Pathways from marital aggression to infant emotion regulation: The development of withdrawal in infancy

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Abstract:

Associations between marital conflict and infant emotion regulation exist, but explanatory pathways have not been explored. For older children, parental behavior partially mediates this association through a "spillover" process. We test: associations between mothers' and fathers' verbally aggressive marital conflict, infant temperament, and infant withdrawal; mediating effects of negative maternal behavior, and moderating effects of infant temperament, exposure to marital arguments, and contact with father. Eighty mothers, 73 fathers, and their 6-month-old infants participated; parents reported marital aggression prenatally, mothers reported infant exposure to arguments, direct caregiving by father, and infant temperament at 5 months. Negative maternal behavior, infant withdrawal, distress to novelty, activity, and look away were observed at 6 months. Mothers' and fathers' aggressive marital conflict predicted infant withdrawal, interactively with exposure to marital arguments and extent of father caregiving, as did infant temperament and negative maternal behavior. Maternal behavior did not mediate between marital conflict and withdrawal.

Keywords: Family systems | Marital conflict | Emotion regulation | Distress to novelty | Negative maternal behavior | Father caregiving

Article:

1. Marital aggression, parenting, and infant withdrawal

Researchers have linked emotion regulation behaviors concurrently with reductions and increases in negative affect and predictively to later behavior, indicating their developmental significance. To date, research on the origins of emotion regulation has focused predominantly on proximal caregiver behavior as a likely developmental influence. More recently, in

conjunction with a systems theory approach to development (Cox & Paley, 1997; Sameroff, 1994), investigators have become interested in the links between marital conflict and infant emotion regulation, although the pathways by which marital conflict and infant emotion regulation are connected have yet to be explored. In studies of older children, parental behavior mediates between marital conflict and child behavior through a "spillover" process (Crockenberg & Covey, 1991; Erel & Burman, 1995) that may also operate in infancy. In this study, we extend this research to infants, testing: (1) associations between mothers' and fathers' marital conflict and infant withdrawal, a specific and arguably maladaptive type of infant emotion regulation; (2) the mediating effect of negative maternal behavior on that association; (3) the moderating effects of infant temperament, infant exposure to marital arguments, and extent of father caregiving on the links between parents' marital conflict and infant withdrawal.

1.1. Withdrawal as a type of emotion regulation

Infant behaviors that begin to develop during the first year of life are thought to regulate negative infant emotions (Rothbart, Ziaie, & O'Boyle, 1992). These include self-comforting and redirecting attention, considered adaptive regulation behaviors because they are associated with reductions in negative affect (Buss & Goldsmith, 1998; Crockenberg & Leerkes, 2004; Stifter & Braungart, 1995) that allow infants to remain engaged with their environment. As a consequence, infants are available for social interaction and other experiences that promote learning.

In contrast, withdrawal occurs when infants avoid a distressing event by moving away from it bodily, closing their eyes, or some combination of these behaviors that restrict their engagement with the environment, not just with the distressing event. Although withdrawal is sometimes effective in reducing negative affect in 6-month-old infants and in toddlers (Buss & Goldsmith, 1998; Crockenberg & Leerkes, 2004; Diener & Manglesdorf, 1999), and is adaptive in that sense, it does so at the expense of restricting social contact and experiences that foster learning. Thus, infants who learn early to use withdrawal as a predominant response to stress associated with novel events miss out on opportunities to develop more adaptive regulation behaviors, such as attention shifting, contributing to continuity over time in their tendency to withdraw. In a recent study, Crockenberg and Leerkes (2006) reported that among negatively reactive infants, those who at 6 months withdrew to a greater extent from a novel toy were more anxious at 2.5 years than comparable infants who withdrew less. This supports the view of withdrawal as maladaptive developmentally, albeit sometimes effective in reducing distress. It indicates also the importance of identifying the conditions that foster withdrawal in infants.

1.2. Marital predictors of differences in infant emotion regulation

Marital conflict, more specifically marital aggression, characterized by loud exchanges and expression of anger, is thought to impact children's emotions by virtue of the emotional/physiological reactions it triggers (direct effects) and through the spillover of angry feelings from the marital to the parent–child relationship (indirect effects). Empirical support for both types of effect is consistent during early childhood and beyond, though less extensive in infancy.

1.2.1. Direct effects

Several investigative teams have reported inflated levels of specific negative emotions, such as anger, sadness, and fear, among children exposed to verbally aggressive marital arguments between their parents (e.g., Crockenberg & Forgays, 1996; Crockenberg & Langrock, 2001; El-Sheikh, 1997; O'Hearn, Margolin, & John, 1997). In Crockenberg and Langrock (2001), children's specific negative emotions were associated with later behavioral problems that reflect poor emotion regulation, and anger predicted externalizing behavior only for 6-year-old girls who lacked good regulation skills. To our knowledge, there is no evidence linking marital conflict directly with poor emotion regulation or maladaptive coping in this age group (Kerig, 2001), although some children avoid marital conflicts between their parents, presumably in an effort to reduce their own distress.

In contrast, in recent studies with infants, marital conflict was associated with insecure attachment relationships, a correlate of poor emotion regulation (Frosch, Mangelsdorf, & McHale, 2000), and directly with poor infant emotion regulation. The latter effect was apparent in atypical patterns of vagal regulation (i.e., higher vagal suppression, a presumed regulation response, during the normal play and reunion episodes of the still-face procedure) reported by Moore, Calkins, Propper, Mariaskin, and Hutchinson (2004), and in lower ratings of emotion regulation observed during a developmental assessment (Porter, Wouden-Miller, Silva, & Porter, 2003). However, the pathways by which these effects occur have yet to be explored. In this study, we test direct and indirect effects of marital conflict on infant emotion regulation, specifically infant withdrawal. In our view, withdrawal is likely to be elevated among infants whose parents engage in aggressive marital conflicts because, during the first half-year of life, they often lack regulatory behaviors available to older children exposed to marital conflicts.

