infancy (Calkins & Fox, 2002). Parents' sensitive care and contingent responsiveness facilitate children's arousal regulation (e.g., Propper, et al., 2008; Gusella, Muir, & Tronick, 1988) and the acquisition of social skills (Feldman & Eidelman, 2009). Failure in acquiring the skills for regulating emotional arousal and responses may result in problems in social interaction and developmental psychopathology (e.g., Calkins, 1994; Cicchetti, Ackerman, & Izard, 1995).

Some research has shown that the presence or absence of sensitive parenting may moderate the relationship between insecure attachment and problematic outcomes, in that children who were insecure at 12 months showed better outcomes in the first three years of life when they experienced subsequent high maternal sensitivity as compared to children of secure attachment who experience subsequent low maternal sensitivity (Belsky & Fearon, 2002a). And given high

exposure to environmental risks, children were less likely to develop negative outcome at early school ages when the parents were responsive, involved, and positive (Burchinal, Roberts, Zeisel, Hennon, & Hooper, 2006). However, no research has examined whether maternal sensitivity moderates the link between early disorganized attachment and externalizing behaviors at 36 months in a community sample. The literature predominantly emphasizes the relevance of maternal sensitivity or insensitivity for the development of secure vs insecure organized attachment and subsequent developmental outcomes (e.g., Belsky & Fearon, 2002a; De Wolff & van IJzendoorn, 1997). A significant, but small to moderate, negative association was reported between maternal sensitivity and disorganized attachment in infants of low-SES families (Van IJzendoorn et al., 1999). In addition, the meta-analysis on 15 sensitivity- based intervention studies that originally focused on an increase of secure attachment as a goal found a side effect of decreased attachment disorganization in response to the sensitive based intervention (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2005). And in Moran, Forbes, Evans, Tarabulsky, and Madigan (2008), lack of maternal sensitivity has also been found to further contribute to attachment disorganization.

Given that maternal sensitivity generally increases between 6 and 36 months for secure or resistant children but not for children of avoidant or disorganized attachment (Mills-Koonce, Garipey, Sutton, & Cox, 2008), the level of sensitivity parents were able to maintain during the toddler years may function to either strengthen or relax the association between early levels of attachment disorganization and externalizing behaviors at 36 months. Indeed, the toddler age

may be an important period in children's reorganization of early attachment as several successful intervention studies showed that changing parenting behaviors was associated with change of children's disorganized attachment into organized ones (Forbes, Evans, Moran, & Pederson, 2007; Hoffman, Marvin, Cooper, & Powell, 2006). Unfortunately, this is also a period when children peak in negativity (Belsky, Woodworth, & Crnic, 1996; Kopp, 1989) and pose increased demands and challenges to parents' ability to be positive, sensitive and responsive to their toddlers. Therefore, the third goal of this study is to examine the possible moderating role of maternal sensitivity at 24 months in the association between children's early levels of disorganization and early externalizing problems at 36 months. I expect that the association between disorganization and 36 month externalizing behavior problems will not be as strong when maternal sensitivity is higher versus lower at 24 months of age.

Moderation by Cumulative Socioeconomic Risks

Increasingly research has documented that high levels of demographic risk have a direct detrimental effect on child development. Numerous studies have established the association between high amounts of environmental stressors associated with demographic risk and children's increased behavioral problems (e.g., Campbell et al., 2000; Deater-Deckard, Dodge, Bates, Pettit, 1998; Gerard & Buehler, 2004). More recently, the association between cumulative environmental risks and children's attachment quality has also been established. Specifically, a meta-analysis found that children who experience five out of six socioeconomic risks between the ages of 12 and 18 months were more likely to show disorganized

attachment in the Strange Situation than their peers with fewer contextual risks. What is most striking is that these children with multiple risks were just as likely to show disorganization as children who were maltreated (Cyr, Euser, Bakermans-Kranenburg, & van IJzendoorn, 2010). The six socioeconomic risks included low family income, low maternal education (less than 12 years of formal schooling), teenage motherhood (gave birth at 20 years of age or younger), single parenthood, ethnic minority status, and maternal substance abuse. It was reasoned, in alignment with the theories of Main and Hesse (1990) and Solomon and George (1999), that in a high risk environment, mothers are more likely to experience loss and trauma themselves and are more likely to be frightened or frightening to their children, or to be extremely insensitive and ignoring. As a consequence, their children's attachment needs may remain chronically unmet causing disorganization and setting the stage for later behavioral maladaptation. However, whether high cumulative risks may put disorganized children at increased risk for later behavioral problems is still an empirical question. While early disorganization may not always lead to problem outcomes, it is possible that high cumulative environmental risks may amplify this vulnerability, such that higher levels of early disorganization are significantly associated with higher externalizing behaviors at 36 months.

It is interesting that one of the few studies on the interaction between attachment, cumulative contextual risks, and children's early outcomes (Belsky & Fearon, 2002b) did not find significant differences in children's total behavioral problems at 36 months between the disorganized group and the secure, avoidant, and resistant groups given an environment with no or moderate cumulative risk factors. However,

the authors have cautioned about the interpretation of this finding given the high attrition rate of children with disorganized attachment and the underrepresentation of at-risk families in their NICHD SECCYD sample. It is possible that those who dropped out from the study were more likely to have higher levels of disorganization due to the extreme family adversity. Additionally, as reasoned previously, the categorical variable of attachment disorganization used by Belsky and Fearon (2002b) also may have less predictive power than a continuous measure of attachment disorganization. Therefore, it is important to examine whether different levels of attachment disorganization may be associated with later behavior problems given differences in the levels of cumulative risks children experience.

In addition, some researchers have raised concerns about a single count-based cumulative risk index since it suggests equal weight of each risk factor and thus obscures the predictive power of certain variables and amplifies the importance of others as related to the specific outcomes (Ackerman, Schoff, Levinson, Youngstrom, & Izard, 1999). As an alternative approach, some researchers have suggested that the mean composite of standardized risk variables may yield more information and increase power for analysis of interaction effects (Burchinal, Vernon-Feagans, Cox, & Key Family Life Project Investigators, 2008). For example, Burchinal et al. (2008) used both the mean composite and sum of 7 risk factors (i.e., maternal education, family income, single parent, number of children in the household, stressors or negative life events, parental unemployment, and neighborhood safety) and found that the mean composite of standardized risk factors showed stronger associations with parenting and child outcomes than the count variable of the risk indexes.

Therefore, besides the count-based index of cumulative demographic risk, this study will also use the mean composite of the standardized risk factors as a moderator of the relationship between early disorganization level and externalizing behavioral outcomes at 36 months.

Hypotheses

On this basis, four hypotheses were formulated for Study 2. First, I hypothesized that children's level of disorganization was significantly related to their externalizing behaviors at 36 months. Second, I hypothesized that there was an interaction between the security and organizational dimensions of attachment in the prediction of externalizing problems. In this regard, I expected security of attachment to attenuate the association between levels of disorganization and externalizing behavioral problems at 36 months. Next, I hypothesized that the association between attachment disorganization and externalizing behavior problems might be moderated by maternal sensitivity at 24 months in that higher levels of attachment disorganization would be related to higher externalizing behaviors at 36 months only when mothers showed low sensitivity parenting to their children at 24 months. Last, I hypothesized a possible moderation role of cumulative sociodemographic risks in the association between attachment disorganization and externalizing behavior problems. Here I expected that chronic exposure to high cumulative sociodemographic risks would exacerbate the association between level of disorganization and externalizing behaviors at 36 months.

Method

Sample

The participants in this study were drawn from the longitudinal Durham Child Health and Development (DCHD) Study in North Carolina. Two hundred and six families from varied socio-demographic backgrounds were originally recruited when the children were 3 months old through parenting classes, phone invitation based on the child's birth record, and fliers in the hospital. Efforts were made so that the participating children were typically developing children without any problematic medical histories before or after birth. Efforts also were made to have relatively equal representation of both African and European American families in the longitudinal study based on maternal report of ethnicity. In this sample, 28% missed scores on attachment disorganization and attachment insecurity; 26% missed scores on difficult temperament; 21% missed scores on maternal sensitivity at 24 months, and 7% missed observation of count-based cumulative risk from 3 months to 36 months. Males comprised 51.46% of the sample, and females comprised 48.54%; 56.8% were African American and 43.2% were European American. Average maternal education from 3 months to 36 months was 14.36 years with a range of 8 to 20.

Procedures

When children were 3, 6, 12 months old, mothers responded to the demographics, individual demographics, financial stress, and income questionnaires at a home visit. Some of the mothers filled in the questionnaires at a lab visit at 12 months of child age. When children were 12 months old, mothers also responded to the Revised Infant Behavior Questionnaire. In addition, at 12 months of age, each

participating pair of mother and infant was filmed in the Strange Situation. See Study 1 for the details of the Strange Situation Procedure.

At 18 and 24 months of child age, mothers filled in the questionnaires on demographics and individual demographics during a lab visit. At 24 months, pairs of mother and child were also filmed for a semi-structured puzzle task interaction for 10 minutes in which children was asked to work on a set of three puzzle tasks with a graded increase in difficulty level. Mothers were instructed that the task was for the child to complete, but that they should provide any help they deemed needed.

At 30 and 36 months of child age, mothers completed demographic questionnaires. Mothers also responded to the financial stress questionnaire at 30 month.

Measures

Covariate. Given that boys are usually considered more likely to develop externalizing behaviors than girls from the toddler ages on (Dodge, Coie, & Lynam, 2006), gender was controlled in all the analysis.

Attachment disorganization. This construct was assessed through a continuous 9-point scale of attachment disorganization (Main & Solomon, 1990) which indexes the extent the child is disorganized based on children's behaviors in the Strange Situation at 12 months. See Study 1 for the details of this construct.

Attachment security. This construct was based on the traditional three-way (A, B, C) classifications of infants' attachment and exploratory behaviors in the Strange Situation Procedure (SSP) at 12 months (Ainsworth et al., 1978). The SSP includes eight episodes of increasing but moderate distress that may activate the attachment

system in children. Secure Infants (Type B) may or may not show distress during the separation episodes of SSP, but seek comfort from or communication with mothers during the reunion episodes, and are able to return to exploration readily. Insecure avoidant infants (Type A) show little distress because of the separation from mothers during the separation sessions and clearly avoid proximity or contact with mothers at reunion, even at the invitation from mothers to play or interact. Insecure resistant infants (Type C) show distress during the separation episodes and seek proximity and contact with mothers at reunion, but also show resistant and angry behaviors that cannot be easily soothed. For the purpose of this study, the three way classifications was collapsed into a binary variable of attachment security with 0 equals Type B (secure group), and 1 equals Type A and C (insecure group).