Additionally, infant temperament, specifically infant negative reactivity, which refers to the infant's predisposition to react negatively and intensely, may increase the likelihood of a negative impact of marital conflict on infant withdrawal. This could happen if negatively reactive infants respond more quickly to arousing events, increasing the need for regulation and reducing opportunities for infants to learn more adaptive ways of regulating negative emotion. Ingoldsby, Shaw, Owens, and Winslow (1999) reported such an effect at 24 months for males; marital conflict interacted with infant negative emotionality, as measured on the Infant Characteristics Questionnaire (ICQ), to predict both distress and externally oriented regulation behaviors during exposure to anger at 42 months. We attempt to replicate this interaction of infant temperament and marital conflict with younger infants during exposure to novelty. Consistent with other research indicating that it is high reactivity to novelty characterized by both high distress and high activity that predicts later behavioral inhibition, defined in large part by withdrawal from novelty (Calkins, Fox, & Marshall, 1996; Fox, Henderson, Rubin, Calkins, & Schmidt, 2001; Kagan & Snidman, 1991), we include both mother-reported distress to novelty and its interaction with observed infant activity as temperamental predictors of infant withdrawal from novelty.

Taken together, these findings are congruent with the expectation that infants exposed to arguments between their maritally aggressive parents will demonstrate poorer emotion regulation than children whose parents are less aggressive with each other, and than children whose

maritally aggressive parents do not argue in front of them. However, we know from previous analyses of these data (Crockenberg & Leerkes, 2006) that the ability to shift attention away from a novel toy and toward something else moderates the impact of reported distress to novelty on later anxiety. A similar moderating effect of attention shifting may occur on distress to novelty in relation to infant withdrawal, and therefore we test this interaction as well.

1.2.2. Indirect effects

As noted above, parents who engage in frequent and intense marital conflicts are more likely than other parents to behave more negatively and less sensitively with their children (see Cox, Paley, & Harter, 2001 for a review; Crockenberg & Langrock, 2001; Katz & Woodin, 2002). Spillover, a carry-over of negative mood from the marital to the parent–child relationship, is often cited as a likely explanation of this effect (Erel & Burman, 1995).

Researchers have reported similar associations between the marital and parental relationships during infancy (Crockenberg & Leerkes, 2003; Frosch & Mangelsdorf, 2001; Isabella & Belsky, 1985; McElwain & Volling, 1999), sometimes more strongly for fathers than for mothers (Lundy, 2002). Indeed, Feldman, Nash, and Aschenbrenner (1983)proposed that a father's experience of his marital relationship is the single best predictor of his involvement and enjoyment of parenting. A number of studies confirm this link. Harmonious marital relationships were positively associated with better father–infant interaction during play (Levy-Shiff & Israelashvili, 1988; Volling & Belsky, 1991), and with paternal sensitivity at 3 years after controlling for child characteristics, demographic factors, and other father characteristics (NICHD Early Childcare Research Network, 2000). Moreover, a conflictual marital relationship was associated with more intrusive, less sensitive father–infant interaction and less involvement of fathers with their infants (Belsky, Fish, & Isabella, 1991; Belsky, Youngblade, Rovine, & Volling, 1991; Cox, Paley, Payne, & Burchinal, 1999).

It appears from these data that the potential exists for marital conflict to increase the likelihood of more negative, less sensitive behavior toward infants in both mothers and fathers. However, this pattern is not always apparent, especially for mothers who Belsky and Fish et al. (1991) suggested may be better able than fathers to differentiate between the marital and the parent–infant relationship. Belsky (1979) pointed out also that, unlike mothers who are typically the primary caregivers, fathers can decrease their involvement with their infants without immediate harm. Thus, the impact of fathers' marital aggression on their parenting may be apparent only for fathers who do maintain significant contact with their infants. Fathers who take on extensive caregiving responsibilities while mothers work are less able to reduce their involvement with their infants than fathers who play a more traditional parental role. As a consequence, these caregiving fathers may be especially likely to express the negative emotion associated with their marriages in their relationships with their infants. We test this moderating effect of father caregiving on the association between fathers' marital aggression and infant withdrawal.

1.3. Parental predictors of differences in infant emotion regulation

Emotion regulation behaviors develop in the context of dyadic interaction between the parent and infant (Kopp, 1989). Results of experimental studies, in which infant affect varied as a function of caregivers' responses, support the view that mothers influence emotion regulation during infancy (e.g., Campos, 1989, Cohen, 2002, Klinnert, 1984; Walden & Ogan, 1988), as does evidence that global measures of maternal sensitivity are associated with better emotion regulation in infants (see Thompson, 1994, for a review).

In a previous report from the current data set, Crockenberg and Leerkes (2004) reported that negative maternal behavior, a composite of negative affect, intrusiveness, mismatched affect, and disengagement, correlated positively with infant withdrawal from novelty. Additionally, withdrawal occurred more frequently than chance following negative maternal behavior, the only maternal behavior for which the contingency was significant at the level of individual dyads. This is consistent with Klinnert's (1984) finding that infants whose mothers grimaced at them backed away from the "deep end" of the visual cliff, and with Belsky, Rovine, and Taylor's (1984) finding that mothers of avoidant infants over-stimulated them more than did mothers of other infants. The researchers speculated that avoidant infants learn to turn away from their mothers during intrusive interactions. On this basis we expect mothers to elicit withdrawal when they react negatively to their infants, and identify such behavior as a likely mediator of marital conflict and infant withdrawal. We test this mediating effect in the current study.

1.4. Hypotheses

1. Mothers' and fathers' marital aggression predict infant withdrawal, and these effects are moderated by infant negative reactivity, exposure to marital arguments, and the extent of father caregiving. Specifically, the positive association between parental marital aggression and infant withdrawal is strongest when one of the following conditions is met: infants are highly reactive to novelty, exposed to marital arguments, or cared for frequently by their fathers.

2. Infant reactivity to novelty predicts infant withdrawal, and this effect is moderated (reduced) by infants' ability to shift attention away from novelty and toward something else.

3. Negative maternal behavior mediates between mothers' marital aggression and infant withdrawal.

2. Method

2.1. Participants

Couples were contacted through local birthing classes. Of the 92 participating mothers who met the inclusion criterion of primiparity, 80 had complete mother and infant data on the relevant measures and 73 of their partners had complete data.[1] Mothers were 29.1 years old on average (range 20–41 years) and had 15.4 years of education (range 11–20); fathers were 32.0 years old on average (range 23–54) and had 15.8 years of education (range 12–20). Ninety-two percent of mothers and fathers were Caucasian, 90% were married, and 10% were living together. Couples had been together for an average of 3.3 years at recruitment. Mean family income was US$ 62,500 (range US$ 8,000–200,000). Fifty-nine percent of the infants were male.

2.2. Procedures

During their 7th or 8th month of pregnancy, couples provided demographic data by phone and completed measures of marital conflict and depressive symptoms, which they received and returned by mail. At 5 months postpartum, they completed another measure of marital conflict and fathers' involvement with their infants, and mothers reported on infant temperament. At 6 months, mothers and infants were videotaped during a laboratory assessment of infant emotion regulation. Participating families received US$ 10 and were entered into a US$ 100 lottery.

2.3. Measures

2.3.1. Marital conflict questionnaire (MCQ)

The MCQ was administered to couples prenatally. It consists of fifteen items that assess conflict strategies and fourteen items that assess resolution patterns that characterize marital conflicts. Partners rate how well each strategy and resolution pattern describes him or her on a four-point scale. Factor scores for marital attack and avoidance correlated negatively with marital satisfaction (Rands, Levinger, & Mellinger, 1981), and composite measures of MCQ aggression correlated significantly with parental coercion (Crockenberg & Langrock, 2001).

Principal components factor analyses with varimax rotation were calculated on MCQ items separately for mothers and partners. This yielded three factors with Eigen values greater than one: verbal aggression, avoidance, and adaptive strategies (Crockenberg & Leerkes, 2003). Only the aggression scores were used in these analyses. Items with factor loadings >.50, or >.40 if the item loaded at .50 or higher on the partner's scale, were included to create measures of marital aggression that included as many of the same, construct-appropriate items as possible for both partners. Verbal aggression consists of eight items for fathers: hurt other's feelings; get mad/yell; get sarcastic; the more I talk the madder I get; start disagreeing about one thing end up arguing about many things; end up feeling annoyed; later use something said against partner; and feel hurt (Cronbach's α = .80). For mothers, it consists of the same eight items as fathers and three additional items: get mad/walk out; get cool distant/give cold shoulder; take a long time to get over being mad (Cronbach's α = .85). Items were weighted by factor loadings and averaged to create prenatal mother and father verbal aggression scores.

2.3.2. The center for epidemiologic studies-depression scale (CES-D; Radloff, 1977)

Depressive symptoms were assessed using this 20-item checklist of moods, feelings, and cognitions associated with depression (e.g., I felt depressed, I felt that people dislike me) designed for use with community samples. Mothers indicate on a four-point scale how often they felt a particular way during the previous week. The CES-D has convergent validity with the Research Diagnostic Criteria, a standardized psychiatric interview, and with the Beck Depression Inventory (Spitzer, Endicott, & Robins, 1978). Items were averaged to derive a prenatal measure of depressive symptoms (Cronbach's α = .88), included as a covariate when regressing infant withdrawal on its predictors because of its potential impact on mothers' ratings of infant temperament and association with marital conflict.

2.3.3. Conflict and problem-solving scales (CPS)

The conflict strategies subscale of the CPS was administered postnatally to assess the extent to which partners use particular tactics during marital conflicts. Using a four-point scale, partners rate the frequency with which both they and their partners engaged in 44 different strategies during the previous year. The CPS has good convergent validity with the conflict tactics and the dyadic adjustment scales and good test–retest reliability over 3 months, $r = .63$ (Kerig, 1996). The single item, argue in front of the baby, was the measure of infant exposure to marital aggression. Mothers' reports were used in all analyses because their responses to this item were more complete than fathers'. Only one mother-reported arguing in front of the baby "very frequently", and therefore we created a two-group dummy variable, consisting of those who never argued in front of their infant ($n = 34$) and those who argued in front of their infants rarely, sometimes, or very frequently ($n = 44$).

2.3.4. Child care activities scale (CCAS) (Cronenwett, Sampselle, & Wilson, 1988)

Mothers completed the CCAS by indicating the percent of time their partners engaged in three types of child care activities with their infants: direct caregiving (e.g., feeding, bathing), indirect caregiving (e.g., washing clothes, arranging babysitting), and play (e.g., reading, going on outings). The average percent time fathers spent in each type of care was calculated. The CCAS has good reliability over 6–8 weeks, and mothers' and fathers' reports of each others' involvement at 5 months correlate significantly (average $r = .67$), identifying mothers as reliable reporters of father involvement (Cronenwett et al., 1988). Given our focus on fathers' direct contact with their infants, we used mothers' reports of direct father care (Cronbach's $\alpha = .74$) in data analyses.