Child difficult temperament at 12 months. This variable of difficult temperament was created as a mean composite of infants' scores on distress to limitations, fear, reflected soothability and reflected falling reactivity/rate of recovery from distress from parents' responses at 12 months to the Infant Behavior Questionnaire-Revised (IBQ-R; Rothbart, 1981). Details of this measure have been described previously in Study 1.

Maternal sensitivity. This construct was based on the 24 month semi-structured parent-child interaction in the laboratory (Cox, 1997). Children were engaged in a set of three puzzle tasks with increasing but age-appropriate levels of difficulty and complexity. The rating scales are consistent with that used for the parent-child free interaction at six months as described in Study 1. Maternal sensitivity at 24 months is a mean composite of sensitivity/responsiveness, positive regard for child,

animation, stimulation of development, and reversed detachment based on factor analysis (Mills-Koonce et al., 2007). Inter-coder reliabilities for the individual subscales are .80 and above between coders and criterion coders on at least 20% of the video tapes of puzzle tasks.

Cumulative sociodemographic risks. This construct is based on 9 risk indicators generated from the relevant literature (e.g., Belsky & Fearon, 2002b; Burchinal et al., 2008; Cyr et al., 2010; Li_Grining, 2007). The mean-based cumulative demographic risk variable was created by taking the mean of the ten standardized risk indicators from 3 to 36 months without forcing the continuous risk indicators into binary indicators as is typically done. They are adolescent mother (less or equal 20 years of age when mothers gave birth to the study child), frequency of single parenthood over time, maternal highest years of education over time, child having a minority status, number of children in the household over time, and frequency of unemployment of the primary caregivers (working less than 10 hours per week) over time based on the demographics questionnaires; aggregated income-to-needs ratio from 3 to 36 months, and the frequency of family on welfare over time based on the Income Questionnaire, average mean financial stress over time based on the Financial Stress Questionnaire. See Table 3 for specific details of the original nine risk indicators in deriving the cumulative risk index, both count and mean based.

Principal component analyses were conducted to establish the construct validity of the risk indexes. For both mean and count based risk indices, six out of the nine risk indicators had above .5 loadings on the principal component of the construct, two of the nine risk indicators had loadings below .5 (.48 for minority status and .30

for number of children at home for the mean-based variable). One variable double loaded on the principal and secondary component (mother's age when giving birth, -.60 for the first component and .52 for the second component for the mean based variable). Minority and family children size had loadings below .5 for the count-based index (.43 and .25 respectively). Adolescent mom double loaded on the principal and secondary components (.51 and -.62 respectively). When taking these three index indicators out, the loadings all exceeded .6 for the mean based risk index as well the count-based variable. Abiding by Burchinal et al.'s strategy (2008) in forming the mean based risk index, only the 6 risk indicators were used for the creation of the mean and count based risk index. Cronbach α was .84 for both the mean based index and for the count based index variable. The three remaining risk variables were treated as separate moderators of attachment disorganization in prediction of children's externalizing behaviors at 36 months in post-hoc tests.

Externalizing behavior at 36 months. The Child Behavior Checklist for Ages 1.5-5 (CBCL/1.5-5) was completed by the mother when the child was 36 months of age during a laboratory visit. Mothers were asked to rate their children on 99 items regarding children's behavioral or emotional problems in the past two months. There were seven syndrome scales. The current study used the externalizing raw scores based on the sum of the aggressive and attention problems. Achenbach and Rescorla (2000) indicated acceptable reliability and validity of the scores on this measure.

Data Analysis Plan

Descriptive and correlational statistics were run for each involved variable for

means, standard deviations, univariate normality, and strengths of relationships. Multivariate outliers were inspected and regression diagnostics were conducted to ensure the assumptions of regression analysis were met. Then multiple regressions were run in Mplus 5.2. The selection of the Mplus program was because the Mplus program, by default, uses direct maximum likelihood estimation for missing data with assumption of missing at random (Arbuckle, 1996; Muthén & Muthén, 1998-2007). Therefore, any missing data in the independent variables was accommodated by using this estimation.

Specifically, the first model had only one control variable (child gender) to acknowledge its possible contribution to the variation in externalizing behaviors at 36 months. The second model was a main effect model with children's level of disorganization as the main predictor of externalizing behaviors at 36 months after the covariate was accounted for. Then, three separate moderation models were run. In the first model, a binary variable dichotomizing secure vs. insecure attachment was computed along with its interaction with disorganization levels. These two variables were then entered to the main effect model. In the second moderation model, a continuous variable of child difficult temperament was entered into the main effect model along with its interaction with levels of attachment disorganization. In the third moderation model, a continuous variable of observed maternal sensitivity at 24 months and its interaction with level of disorganization were added to the main effect model. In the fourth and fifth moderation model, two cumulative risk indexes (count-based and mean-based respectively) and their respective interaction with levels of disorganization were added to the main effect model. In the post-hoc tests,

three risk indicators that did not load strongly on the risk indexes were added to the main model along with their respective interaction with attachment disorganization. Since the demographic factors were aggregated into a cumulative demographic risk index, they were not used as covariates in any of the main and moderation models. Significant moderation effects were probed through the online procedure (Preacher et al, 2006).

Results

Descriptive Statistics

Regarding the univariate normality, child difficult temperament, maternal sensitivity, and mean-based risks all have quite normal distributions with skewness and kurtosis within ± 1 . Attachment disorganization levels at 12 months have a preponderance of values of 1 with skewness equal to 1.40 and kurtosis equal to .84. The count-based cumulative risk index has skewness of .49 and kurtosis of -1.03. Maternal age when giving birth to the study child has skewness of .02 and kurtosis of -1.01. Number of children at home has skewness of 2.39 and kurtosis of 11.25. The outcome variable has skewness of 1.02 and kurtosis of .83 (See the histograms on the diagonals of Figure 7, 8). Cohen et al. (2003) suggested concern for variables with skewness larger than 2 and kurtosis larger than 7. With a slightly more strict criterion, Muthén and Kaplan (1985) and Muthén and Asparouhov (2002) considered ML an adequate estimator with univariate skewness below 2 and univariate kurtosis below 3. Given these criteria, the only concerning variable regarding univariate normality is number of children at home. Examination of the histogram of this variable revealed that one observation had a value of extremely

outlying. When this observation was taken out, the distribution of this variable became much more normal (skewness=1.25; kurtosis=1.99). However, the sample with or without this observation did not meaningfully change the parameter estimates in Mplus which suggested robustness of ML estimation when there is only one variable with severe non-normality in the model. In addition, univariate non-normality on the predicting side usually is not as much a concern as non-normality on the outcome side. What is more problematic is the lack of joint multivariate normality. Therefore, this observation was retained for further diagnosis with reservation. For each regression model, residual normality was examined and the skewness and kurtosis statistics were all within ± 1 .

Regarding the strength of associations, child gender correlated significantly with children's attachment disorganization levels at 12 months ($r=-.18, p<.05$) indicating that boys were more likely than girls to have higher attachment disorganization scores. However, girls were more likely than boys to be perceived by mothers as having a difficult temperament at 12 months ($r=.18, p<.05$).

Among the predictor variables, attachment disorganization level was significantly and positively correlated with attachment security at 12 months ($r=.29, p<.001$) with higher disorganization indicating with a tendency to form an insecure attachment. The same variable was also significantly related to the count-based cumulative risk index of children ($r=.21, p<.05$) indicating that higher disorganization levels were for children exposed to more cumulative risks from 3 months to 36 months. Higher levels of attachment disorganization were also observed among children reared by younger mothers ($r=-.19, p<.05$). In addition, mothers who perceived their child as

temperamentally difficult at 12 months tended to be less sensitive at 24 months ($r = -.26$, $p < .01$), to be African Americans ($r = .35$, $p < .001$), and to experience more risk (count-based cumulative risks, $r = .29$, $p < .001$; mean-based cumulative risks, $r = .33$, $p < .001$). Lower maternal sensitivity at 24 months also was significantly related to higher count-based ($r = -.47$, $p < .001$) and mean-based cumulative risks ($r = -.47$, $p < .001$), being African Americans ($r = -.4$, $p < .001$), and younger maternal ages when the study children were born ($r = .35$, $p < .001$). Lower maternal sensitivity at 24 months also co-varied with having more children at home ($r = -.13$, $p < .10$). The two cumulative risk indices also were highly correlated ($r = .9$, $p < .001$). Higher count or mean based cumulative risks were associated with being African Americans ($r = .38$ & $.39$, $p < .001$ respectively), younger maternal ages when giving birth to the study children ($r = -.53$ & $-.52$, $p < .001$ respectively), and more children living at home ($r = .19$ & $.25$, $p < .01$ & $.001$ respectively). Being African Americans and older at the time of child birth age were both related to having more children living at home ($r = .26$ & $.15$, $p < .001$ & $.05$ respectively).

Lastly, the outcome variable (externalizing behaviors at 36 months) was significantly correlated with higher attachment disorganization levels at 12 months ($r = .223$, $p < .01$), higher temperamental difficulty ($r = .15$, $p < .10$), and higher count based cumulative risks ($r = .16$, $p < .05$). Boys also were more likely to have higher externalizing behaviors at 36 months than girls ($r = -.14$, $p < .10$). See Table 4 for the descriptive statistics and bivariate correlations of the study variables.

Diagnostics

Detection of multivariate outliers and regression diagnostics were conducted in

the same way as described in Study 1. Specifically, multivariate outliers were screened by using the conventional standard of DFFITS >1 in SAS 9.2. One observation was detected with DFFITS bigger than 1 in the moderational model with number of children at home at the moderator. Two observations were detected with DFFITS bigger than 1 in the moderational model with count based risks as the moderator, and three observations had DFFITS values exceeding 1 in the moderational model with mean-based risks at the moderator. These observations were temporarily deleted with respect to their specific models and each of the three models was rerun based on the reduced sample. In the model with number of children as the moderator, no significant changes occurred in all the parameter estimates when the potential multivariate outlier was deleted. In the model with count or mean based risks as the moderator, the deletion of the potential multivariate outliers led to even less significant parameter estimates. With the complete sample, attachment disorganization stood as a significant predictor of children's externalizing behaviors at 36 months and the p value for the r^2 of the model was marginally significant. However, with the deletion of the suspicious cases, neither statistics still held in either of the two models. An examination of the suspicious case did not suggest any obvious error in their data. Since it was recommended to not delete any cases that are of true meaningful value (Cohen et al., 2003), these observations were retained and the final models in this study were based on the full sample of 206 observations. Details on the DFFITS statistics were described in Study I and are omitted here.