2.3.5. Infant behavior questionnaire (IBQ)

Two IBQ subscales (Rothbart, 1981) were administered to assess mothers' perceptions of their infant's temperament, distress and latency to approach sudden or novel stimuli and distress to limitations. Mothers indicate on a seven-point scale how frequently their infants responded to specific events by fussing or crying during the previous week (e.g., when exposed to a loud noise or when introduced to a stranger). At 6 months, subscales have good internal reliability (.75–.81), concurrent validity with home observations of infant temperament, mean $r = .40$, and with the negative emotionality and approach-sociability subscales of the Revised Infant Temperament Questionnaire and the Infant Characteristics Questionnaire, r's .61–.73 (Goldsmith, Rieser-Danner, & Briggs, 1991; Rothbart, 1981; Rothbart & Goldsmith, 1985). In this study, mean ratings from the seventeen-item *distress to novelty* scale (Cronbach's $\alpha = .68$) served as an emotion-specific measure of infant temperament.

2.3.6. Six-month observation

Following a 5-min warm up, mothers placed infants in a car seat, and sat 3 ft away, situated so that by turning infants could see them. Two novel toys (a bumble ball and fire truck) were introduced, in counterbalanced order to control for toy effects. During the first novelty task

(*mother uninvolved*), mothers remained neutral so that we could observe infants' regulatory responses to the toy without maternal intervention. During the second task (*mother involved*), mothers interacted with their infants as they liked, but were asked not to intervene directly (e.g., touch the novel toy), or remove their child from the seat, unless they wished to end the activity.[2] Mothers soothed their infants between tasks to reduce carry-over.

During the novelty tasks, the infant seat was at a table with a clear plastic barrier that prevented toys from touching the infant. The *fire truck* approached from the opposite end, with a voice and siren sounding and lights flashing. When it reached the barrier, it stopped; lights and siren continued. This lasted 25 s and was repeated three times. After the third approach, the siren, voices, and flashing lights continued for 35 s. Then, the experimenter placed the silent fire truck within the infant's reach for 1 min. For the *bumble ball*, another barrier was added, two feet from the first, to ensure that the bumble ball would bounce in close proximity to the infant. The experimenter put the ball between the barriers and turned it on. It bounced unpredictably for 30 s, and then remained still, emitting a high-pitched giggle for 15 s. This repeated three times. Then the experimenter turned it off and placed it within the infant's reach for 1 min.

Infant and maternal behaviors were coded *continuously* from videotapes, using a computerized, event-based coding system. Trained students coded in pairs to maintain accuracy while watching a tape, operating the VCR, and entering codes; those who coded one type of behavior were blind to other coding and to all other data. Pairings varied to prevent pair-linked coder drift. The authors coded 25 videotapes independently, at the beginning and midway through the process, to assess reliability and to prevent coder drift for each type of coding.

2.3.7. Infant regulatory behaviors

Twelve mutually exclusive behavioral codes, adapted from Rothbart et al. (1992), were used to code infant behavior. Thirteen additional codes were created during coder training to identify instances in which infants engaged in two or more behaviors simultaneously (e.g., self-soothe and look at mom). Definitions and coding instructions are available from the first author. Inter-coder reliability for all codes within a 1-s interval ranged from .65 to .87, mean $\kappa = .75$.

The percent of total time infants engaged in three behaviors was included in the study. *Withdrawal*, defined by closed eyes and/or movement away from the novel toy, was the outcome variable. *Activity*, defined as physical movement of hands or limbs, sometimes in the direction of the novel toy, and *look away*, defined as looking away from the novel toy and at something else, were included as potential moderators of reported distress to novelty,[3] for reasons explained above. Withdrawal was positively skewed and underwent a logarithmic transformation.

2.3.8. Infant affect

Infant affect was rated *continuously* on a seven-point scale adapted from Braungart-Rieker and Stifter (1996). Scores included: 1 = high positive, 2 = moderate positive, 3 = mild positive, 4 = neutral, 5 = mild negative, 6 = moderate negative, and 7 = high negative, based on infant facial expressions, body tension, and vocalizations. Kappas for each level of affect ranged from

.68 to .98, mean $\kappa = .83$, across conditions. As reported previously (Leerkes & Crockenberg, 2003), this yielded several measures of observed infant distress (peak intensity of negative affect, latency to first negative, mean affect, and ratio of time negative to positive or neutral). A factor analysis of these measures resulted in factor loadings ranging from .73 to .95 (absolute value); they were standardized and averaged to create a measure of infant distress.

2.3.9. Maternal behavior

Twelve behavior codes were created based on existing schemes (Farran, Kasari, Comfort, & Jay, 1986; van den Boom, 1994.) Detailed descriptions of all codes are available from the second author. Inter-coder reliability (kappas) within a 1-s interval ranged from .65 to .85 for the twelve codes; mean $\kappa = .75$, using procedures described above. The variable of interest in this paper is the percent of time mothers engaged in *negative maternal behavior* that includes four low-frequency behaviors, combined a priori as types of insensitive behavior. These are: negative affect (annoyed vocalizations or facial expressions directed at infant); intrusiveness (e.g., places infant's hand on novel toy); mismatched affect (mother's affect incongruent with infant's, e.g., laughs when infant upset); and distracted (mother does not watch or interact with infant). This behavior correlated significantly and negatively with an independent, global rating of sensitivity used in previous analyses (Leerkes & Crockenberg, 2002), $r = -.32$; $p < .05$, supporting its validity.

Descriptive data on all variables are included in Table 1. To maintain as large a sample as possible, missing data were replaced with the average score for that variable, yielding an *n* of 80 for all analyses.

Table 1. Descriptive statistics

	N	***M***	**S.D.**
Maternal depressive symptoms	80	.00	.36
Mothers' marital aggression	80	1.13	.33
Fathers' marital aggression	80	1.01	.28
Negative maternal behavior	80	.35	.62
Extent of father caregiving	80	22.91	14.05
Exposure to marital arguments	80	1.56	.50
Reported distress to novelty	80	2.12	.58
Observed distress to novelty	80	−.00	.64
Observed infant activity	80	.62	.47
Observed infant look away	80	1.15	.31
Infant withdrawal	80	.43	.55

3. Results

Data analyses proceeded in several steps. First, correlations were calculated among all predictors (prenatal maternal depressive symptoms, mothers' and fathers' marital aggression, negative maternal behavior, extent of father caregiving, infant exposure to marital arguments, and several temperament variables) and between each predictor and infant withdrawal. Second, withdrawal was regressed on its predictors in a nested set of analyses. In the final analyses, all significant predictors identified in previous analyses were combined in a single, model-testing regression to determine whether mother, father, and infant effects explained non-overlapping variance in

infant withdrawal. This approach reduced the number of predictors included in each regression equation and served to maintain an adequate subject to variable ratio in the analyses. According to Harris (1985), an adequate sample size in multiple regression is 50 plus number of predictors, which in these analyses ranged from 10 to 15, indicating that an *n* of 80 is sufficient.

3.1. Zero-order correlations

As presented in Table 2, mother's prenatal depressive symptoms correlated positively with mothers' marital aggression, and were included as a covariate in subsequent analyses. Mothers' and fathers' prenatal marital aggression correlated significantly and positively with each other and with infant exposure to marital arguments; mothers' marital aggression correlated positively with infant look away behavior. Observed distress to novelty correlated negatively with infant activity, identifying observed distress as a necessary covariate when testing interactive temperament effects. Additionally, observed infant activity and look away correlated positively, indicating covariation and suggesting that both be included in analyses testing the moderating effects of infant temperament (distress to novelty and emotion regulation behavior).

Table 2. Zero-order correlations between variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Maternal depressive symptoms	–	.31**	.10	.08	.14	.10	.09	.04	.02	−.11	.01
2. Mothers' marital aggression		–	.48**	.13	−.08	.30**	.06	.13	.01	.22*	.29**
3. Fathers' marital aggression			–	.04	.01	.28*	−.03	.01	.08	.01	.08
4. Negative maternal behavior				–	.03	.13	.11	.46**	−.15	−.02	.50**
5. Extent of father caregiving					–	−.11	−.14	−.04	.18	−.03	.04
6. Exposure to marital arguments						–	.18	.23*	−.16	−.08	.32**
7. Reported distress to novelty							–	.12	−.04	−.23*	.05
8. Observed distress to novelty								–	−.27*	−.18	.71**
9. Observed infant activity									–	.31**	−.32**
10. Observed infant look away										–	−.05
11. Infant withdrawal											–

Mothers', but not fathers', marital aggression correlated positively and significantly with infant withdrawal, as did infant exposure to marital arguments, negative maternal behavior, and observed infant distress to novelty; observed infant activity correlated negatively with withdrawal. No marital variable correlated significantly with negative maternal behavior, thus eliminating the possibility that maternal behavior mediated the association between marital conflict and infant withdrawal. However, observed infant distress to novelty and exposure to marital arguments correlated positively with each other, identifying elevated infant distress to novelty as a possible mediator between exposure to marital arguments and infant withdrawal.

3.2. Hierarchical multiple regressions

In view of the number of hypothesized interactions and the sample size, we tested hypothesized *interactive* effects of each partner's marital aggression with each potential moderator (i.e., infant distress to novelty (temperament), infant exposure to marital arguments, and, for fathers, extent of caregiving with infant) in separate hierarchical regression analyses. For all significant interactions, variables were centered and the interactions were plotted using procedures recommended by Aiken and West (1991). Maternal prenatal depression was a

covariate in all analyses to reduce any bias in maternal reporting and collinearity associated with this pre-existing maternal characteristic.

3.2.1. Moderating effects of distress to novelty

In the first set of analyses, infant withdrawal was regressed on maternal depressive symptoms, mothers' marital aggression, and fathers' marital aggression, followed by observed infant activity and observed look away as potential moderators of distress to novelty, mother-reported and observed infant distress to novelty, and negative maternal behavior entered simultaneously, and then the four 2-way interactions: mother-reported distress to novelty by observed infant activity was included to test the predictive power of this joint measure of infant reactivity to novelty (as discussed above); mother-reported distress by observed infant look away behavior was included to test the moderating effect of the availability of attention shifting, another regulating behavior, on easily distressed infants' use of withdrawal to regulate distress to novelty. The interactions of reported distress to novelty with marital aggression and with negative maternal behavior were included to test the moderating (exacerbating) effects of infant temperament on the associations between marital and maternal behavior and infant withdrawal.

Table 3. Hierarchical multiple regression testing moderating effects of infant temperament ($N = 80$)

Predictors	1 (β)	2 (β)	3 (β)	3 (B)	4 (β)	4 (B)
1. Maternal depressive symptoms	−.10	−.09	−.12		−.14	
Mothers' marital aggression	.36**	.22*	.23*		.49	
Fathers' marital aggression	−.09	−.02	−.03		−.03	
2. Observed infant activity		−.15t	−.82**		−.86**	
Observed infant look away		.03	.70t		.65	
Reported distress to novelty		−.04	.38		.56	
Observed distress to novelty		.56**	.58**		.57**	
Negative maternal behavior		.21*	.16t		.21	
3. Reported distress × activity			.73*	.38*	.78*	.40*
Reported distress × look away			−.85t	−.53t	−.80	−.50
4. Reported distress × negative maternal behavior					−.05	−.35
Reported distress × mothers' marital aggression					−.02	−.19

Note: $R^2 = .10^*$ for step 1; $\Delta R^2 = .51^{**}$ for step 2; $\Delta R^2 = .03^t$ for step 3; $\Delta R^2 = .00$ for step 4. $^t p < .10$; $^* p < .05$; $^{**} p < .01$; β is standardized beta; B is unstandardized beta and reported only for interactions.