The distributions of the standardized residuals across all the estimated models

had both skewness and kurtosis within ± 1 . The histogram and QQ plot of the standardized residuals consistently suggested relative normal distributions of the standardized residuals in all the models. Scatterplots of the standardized residuals against each model involved independent variables did not indicate strong violation of linearity assumption although outlying cases did exist. Scatterplots of the standardized residuals against the standardized predicted outcome variable were generated for all the regression models and none of them suggested a clear pattern of heteroscedasticity or lack of independence in the observations (see these plots based on the interaction model between disorganization levels and number of children at home in Figure 6).

Prior to the regression analysis, all the independent continuous variables were grand mean centered for the sake of better interpretation of the results and easier probing of any possible interactions that are significant. Another benefit of centering the variables is the reduction of multicollinearity in regression analysis (Aiken & West, 1991).

Multiple Linear Regression Analyses in Mplus

I used the Mplus program in this study because of its maximum likelihood estimation functioning with the missing at random assumption, thus the sample size was maximized (N=206). Model fit statistics were not reported in this study because of the same reason (i.e., models estimated were all fully saturated) as explained in Study 1.

Seven regression models were run separately in Mplus with the ML estimator and

MAR assumption. In the control model (Model 1), only child gender was used to predict children's externalizing behaviors at 36 months. Child gender had a marginal effect on children's externalizing behaviors at 36 months ($b=-2.237$, $p<.10$), with boys having higher externalizing behaviors than girls at 36 months. This model explained 2% ($p=.338$) of variation in children's externalizing behaviors at 36 months. In the main effect model (Model 2), in addition to child gender, attachment disorganization levels were added. Children's levels of attachment disorganization at 12 months was a significant predictor of their externalizing behavior problems at 36 months ($b=.966$, $p<.01$) with higher attachment disorganization levels being associated with higher externalizing behavior problems controlling for child gender. This model explained 7.6% of variation in children's externalizing behaviors at 36 months ($p<.10$). Lastly, five moderation models were run separately to see if there was any moderational mechanism in the association between early attachment disorganization levels and children's externalizing behaviors at 36 months. In the first moderational model (Model 3), children's attachment insecurity and its interaction with attachment disorganization were added to the main effect model. However, there was no interaction effect between attachment insecurity and disorganization levels ($b=.067$, $p=.929$). The only effect was attachment disorganization ($b=.943$, $p=.062$). This model explained 7.7% of variation in externalizing behaviors at 36 months ($p<.10$). In the second moderation model (Model 4), child's difficult temperament at 12 month and its interaction with attachment disorganization were added to the main effect model. No significant interaction resulted ($b=-.014$, $p=.984$). Attachment disorganization remained a

significant predictor of externalizing behaviors ($b=.928$, $p<.01$). Difficult temperament had a significant effect on children's externalizing behaviors as well ($p=2.255$, $p<.05$). This model explained 10% of variation in externalizing behaviors at 36 months ($p<.05$). In the third moderation model (Model 5), maternal sensitivity at 24 months and its interaction with attachment disorganization were added to the main effect model. Again, no significant interaction resulted ($b=.204$, $p=.51$), nor was there a main effect of maternal sensitivity ($b=-.486$, $p=.349$). The only significant effect was early attachment disorganization levels ($b=.989$, $p=.005$; $R^2=8.8\%$, $p<.10$). In the fourth hypothesized moderation model (Model 6), the count-based demographic risk index and its interaction with attachment disorganization were added to the model. No significant interaction between attachment disorganization and the count-based cumulative risks occurred ($b=.088$, $p=.622$), and no significant main effect of this risk variable was seen ($b=.452$, $p=.138$). Early attachment disorganization remained a significant predictor ($b=.839$, $p<.05$). This model explained 9% of variation in externalizing behaviors at 36 months ($p<.05$). Similar results were obtained when the mean-based risk index was used instead of the count based risk index (Model 7). That is, the interaction between attachment disorganization and mean-based risk index was not significant ($b=-.003$, $p=.973$); the mean based cumulative risk was not a significant predictor ($b=.202$, $p=.126$); attachment disorganization remained a significant predictor of externalizing behaviors at 36 months ($b=.895$, $p<.05$) and 8.7% of variation of externalizing behaviors were explained by this moderation model ($p<.10$).

Post-hoc Tests

Given that there were three risk indicators (child minority status, age of the mother when giving birth to the study child, average number of children in the family) that did not load strongly on either the count based or the mean-based cumulative risk index, these variables were used separately as possible moderators in the association between early attachment disorganization and externalizing behaviors at 36 months. Therefore, three additional moderational models were run using these three variables as moderators separately. In the first additional moderational model (Model 8), child minority status and its interaction with early attachment disorganization levels were added to the main effect model. Again, children's attachment disorganization levels was the only significant predictor of externalizing behaviors at 36 months ($b=1.104$, $p<.05$). This model explained 7.7% of variation in externalizing behaviors at 36 months ($p<.10$). In the second additional moderational model (Model 9), mother's age when the child was born and its interaction with attachment disorganization levels were added to the main effect model. Again, attachment disorganization remained the only significant predictor of externalizing behaviors ($b=1.03$, $p<.01$). This model explained 8.2% of variation in externalizing behavior ($p<.10$). In the third additional moderational model (Model 10), average number of children from 3 to 36 months and its interaction with attachment disorganization were added to the main effect model. This model yielded both significant main effects of attachment disorganization ($b=1.236$, $p=.001$) and a significant interaction of the two predictors ($b=1.094$, $p<.05$). This model explained 15.7% of variation in externalizing behaviors ($p<.05$). See Table 5-7 for the regression statistics of the control, main effect, and moderational models.

To further understand the interaction effect between attachment disorganization and average number of children from 3 to 36 months in the family, online graphic probing of interaction was conducted. This graph suggested that higher levels of attachment disorganization were related to higher externalizing behaviors at 36 months when the average number of children at home was at the mean levels (2), or one standard deviation above the mean (3). However, when the average number of children was one standard deviation below the mean (1), higher attachment disorganization at 12 months was not related to higher externalizing behaviors at 36 months. The region of significance plot further supported such a moderational mechanism in that the simple slope of attachment disorganization levels on externalizing behavior was significant when the average number of children was at or above the mean level. See Figure 8 for the plot of the interaction between attachment disorganization levels at 12 months and average number of children from 3 to 36 months in the family. See Figure 9 for the plot of region of significance for this interaction.

Discussion

In this study, I tested the possible direct association between attachment disorganization and children's externalizing behaviors at 36 months, controlling for child gender. In addition, I examined the possible moderating mechanisms in the association between attachment disorganization and children's externalizing behaviors at 36 months. As hypothesized, I found that children's level of attachment disorganization was a significant predictor of their externalizing behaviors at 36 months. However, no support was found for the moderation of this association by

any of the moderators proposed, i.e., attachment insecurity, child difficult temperament at 12 months, maternal sensitivity at 24 months, and count-based and mean-based cumulative risks from 3 months to 36 months. The only existing moderational mechanism was identified through one of the post hoc tests which indicated that number of children at home over time was a significant moderator of the link between early attachment disorganization levels and externalizing behaviors at 36 months. In addition, while child difficult temperament did not serve as a significant moderator of the association, it emerged as a unique predictor of children's externalizing behavior outcome above and beyond the prediction of attachment disorganization levels and the effect of child gender.

The significant prediction of children's externalizing behaviors at 36 months from attachment disorganization levels at 12 months is consistent with literature on such an association in children of older ages, in which attachment disorganization was used as a dichotomous construct (e.g., Green & Goldwyn, 2002; Lyons-Ruth et al., 1991). On the one hand, this is evidence that attachment disorganization, as measured continuously, may have better power in detecting the relationship with externalizing problems shown as early as 36 months in light of the fact that attachment disorganization used as a binary construct has failed to identify such a relationship at this age (e.g., Belsky & Fearon, 2002b). This statistical advantage of using attachment disorganization as a continuous construct, is of special value in early prevention of externalizing problem behavior because early behavior problems may lead to a developmental cascade of further problem behaviors at older ages that are more persistent, chronic, and less responsive to treatment (Loeber, 1991).

Nevertheless, it should be noted that the variations in externalizing behaviors at 36 months explained by attachment disorganization levels after controlling for child gender were small and this model was only significant at a .10 level. This suggests that there are several other factors that independently or interactively may predict high externalizing problems at 36 months. Alternatively, it may be that strong consolidation factors, rarely observed together must be present to maintain a pathway linking disorganized attachment relationship and externalizing problems. Just as Gottlieb (2007) explained, multifinality is a very common outcome in development. By this he meant that, similar conditions early in development often give rise to multiple end points as those conditions interact with specific environmental factors over ontogeny. In the current case, the outcomes of early risk factors (such as high levels of attachment disorganization) may be different under different developmental contexts and can only be understood in probabilistic terms. Therefore, it is important to examine the specific contexts under which higher attachment disorganization levels become more or less predictive of higher externalizing behaviors at 36 months.

This led to the examination of multiple levels of risk or protective factors in this study as possible moderators of the association between attachment disorganization levels and externalizing behavior problems at 36 months. Because there is a dearth of empirical evidence regarding moderating mechanisms responsible in the link between attachment disorganization and children's maladaptive behavior outcomes, I consider this aspect of my research as an exploratory study for such mechanisms. However, the lack of moderation by any of the risk or protective factors at both child

level (difficult temperament), parenting level (maternal sensitivity at 24 months), parent-child relation level (insecure attachment) and broader contextual levels (count and mean based cumulative risk indexes) was unanticipated given their relevance to the association between attachment disorganization and externalizing behaviors as indicated by the literature (eg., Burchinal et al, 2008; Deater-Deckard et al, 2006; Gerard & Buehler, 2004; Sroufe et al., 2005).