As shown in Table 3, mothers' marital aggression and maternal negative behavior significantly predicted infant withdrawal at entry and continued to do so after all other single variables had entered the equation, indicating that they explained non-overlapping variance in infant withdrawal from novelty. The distress to novelty interaction (reported distress × activity) was positively and significantly associated with infant withdrawal; the reported distress to novelty × look away interaction was a trend at entry. As shown in Fig. 1, reported distress to novelty was positively associated with observed infant withdrawal only when observed infant activity was high. When infant activity was low, the association was negative, reflecting the significant and negative correlation of infant activity and infant withdrawal. As shown in Fig. 2, and as hypothesized, reported distress to novelty was negatively associated with withdrawal

when infants looked away frequently from the novel toy, whereas it was positively associated when infants looked away infrequently.

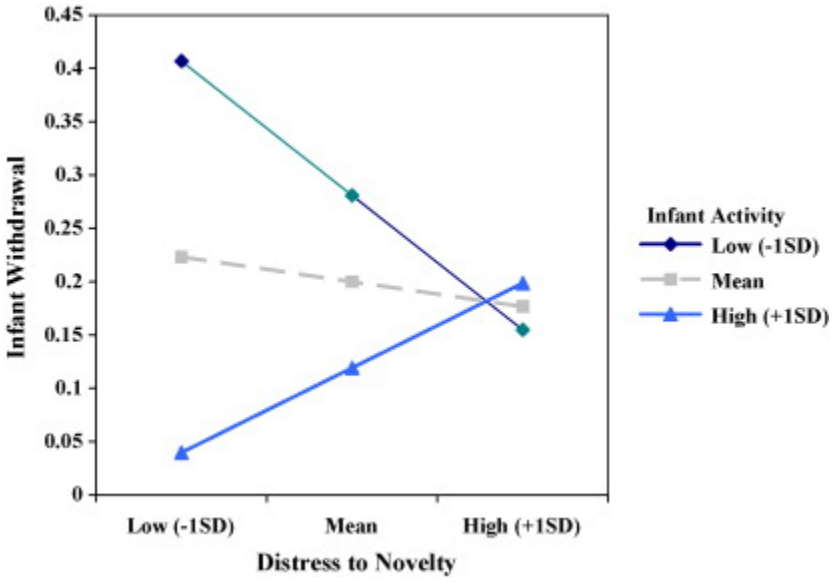

Fig. 1. The association between mother-reported distress to novelty and observed infant withdrawal varies as a function of observed infant activity.

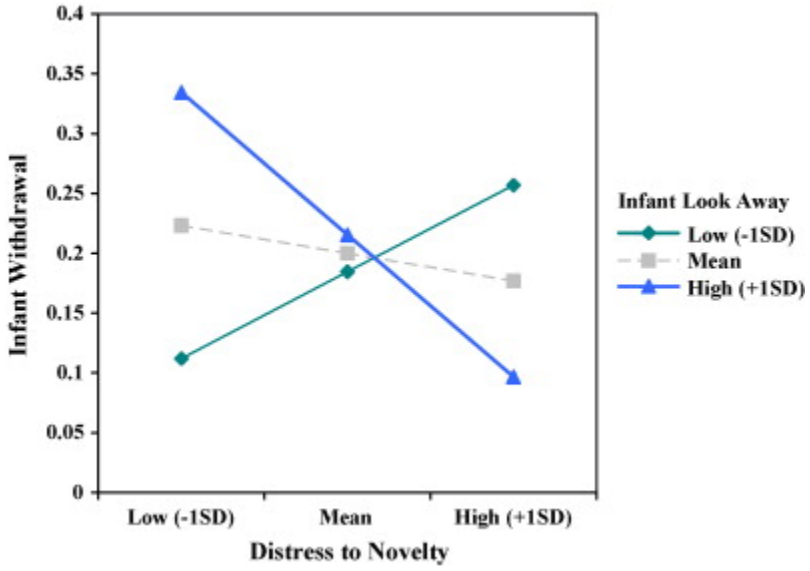

Fig. 2. The association between mother-reported distress to novelty and observed infant withdrawal varies as a function of infant look away behavior.

Marital aggression remained significant and negative maternal behavior remained a strong trend after entry of the temperament interactions (step 3), demonstrating that they explain primarily non-overlapping variance in infant withdrawal. Observed distress to novelty was strongly associated with infant withdrawal at each step in the equation, indicating that infants who became more distressed during exposure to the novel toy engaged in more withdrawal. Thus, in subsequent regression analyses, distress × activity and observed distress were included as

predictors of withdrawal. Given the difficulty of detecting moderation in non-experimental research (McClelland & Judd, 1993) and the power limitations of the current sample, the trend interaction between reported distress to novelty and look away was also included in subsequent analyses in an attempt to understand the effect of correlated interaction terms on the model.

Contrary to hypothesis, reported distress to novelty interacted with neither mothers' nor fathers' marital aggression, nor with negative maternal behavior to predict withdrawal. To explore the possibility introduced by the significant distress to novelty by activity interaction that this measure of infant temperament would moderate the main effect of marital aggression or of negative maternal behavior on infant withdrawal, we recalculated the analyses, adding the three-way interactions (distress to novelty × activity × marital aggression or distress to novelty × activity × maternal negative) on the last step of the equations. The two-way interactions between marital or maternal behavior and infant activity needed to test the three-way interactions were also included. No significant three-way effects or trends were observed, all p values >.30; this was the case also for interactions of infant temperament with father's marital aggression.