From a purely statistical perspective, the non-significant results reported here regarding possible moderation effects may be explained by McClelland and Judd (1993) who demonstrated that it is more difficult in observational and field studies than in experimental ones to identify moderation effects. This is so, they argued, because field studies usually have more measurement errors, less design efficiency, and less statistical power as compared to experimental studies. This is exactly the case with the current sample, in which the combined distribution of the pairs of predictors (attachment disorganization levels with the hypothesized moderators respectively) showed very few jointly extreme observations (unlike that seen in experimental studies), a condition that is crucial for the detection of interaction effects (McClelland & Judd, 1993). In the present study, this problem was exacerbated by relatively small sample size and measurement errors that could not be addressed by multiple regression analysis approach. These factors may have precluded finding support for the hypothesized interaction effects, and specifically, the moderation of effect of the security dimension of attachment in such a link as discussed in the introduction section. Therefore, it is necessary to test the hypothesized moderation effects in a larger sample with more joint extreme

observations on the major constructs of interest before a conclusion can be drawn regarding the existence or non-existence of such possible moderational mechanisms in the link between early attachment disorganization levels and externalizing outcomes at 36 months.

From a conceptual perspective, the lack of interaction between attachment disorganization and child difficult temperament in the prediction of behavioral problems is consistent with the contradictory findings in the literature regarding the role of child temperament in this association. For example, although Stam, Juffer, and van IJzendoorn (2002) found a significant interaction between attachment disorganization and difficult temperament in predicting children's poorer cognitive outcomes and lower ego-control, they did not find the same interaction to predict behavioral problems at seven years old. The authors urged further study of these two constructs as related to externalizing outcomes. Indeed, given evidence that attachment disorganization result from disrupted parent-child relationship, it is legitimate to anticipate that children enmeshed in a highly chaotic relationship and also having highly difficult temperament may be those most at risk for externalizing problems as compared to children from similarly chaotic and disorganized relationships but with easier temperament. This moderation hypothesis is further supported by evidence from a behavioral genetic study (Bokhorst, Bakermans-Kranenburg, Fearon, van IJzendoorn, Fonagy, & Schuengel, 2003) showing variation in attachment disorganization is exclusively accounted for by a unique environmental component and error terms whereas variation in temperamental reactivity was predominantly accounted for by genetic factors.

While child difficult temperament did not interact with attachment disorganization as a moderator, this study did find a main effect of temperamental difficulty on externalizing behaviors holding gender and attachment disorganization levels constant. Such a finding exemplifies the converse of multifinality, namely, the principle of equifinality over the course of development (Cicchetti & Rogosch, 1996). The equifinality principle suggests that the same development outcome may result from different origins and different pathways. In the current situation, attachment disorganization levels and child difficult temperament at 12 months serve as two different risk factors that potentiate children's development of externalizing behaviors as early as 36 months. Follow up study should be directed toward understanding how the two risk factors in infancy operate to increase externalizing behavior outcomes two years later, i.e., the differential mechanisms leading to externalizing problems as early as 36 months.

Regarding the hypothesized moderation by maternal sensitivity, not only was there no interaction effect between attachment disorganization levels and maternal sensitivity, but also maternal sensitivity was not uniquely related to externalizing behaviors above and beyond the effect of attachment disorganization levels and gender as the control variable. Although maternal sensitivity was postulated as a potential moderator of this relation, this null finding may be found consistent with literature showing that maternal sensitivity is more associated with the security dimension of attachment whereas atypical parenting is more related to attachment disorganization (e.g., Green, Stanley, & Peters, 2007). Thus, one interpretation of this finding could be that subsequent maternal sensitivity may have less leverage on

reducing the strength of the relationship between attachment disorganization and externalizing behaviors, whereas atypical and disrupted parenting would strengthen this link.

Alternatively, a systems view may suggest that it is not enough to just examine maternal sensitivity per se; rather, one should examine the whole system in which maternal sensitivity is nested (Cox & Paley, 2003). For example, in this study, maternal sensitivity was assessed through a lab session when mother and child were removed from their daily living and were able to focus exclusively on each other. Thus, mothers were able to present their best in the interaction with their children. However, maternal sensitivity may be attenuated under stressful situations for some parents with genetic vulnerability to daily hassles (van IJzendoorn, Bakermans-Kranenburg, & Mesman, 2008). For these mothers, when suffering from daily stresses, their sensitivity observed in the lab may not necessarily reflect that of their real living world. Thus, only examining parenting in the lab may not be sufficient to understand the pathways from attachment disorganization to externalizing behaviors at 36 months.

The lack of moderation by the security dimension of attachment is also consistent with other findings that documented comparable risk for problem behaviors at early school ages between disorganized children who were alternate secure or insecure (in studies where attachment disorganization was measured dichotomously) (Lyons-Ruth et al, 1993). Lyons-Ruth et al.'s finding suggests that being disorganized is a highly salient and dominant risk that cannot be significantly mitigated by children's otherwise secure behavior. The current study suggests, consistent with this, that

higher levels of attachment disorganization are associated with higher externalizing behaviors at 36 months, regardless of the forced classification of children as being secure or insecure. Actually, when the interaction term was removed from the model, attachment insecurity was not a significant predictor of externalizing behavior above and beyond the effect of child gender and attachment disorganization levels, a finding lending clear support for a two-dimensional perspective on attachment (the organizational and the security dimensions) and their differential developmental implications.

Regarding this two-dimensional perspective on attachment, Spangler and Grossmann(1999) posited that the security and organizational dimension of attachment should be viewed as orthogonal constructs, with the former contingent on the interactive history between parent and child whereas the latter on the child's idiosyncratic characteristics. Nevertheless, what specifically defines the dimension of attachment disorganization has remained controversial since Main and Hesse (1990) argued for the relational history inherent in the formation of attachment disorganization, and Spangler, Johann, Ronai, Zimmermann (2009) indicated that the genetic associations with attachment disorganization hold only when mothers show low responsiveness. In this study, the finding that only attachment disorganization levels served as a significant predictor of externalizing behaviors at 36 months and attachment insecurity neither uniquely predicted externalizing behaviors above and beyond attachment disorganization levels nor moderated the association between attachment disorganization levels and externalizing behaviors at 36 months corroborated the proposition that disorganization and security of

attachment probably are two independent constructs with differential implications for normative and abnormal development and outcomes. That is, the security dimension of attachment has its major relevance in understanding the normative development of competence and incompetence (e.g., Bretherton, 1985; Sroufe et al., 2005; Thompson, 2008). The organizational dimension of attachment, in contrast, has more explanatory power in the abnormal development of pathological and problematic outcomes, (e.g., Green & Goldwyn, 2002; Lyons-Ruth et al., 1991).

The finding that neither the count-based nor the mean based cumulative risks moderated the association between attachment disorganization levels and externalizing behaviors at 36 months nor additionally predict externalizing behaviors is contrary to my hypothesis. It is consistent, however, with Belsky and Fearon's (2002b) finding that the co-existence of cumulative risk composite did not put children with disorganized attachment at significantly greater risk for problem behaviors at 36 months than the secure, avoidant and resistant groups, and cumulative risk exposure did not predict maternal disrupted parenting or children's attachment disorganization (Lyons-Ruth et al., 1999). However, I was expecting the opposite because of addressing the limitations in Belsky and Fearon (2002b) and Lyons-Ruth et al. (1999).

Specifically, in this study, I have the advantage of using the continuous measure of attachment disorganization which should preserve more power than the binary variable of attachment disorganization. Second, I used extended time points from 3 months to 36 months which should be more comprehensive in capturing whether the risk factor ever occurred in the study child's first three years. Lastly, in addition to the

count based risk index, I also added a mean-based approach to represent the cumulative risk index which was proposed to have more power than the normal count-based cumulative risk (Burchinal et al., 2008). However, the lack of moderation by either the count or mean based index may be due to the problem that I have treated the individual risk factors with equal weight, following the tradition originally proposed by Rutter (1979). Since risk factors do differ in their specific influences (Ackerman et al., 1999), a cumulative approach, be it count or mean based, may have marginalized the role of certain risk factor that are most salient in moderating the linkage between attachment disorganization levels and externalizing behavior problems at 36 months. Indeed, Flouri (2008) has suggested the need to examine the function and salience of individual risk indicators in predicting children's behavior outcomes, and McMahon, Grant, and Compas (2003) have advocated for the equal importance of testing risk specificity. Thus, follow-up study should be invested in testing the function of each individual risk indicators in the link between early attachment disorganization levels and externalizing behaviors at 36 months. Consistent with this, post-hoc tests in this study supported the need to examine individual risk factors in understanding such a link.

The post-hoc test did suggest that number of children in the house moderated the association between attachment disorganization levels and externalizing behaviors, a finding that is both unexpected and reasonable. This finding is unexpected because it was originally considered one meaningful component of the cumulative risk index, but it did not load as strongly as expected on the risk indices. Therefore, probing its interaction with attachment disorganization is more data-driven than

conceptual. In addition, no literature has examined the possible moderating effect of number of children within the family in the linkage between attachment disorganization and externalizing behaviors. With regard to parenting in general, number of children at home did not seem to be a risk factor. For example, Lyons-Ruth et al. (1999) found that more number of children within the household was a protective factor in that higher number of children within the family was related to less likelihood of mothers being classified as having disrupted parenting, a precursor of behavior problems in children (Forbes et al., 2007). The authors explained this as parents may be more experienced with more siblings. In addition, having older siblings was found to facilitate a faster decrease of externalizing behaviors in children with difficult temperament (Judi et al., 2009). The current finding, however, suggests that for children with higher levels of attachment disorganization, having siblings at home exacerbated their chance of developing externalizing behavior problems at 36 months.

Nevertheless, from a family systems perspective (Cox & Paley, 2003), this finding can be well justified and it may also shed light on the lack of expected moderation findings discussed above. Specifically, this finding suggests that when there are multiple children at home, parents may not be able to meet the needs and demands of all of them, and they may invest more in the sibling with whom they have a more harmonious relationship. Thus, when overwhelmed by raising multiple siblings, parents may invest the least in the child with whom she has the worst relationship (disorganized), thus putting this child at higher risk for externalizing behaviors.

Indeed, the evolutionary perspective on parenting further suggests that mothers

may sacrifice by being insensitive to one specific child to ensure the survival of a maximized number of offspring (Main, 1990). Trivers (1974)'s parent-offspring conflict theory further suggests that children normally desire more investment from parents than parents are selected to provide for with consideration of cost (reproductive success in parents that are sacrificed) and benefit (reproductive success gained in offspring) of such investment (Simpson & Belsky, 2008). When the cost of investing effort, time and energy in a given child is disproportionate to the benefits, parents may invest preferentially in certain children over others (Daly & Wilson, 1981). It could be that the cost of investing in a highly disorganized child may far exceed the benefit of such investment given the strained relationship between a disorganized child and a parent and the related difficulties within both the child and the parent. Accordingly, parents may provide lower investment in their disorganized offspring giving preference to their other offspring.