Table 4. Hierarchical multiple regression testing moderating effects of infant exposure to marital arguments ($N = 80$)

Predictors	**1 (*β*)**	**2 (*β*)**	**3 (*β*)**	**3 (*B*)**	**4 (*β*)**	**5 (*β*)**	**5 (*B*)**
1. Maternal depressive symptoms	−.10	−.12	−.16		−.10	−.13	
Mothers' aggression	.36**	.28*	−.44		−.02	.02	
Fathers' aggression	−.09	−.10	−.07		−.04	−.05	
2. Observed infant activity		−.20*	−.16t		−.12	−.80*	
Observed infant look away		−.05	−.13		.00	.74t	
Reported distress to novelty		−.06	−.06		−.06	.42	
Negative maternal behavior		.43**	.44**		.22**	.17t	
Exposure to conflict		.19t	−.58		−.13	−.08	
3. Mothers aggression × exposure			1.22*	.75*	.39	.34	
4. Observed distress to novelty					.52**	.54**	
5. Reported distress × activity						.73*	.38*
Reported distress × look away						−.93t	−.58t

Note: $R^2 = .10^*$ for step 1; $\Delta R^2 = .32^{**}$ for step 2; $\Delta R^2 = .04^*$ for step 3; $\Delta R^2 = .17^{**}$ for step 4; $\Delta R^2 = .03^*$ for step 5. $^t p < .10$; $^* p < .05$; $^{**} p < .01$; β is standardized beta; B is unstandardized beta, reported only for interactions.

3.2.2. Moderating effect of infant exposure to marital arguments

In the second set of analyses, infant withdrawal was regressed on maternal depressive symptoms, mothers' marital aggression, and fathers' marital aggression entered first, followed by observed infant activity and look away behavior, reported distress to novelty, negative maternal behavior, and infant exposure to marital arguments entered simultaneously, then the interaction of infant exposure and mothers' marital aggression. To test the hypothesized mediating effect of observed distress to novelty (on the association between the marital aggression × exposure interaction and infant withdrawal), observed distress to novelty was entered next,[4] and its impact on the interaction noted. The two interactions (reported distress to novelty by activity and by look away) were entered on the final step to determine if temperament and exposure effects explained independent variance in infant withdrawal. The interactive effect of fathers' marital aggression

by infant exposure was tested in a separate analysis in which all the same variables, except the interaction of mothers' marital aggression by infant exposure, were entered as above.

As shown in Table 4, the mothers' marital aggression effect, significant at entry, was qualified by its significant interaction with exposure to conflict. As shown in Fig. 3, prenatal marital aggression was more strongly (and positively) associated with infant withdrawal when infants were exposed to marital arguments postnatally than when they were not.

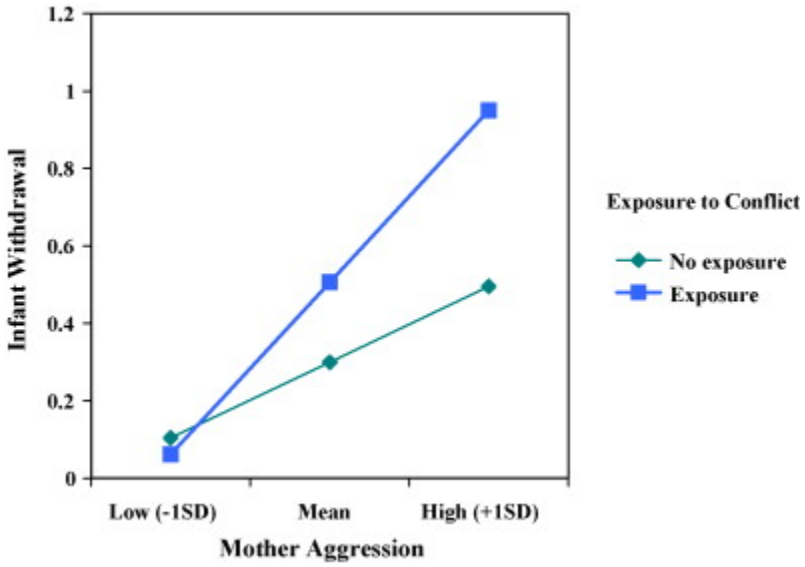

Fig. 3. The association between mothers' marital aggression and observed infant withdrawal varies as a function of infant exposure to marital arguments.

Consistent with the hypothesized mediating effect,[4] the interaction of mothers' marital aggression and infant exposure to marital arguments was no longer significant after observed infant distress entered the equation (β dropped from 1.22, $p < .01$–.39, n.s.), whereas observed distress continued to predict infant withdrawal. The interaction of reported distress to novelty by activity was significant on the final step after entry of the marital aggression by exposure interaction, and the interaction of reported distress to novelty by look away remained a trend, indicating that they explained variance in infant withdrawal that did not overlap with variance explained by the marital aggression by infant exposure interaction.

When the regression was recalculated substituting fathers' marital aggression by infant exposure for the maternal aggression interaction, the effect was a trend, $\beta = 1.24$, $p = .06$, and operated as above, with increasing marital aggression associated with increasing infant withdrawal when infant exposure to marital arguments was high. Consistent also with the effect for mothers' marital aggression, this interactive effect became non-significant after entry of observed distress (β dropped from 1.22, $p < .10$–.04, n.s.), indicating again that the effect of exposure to fathers' aggressive marital conflict on infant withdrawal is mediated by the infant's negative arousal. All other effects were as reported above using mothers' marital aggression. The fathers' marital aggression by infant exposure interaction was not included in the final model because it was a trend, and because the two interactions explained shared variance in withdrawal.