Theory and evidence on sibling size further support such reasoning. That is, the resource dilution hypothesis regarding sibling size has postulated that there are limits in parenting resources and having a new sibling in the household would deplete resources of parents in parenting other children in the family. However, this hypothesis has been largely adopted in the explanation of children's intellectual development and educational outcomes given that siblings were considered as competitors for resources from parents such as time, energy, and monetary investment. Thus, the fewer the siblings, the better children's intellectual development (Anastasi, 1956; Downey, 2001) and educational outcomes (Downey, 1995). The only study that examined the sibling size effect beyond intellectual

development (Holmgren, Molander, & Nisson, 2006) found that bigger sibling size is related to adults' poorer performance on executive functioning task, i.e., working memory. Thus, more research is needed to clarify the role of number of siblings in children's social and behavioral outcomes. Furthermore, it is interesting that one study (Strohschein, Gauthier, Campbell, & Kleparchuk, 2008) shows that the addition of a sibling in the family, while it led to decreases in positive interaction, also resulted in increased consistency in parenting; thus the finite parenting resources were considered to be reallocated instead of being diluted with increased family size. The current finding should be replicated in studies that further investigate this phenomenon.

In sum, this is an exploratory study on the direct link between attachment disorganization levels and children's externalizing behaviors at 36 months, and the possible moderators of this link. This study contributes to the literature by: 1) identifying the significant relationship between attachment disorganization levels and children's early externalizing behaviors at 36 months; 2) identifying the unique additional effect of child difficult temperament on children's early externalizing display at 36 months; 3) finding the significant moderation of number of children in the link between attachment disorganization levels and early externalizing behaviors; and 4) exploring possible moderation at the child, mother, parent-child relationship, and broader contextual levels, albeit with non-significant findings. This study can be further improved by addressing the statistical limitations discussed above and by replication in a high risk sample where some of the hypothesized moderational factors may be more crucial than in the current community sample.

General Discussion

In general, this dissertation project contributes to the literature by exploring possible moderating pathways leading to high attachment disorganization levels in children at 12 months and by examining the possible moderating mechanisms responsible for the association between early attachment disorganization and children's externalizing problems as early as 36 months. Regarding the mechanisms in the etiology of attachment disorganization levels, this study identified two significant interactions (the interaction between harsh negative parenting and parental belief in discipline and control; the interaction between child difficult temperament and parental belief in discipline and control) in predicting attachment disorganization levels at 12 months. Regarding the pathways to early externalizing behaviors, this study found a significant interaction between early attachment disorganization levels and number of children at home. Together, this dissertation research highlighted the importance of paying attention to the specific conditions under which risk (attachment disorganization) and maladaptation (early externalizing behavior at 36 months) may arise.

Table 1
Study 1 descriptive Statistics and Bivariate correlations

Variable	1	2	3	4	5	6
1 Child gender	1					
2 Maternal education at 6 months	-0.03	1				
3 Harsh negative parenting at 6 months	0.05	-0.41 ***	1			
4 Parental belief in discipline and control at 6 months	0.02	-0.38 ***	0.2 *	1		
5 Child difficult temperament at 6 months	0.12	-0.38 ***	0.16 *	0.09	1	
6 Attachment disorganization levels at 12 months	-0.18 *	-0.03	0.25 **	0.14	-0.01	1
N	206	179	175	164	160	148
Mean	0.49	14.4	2.58	3.2	2.96	2.31
SD	0.5	2.69	0.91	1.11	0.63	2
Minimum	0	8	1	1	1	1
Maximum	1	20	5	5.75	4.83	8

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. Gender: 0=Male, 1=Female.

Table 2

Study 1 Predicting Attachment Disorganization Levels at 12 Months

Parameter	Control Model		Main Effect Model		Interaction Model				
	B	SE	B	SE	B	SE			
Intercept	2.654	***	0.242	2.678	***	0.245	2.575	***	0.24
Child gender	-0.707	*	-0.323	-0.77	*	0.315	-0.786	**	0.304
Maternal education at 6 months	-0.044		0.066	0.072		0.073	0.116	†	0.065
Child difficult temperament at 6 months (DT)				0.063		0.275	0.277		0.28
Harsh negative parenting at 6 months (HP)				0.605	**	0.218	0.485	*	0.233
Parental belief in discipline and control at 6 months (PB)				0.219		0.192	0.164		0.184
HP X PB							0.654	*	0.264
HP X DT							-0.386		0.357
DT X PB							-0.66	**	0.242
N	148			148			148		
R ²	0.035		0.028	0.113	*	0.052	0.223	***	0.065

Note. † $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3

Cumulative sociodemographic Risk Indicators

Cumulative risk indicators	Time points	Count based criterion	Mean based criterion
Adolescent mother	3m	Below 21 when gave birth	*Reversed Mothers' age when gave birth
Single parenthood	3, 6, 12, 18, 24, 30, 36m	Not married or not cohabiting for at least twice	average frequency of single parenthood over time, ignoring missing
Maternal education	3, 6, 12, 18, 24, 30, 36m	High school degree (12 years) or below for at least twice	average years of education over time, reversed, ignoring missing
Minority status	3m	Child being a minority (black)	Child being a minority (black)
Number of children within the Household	3, 6, 12, 18, 24, 30, 36m	Four or above children in the household at least once	average number of children over time
Residential primary wage earner	3, 6, 12, 18, 24, 30, 36m	at least 2 times No employment (10 hrs. per week or below)	Average frequency of unemployment over time
Family income	3, 6, 12, 30, 36m	income-to-needs ratio below 2 for at least twice in easy dataset	average income-to-needs ratio (2003 cutoff) over time, reversed
Welfare status	3, 6, 12, 30, 36m	At least twice Receiving welfare or not	Average frequency of on welfare over time
Financial stress	3, 6, 12, 30m	At least two times on the Top 25% on combined mean item scores	mean item scores (reserved one item, rescaled two on the 4 point scale)

Note. This variable was not reversed when used separately for the correlation and post-hoc regression analysis.

Table 4

Study 2 Descriptive Statistics and Bivariate Correlations

3

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Sex	1										
2. D	-0.18 *	1									
3. IS	-0.09	0.29 ***	1								
4. DT	0.18 *	-0.003	-0.09	1							
5. MS	0.02	-0.05	-0.08	-0.26 **	1						
6. CB	0.03	0.21 *	0.02	0.29 ***	-0.47 ***	1					
7. MB	0.02	0.1	0.02	0.33 ***	-0.47 ***	0.9 ***	1				
8. Race	0.08	-0.04	0.09	0.35 ***	-0.4 ***	0.38 ***	0.39 ***	1			
9. MA	0.09	-0.19 *	-0.07	0.06	0.35 ***	-0.53 ***	-0.52 ***	-0.07	1		
10. ANC	0.05	-0.08	-0.08	0.11	-0.13 †	0.19 **	0.25 ***	0.26 ***	0.15 *	1	
11. EB	-0.14 †	0.25 **	0.06	0.15 †	-0.1	0.16 *	0.14 †	-0.03	-0.07	-0.002	1
N	206	148	148	152	162	192	206	206	206	206	178
Mean	0.49	2.31	0.35	3.05	4.48	2.09	0	0.57	28.14	2.08	10.45
SD	0.5	2	0.48	0.57	1.25	1.96	4.47	0.5	5.68	1.12	7.97
Min.	0	1	0	1.55	1	0	-9.24	0	17.74	1	0
Max.	1	8	1	4.87	7	6	13.12	1	39.75	9.83	35

Note. 0=Male, secure attachment, 1=Female, insecure attachment. D=Attachment disorganization levels at 12 months.

IS=Attachment insecurity at 12 months. DT=Child difficult temperament at 12 months. MS=Maternal sensitivity at 24 months.

CB=Count-based cumulative risk index. MB=mean-based cumulative risk index. MA=Maternal age when giving birth to the study child.

ANC=Average number of children at home. EB=externalizing behavior at 36 months. All these abbreviations apply to the tables thereafter.

† p<.10. *p<.05. **p<.01. ***p<.001.

Table 5

Study 2 Predicting Externalizing behaviors at 36 Months: Control and Main Effect Models

Parameter	Model 1		Model 2	
	B	SE	B	SE
Intercept	11.556 ***	0.829	11.325 ***	0.817
Child gender	-2.237 †	1.18	-1.574	1.182
Attachment Disorganization Levels (D)			0.966 **	0.355
N	206		206	
R ²	0.02	0.021	0.076 †	0.045

Note. Model 1=control model. Model 2=main effect model.
 † p<.10. **p<.01. ***p<.001.

Table 6

Study 2 Predicting Externalizing behaviors at 36 Months: Hypothesized Interaction Models

Parameter	Model 3		Model 4		Model 5		Model 6		Model 7								
	B	SE	B	SE	B	SE	B	SE	B	SE							
Intercept	11.373	***	1.007		11.586	***	0.826		11.232	***	0.822	11.328	***	0.816	11.392	***	0.814
Sex	-1.582		1.187		-2.09	†	1.226		-1.341		1.226	-1.736		1.183	-1.634		1.176
D	0.943	†	0.505		0.928	**	0.354		0.989	**	0.355	0.839	*	0.366	0.895	*	0.357
IS	-0.178		1.429														
DT					2.255	*	1.093										
MS								-0.486	0.52								
CB										0.452	0.305						
MB														0.202	0.132		
D X IS	0.067		0.75														
D X DT					-0.014		0.703										
D X MS								0.204	0.308								
D X CB										0.088	0.179						
D X MB															-0.003	0.079	
N	206				206			206				206			206		
R ²	0.077	†	0.045		0.1	*	0.049	0.088	†	0.047	0.09	*	0.045	0.087	†	0.045	

Note. † p<.10. **p<.01. ***p<.001.

Table 7

Study 2 Predicting Externalizing behaviors at 36 Months: Post-hoc Interaction Models

Parameter	Model 8		Model 9		Model 10				
	B	SE	B	SE	B	SE			
Intercept	11.406	***	1.005	11.32	***	0.823	11.596	***	0.819
Sex	-1.509		1.194	-1.485		1.19	-1.515		1.165
D	1.104	*	0.499	1.03	**	0.376	1.236	***	0.359
Minority	-0.217		1.173						
MA				0.006		0.108			
ANC							0.68		0.641
D X Minority	-0.284		0.71						
D X MA				0.016		0.065			
D X ANC							1.094	*	0.479
N	206			206			206		
R ²	0.077	†	0.045	0.082	†	0.047	0.157	*	0.072

Note. †p<.10. *p<.05. **p<.01. ***p<=.001.

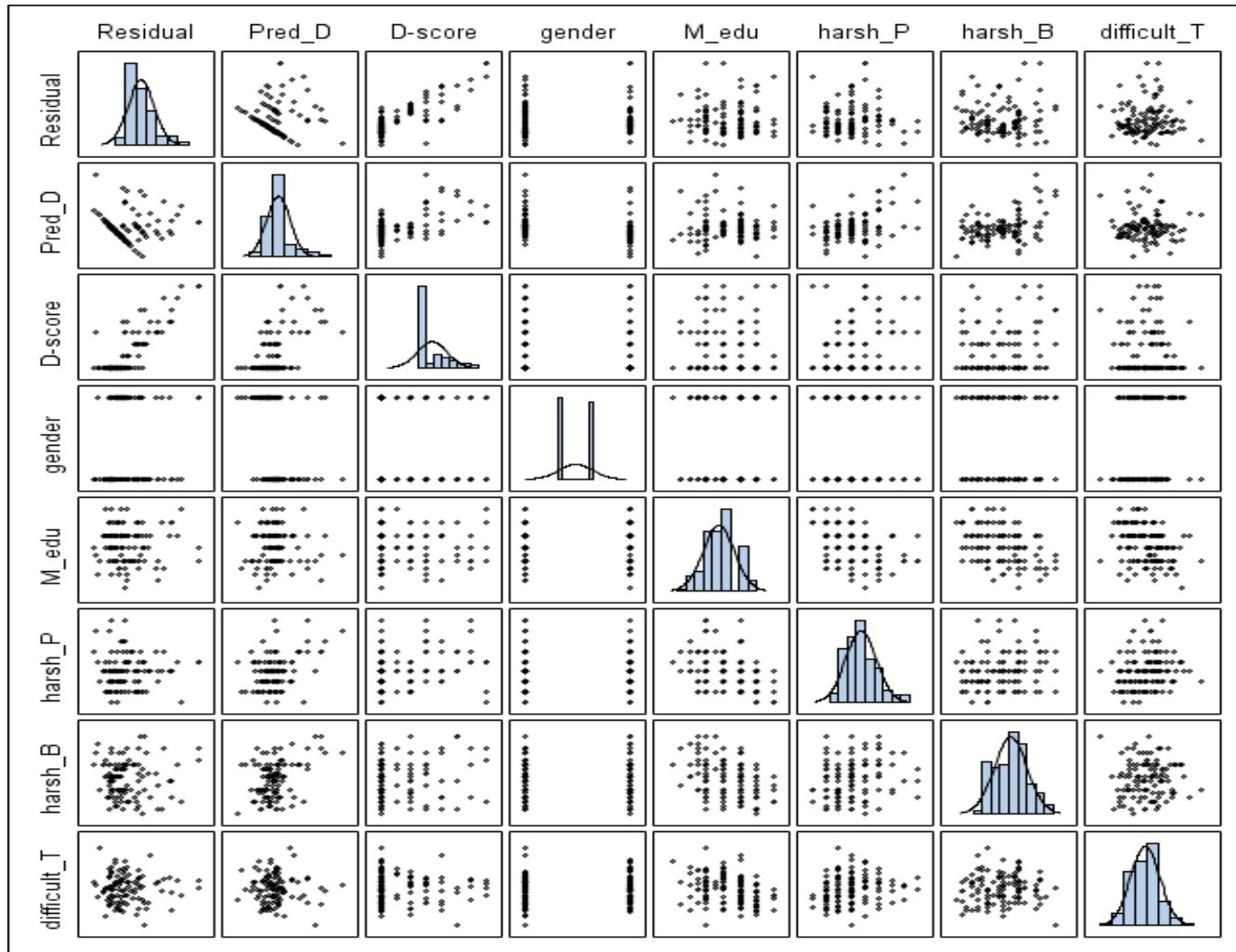


Figure 1. Study 1 panel scatter plots.

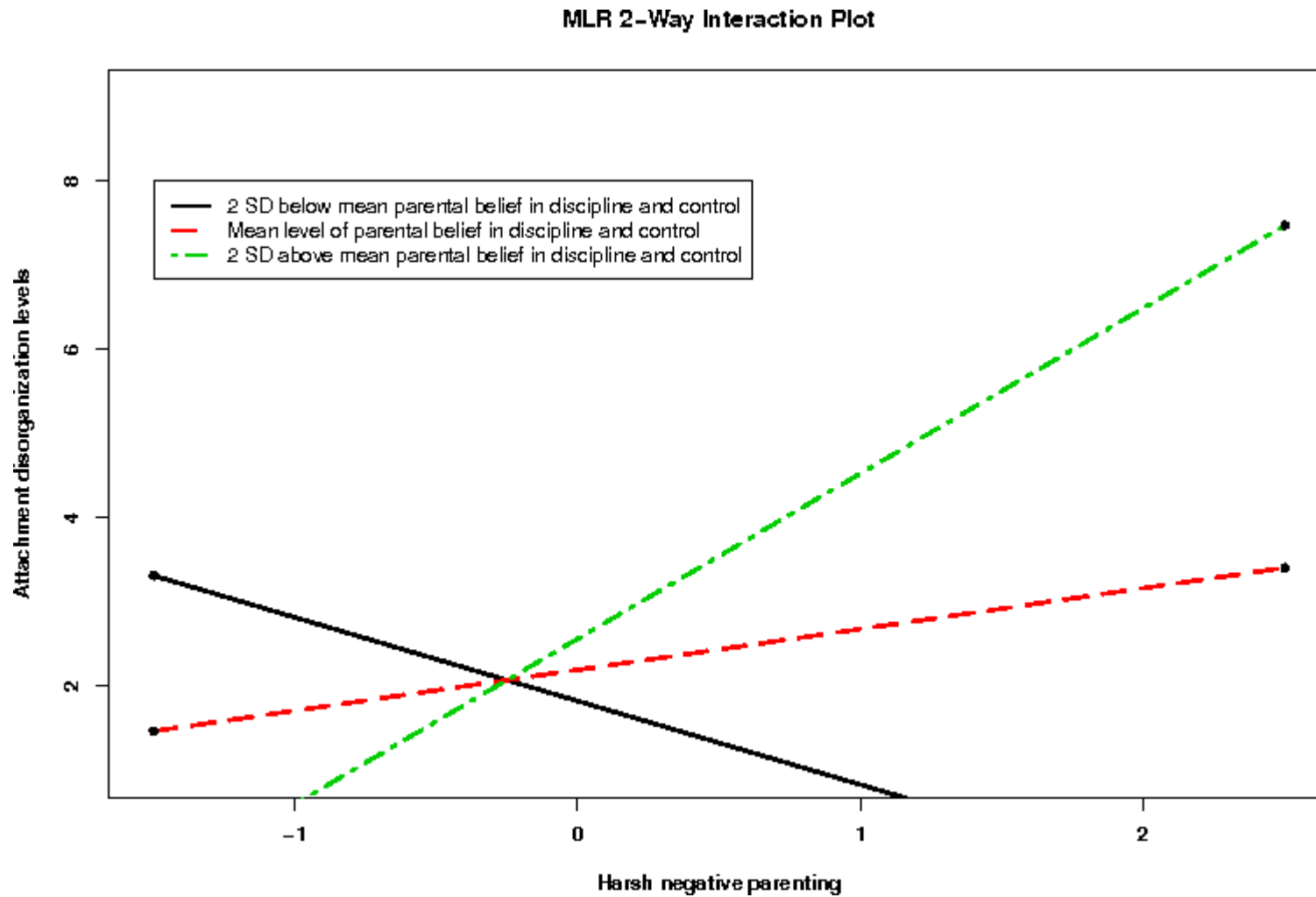


Figure 2. Study 1 interaction plot of harsh negative parenting and parental belief in discipline and control.

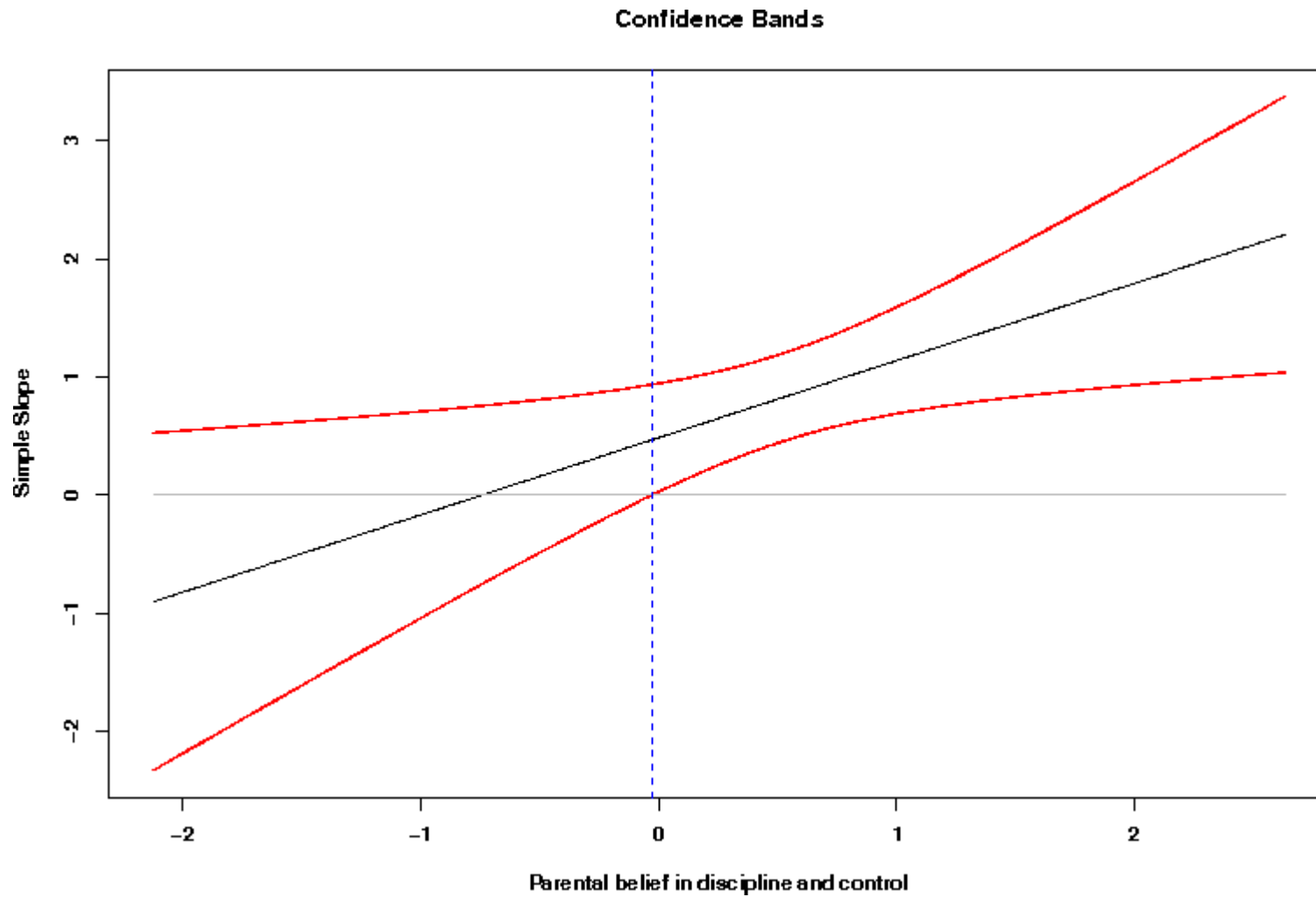


Figure 3. Study 1 significance bands for the interaction between harsh negative parenting and parental belief in discipline and control.

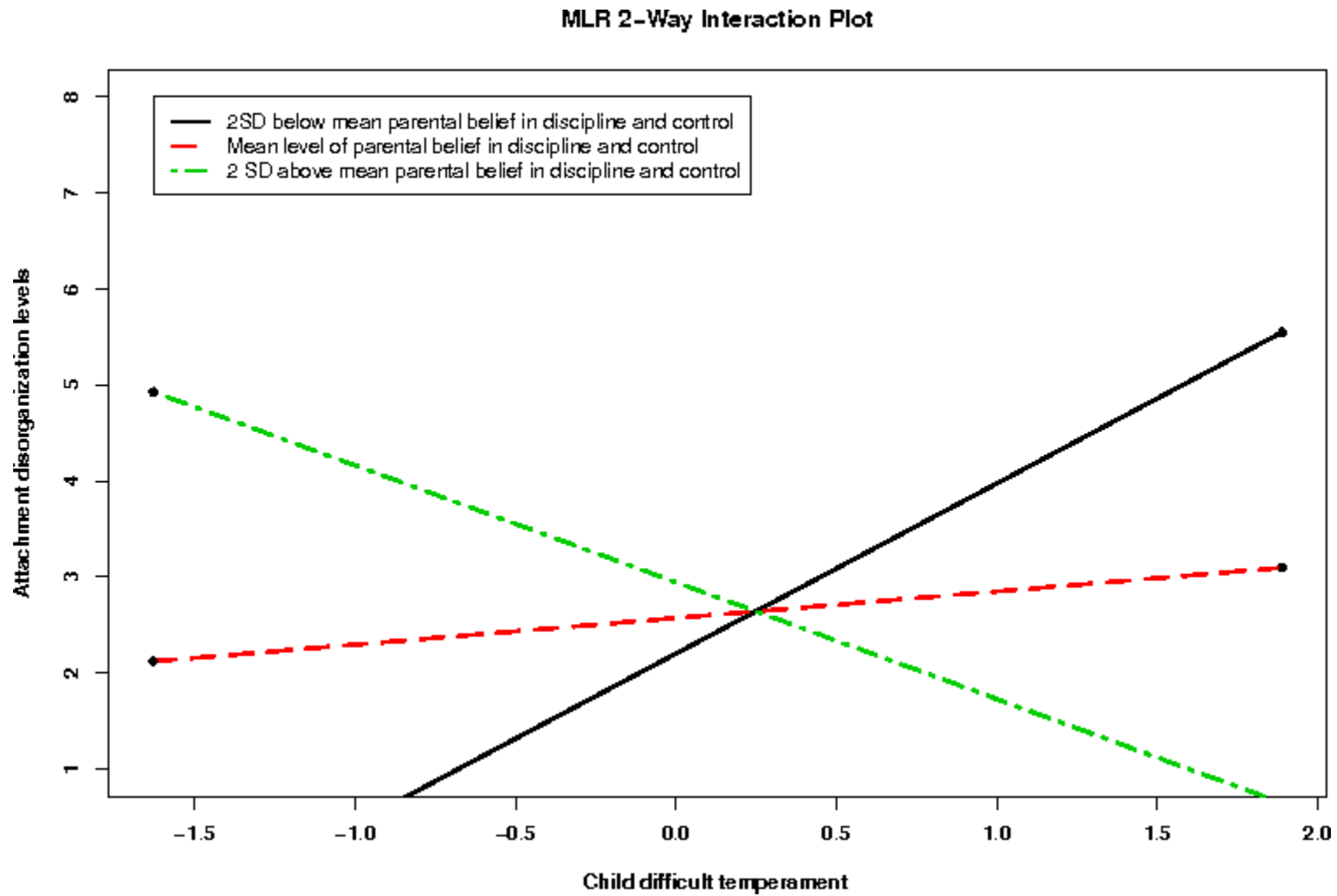


Figure 4. Study 1 interaction plot of child difficult temperament and parental belief in discipline and control.

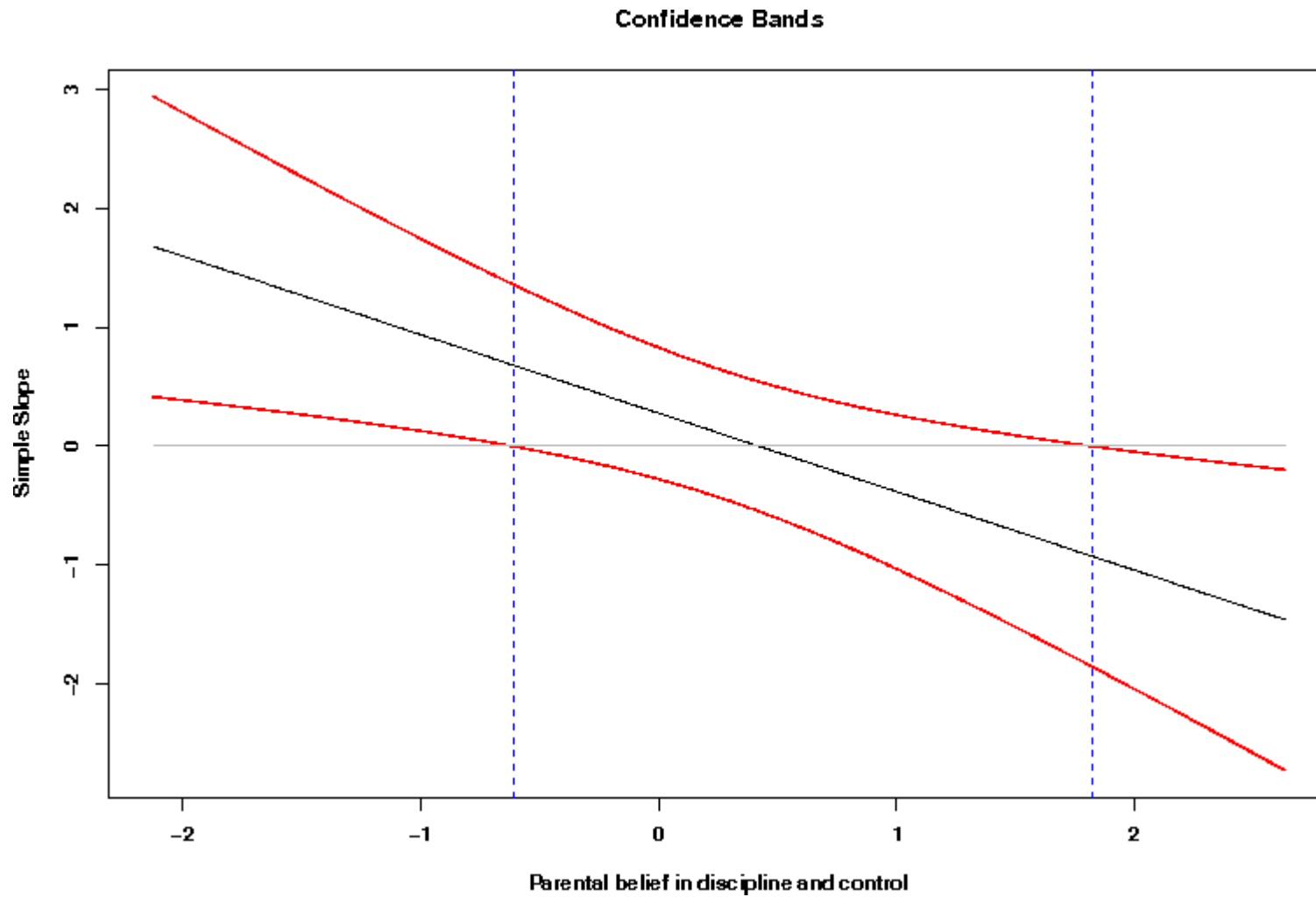


Figure 5. Study 1 significance bands for the interaction between child difficult temperament and parental belief in discipline and control.

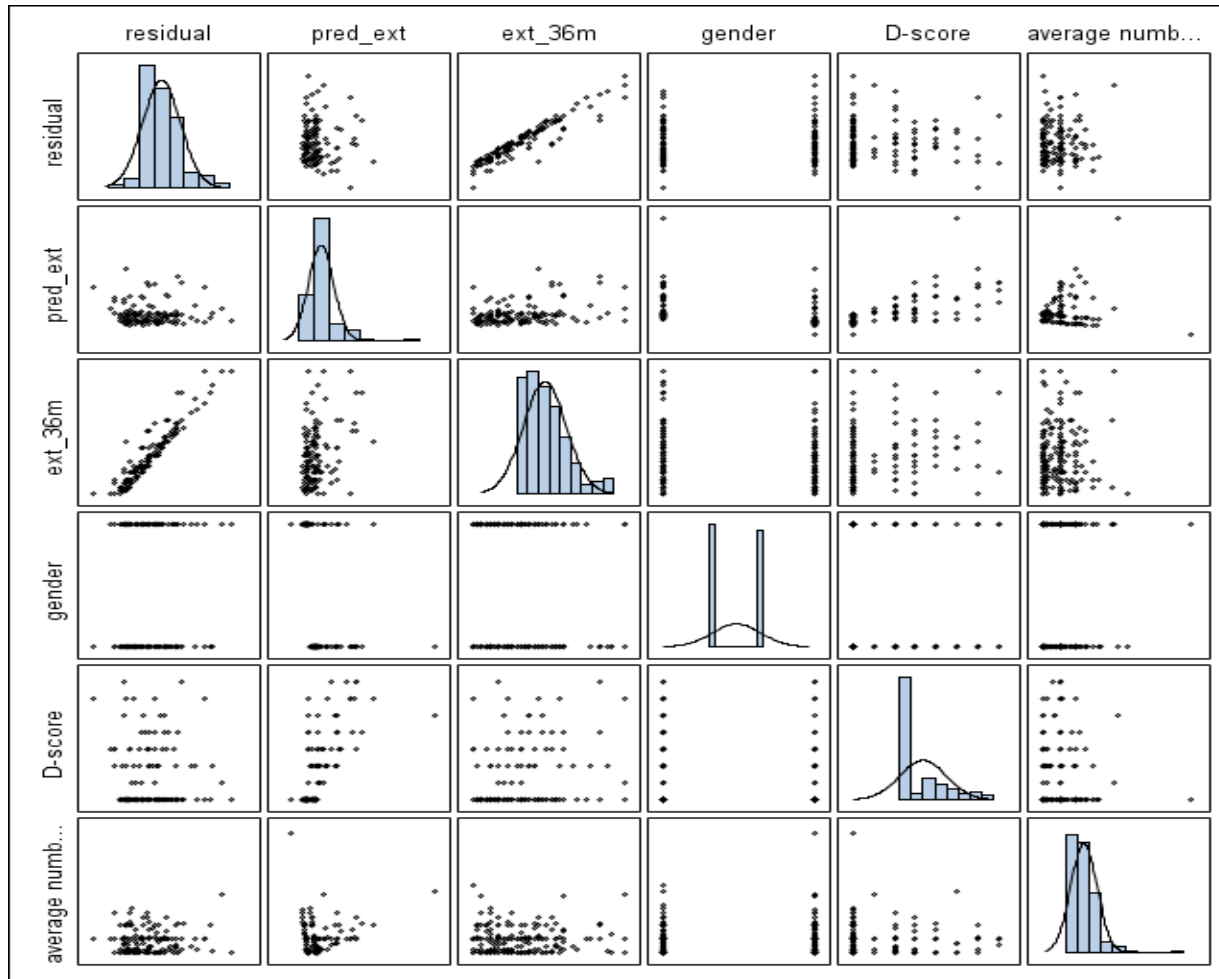


Figure 6. study 2 regression diagnostics plots based on the moderational model by number of children at home over time.

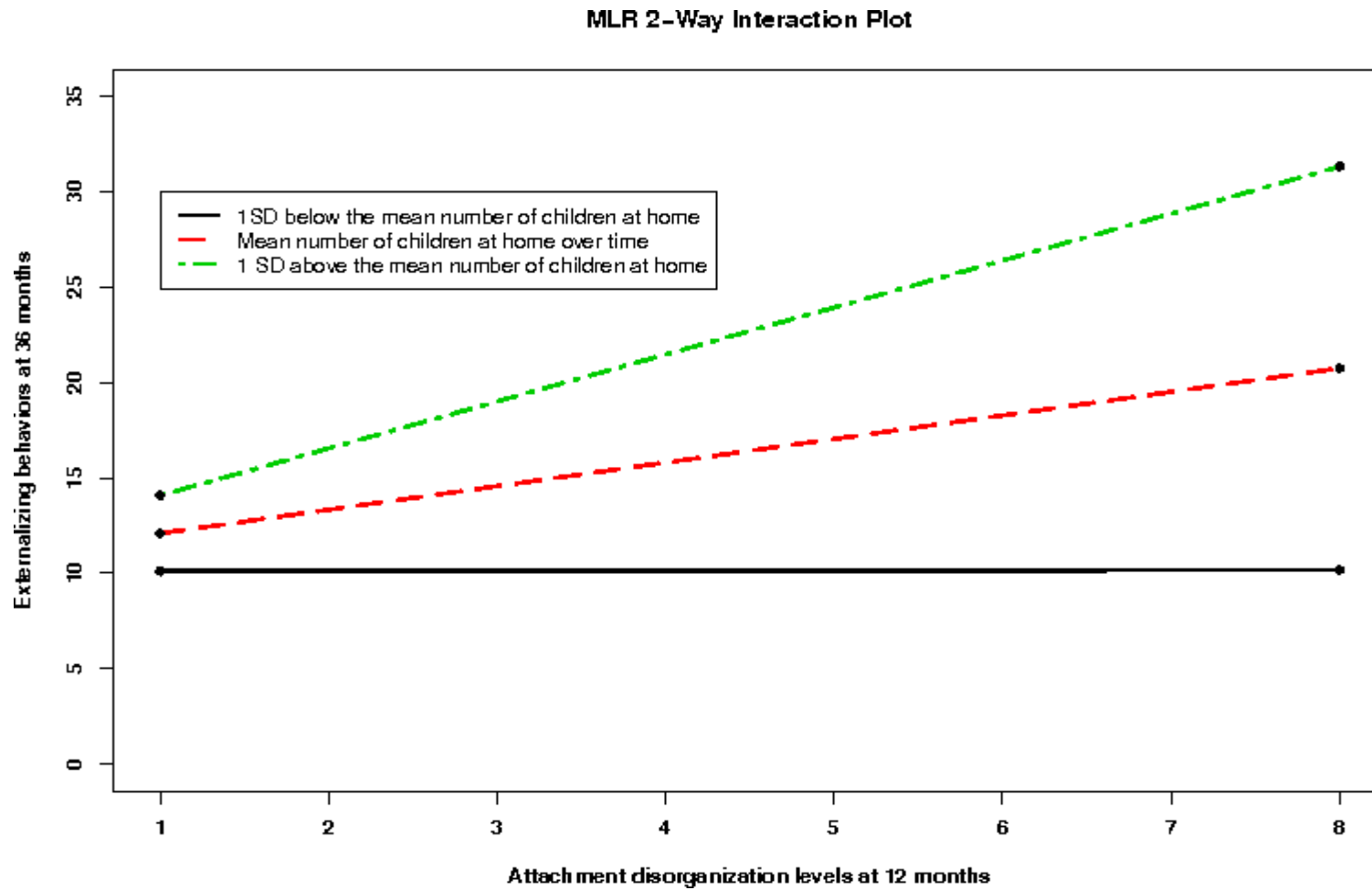


Figure 7. Study 2 interaction plot of attachment disorganization levels and number of children at home.

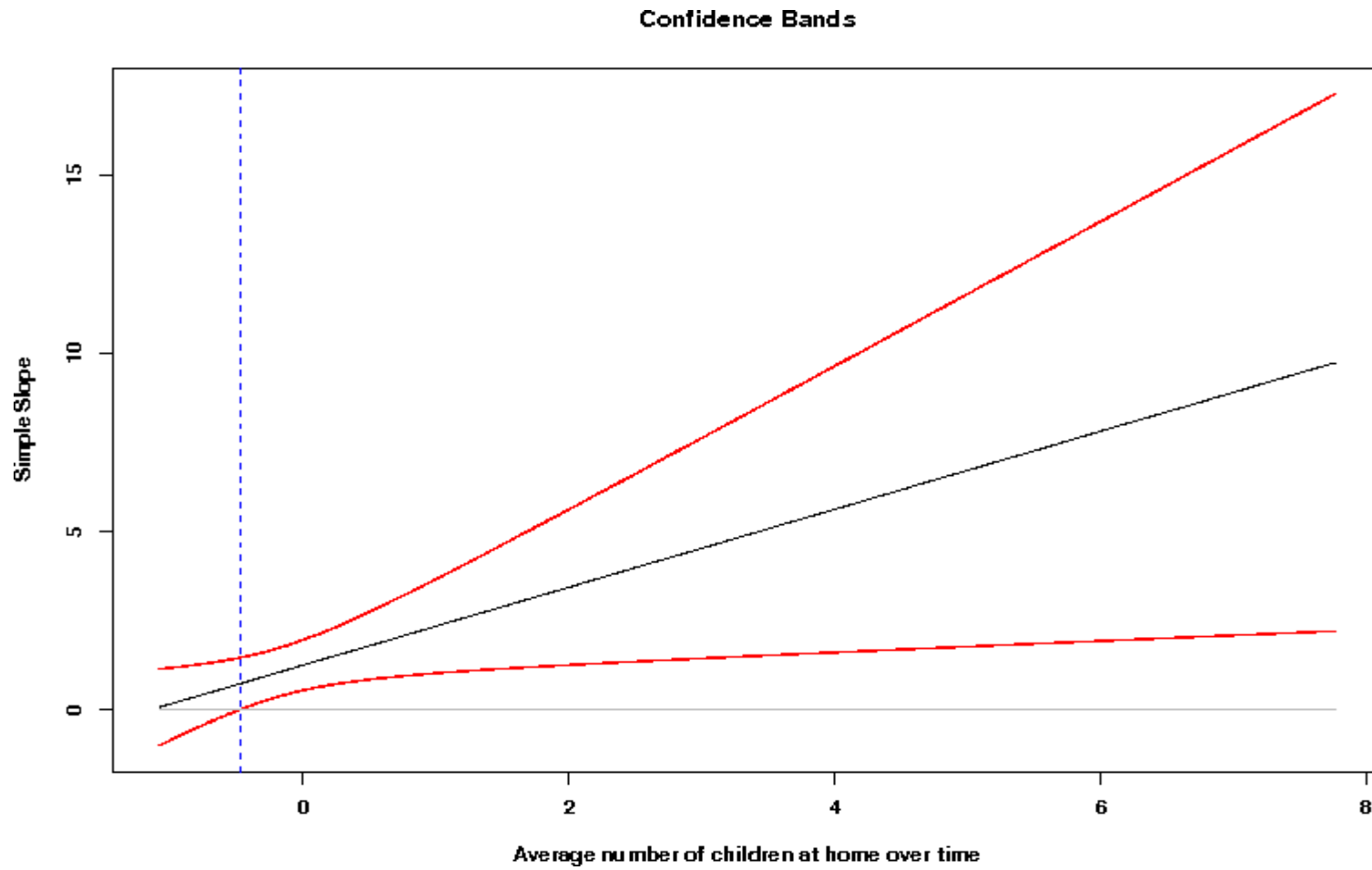


Figure 8. Study 2 significance bands for the interaction between attachment disorganization levels and number of children at home.

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