3.2.3. Moderating effect of father caregiving

In the third set of analyses, infant withdrawal was regressed on maternal depressive symptoms, mothers' marital aggression, and fathers' marital aggression, followed by observed activity and look away behavior, reported distress to novelty, negative maternal behavior, and father caregiving entered simultaneously, then the father marital aggression × caregiving interaction to test the hypothesized moderating effect, followed by observed infant distress, and then the temperament (reported distress × activity, reported distress × attention) interactions to determine if temperament and father marital effects were independent.

As hypothesized, fathers' marital aggression interacted with paternal caregiving to predict infant withdrawal after all single variables had entered the equation, as shown in Table 5. As illustrated in Fig. 4, when fathers engage in high amounts of infant caregiving, fathers' marital aggression is positively associated with infant withdrawal, whereas when father caregiving is low, a negative association occurs between fathers' aggression and infant withdrawal. This interactive effect was reduced to a trend when the temperament interactions entered the equation, and the temperament effects were similarly reduced. Thus, we infer that the interactive effects of infant temperament and caregiving by maritally aggressive fathers are predominantly, though not entirely, independent.

Table 5. Hierarchical multiple regression testing moderating effects of father caregiving ($N = 80$)

Predictors	**1 (*β*)**	**2 (*β*)**	**3 (*β*)**	**3 (*B*)**	**4 (*β*)**	**4 (*B*)**	**5 (*β*)**	**5 (*B*)**
1. Maternal depressive symptoms	−.10	−.14	−.11		−.09		−.21	
Mothers' marital aggression	.36**	.33**	.35**		.25**		.26**	
Fathers' marital aggression	−.09	−.06	.42*		−.29^{t}		−.26^{t}	
2. Observed infant activity		−.25**	−.27**		−.18*		−.74*	
Observed infant look away		−.05	−.08		.02		.62	
Reported distress to novelty		−.01	.00		−.01		.38	
Negative maternal behavior		.43**	.44**		.21**		.17*	
Extent of father caregiving		.11	−.74^{t}		−.51		−.44	
3. Fathers' aggression × father caregiving			.95*	.03*	.69*	.02*	.61^{t}	.02^{t}
4. Observed distress to novelty					.54**		.56*	
5. Reported distress × observed activity							.61^{t}	.31^{t}
Reported distress × observed look away							−.77	−.48

Note: $R^2 = .10^{*}$ for step 1; $\Delta R^2 = .30^{**}$ for step 2; $\Delta R^2 = .04^{*}$ for step 3; $\Delta R^2 = .21^{**}$ for step 4; $\Delta R^2 = .02$ for step 5. $^{t}p < .10$; $^{*}p < .05$; $^{**}p < .01$: β is standardized beta; B is unstandardized beta, reported only for interactions.

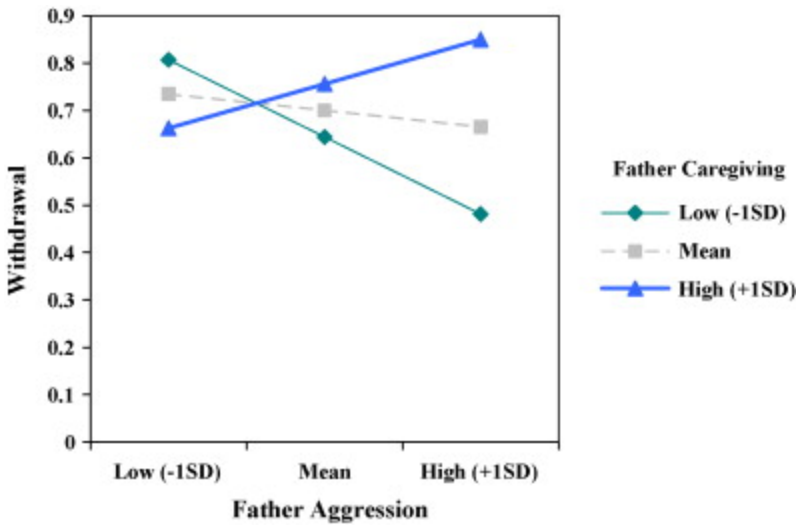

Fig. 4. The association between fathers' marital aggression and observed infant withdrawal varies as a function of the extent of father caregiving.

3.2.4. Test of the complete model

In the final regression analysis, infant withdrawal was regressed on maternal depressive symptoms, mothers' marital aggression, and fathers' marital aggression entered first, followed by observed infant activity and look away behavior, reported infant distress to novelty, negative maternal behavior, father caregiving, and infant exposure to marital arguments entered simultaneously, the previously identified marital aggression interactions (i.e., mothers' marital aggression × infant exposure to marital arguments; fathers' marital aggression × father caregiving), followed by observed infant distress,[4] and then the temperament interactions (reported distress × activity; reported distress × look away).

Table 6. Hierarchical regression: effects of fathers' and mothers' marital aggression and infant temperament on withdrawal

Predictors	**1 (*β*)**	**2 (*β*)**	**3 (*β*)**	**3 (*B*)**	**4 (*β*)**	**4 (*B*)**	**5 (*β*)**	**5 (*B*)**
1. Maternal depressive symptoms	−.10	−.14	−.16		−.11		−.13	
Mothers' marital aggression	.36**	.29*	.40		.00		.02	
Fathers' marital aggression	−.09	−.10	−.41*		.29^{t}		−.27^{t}	
2. Observed infant activity		−.23*	−.20*		−.16*		−.71*	
Observed infant look away		−.04	−.15		−.01		.67^{t}	
Reported distress to novelty		−.04	−.03		−.03		.43	
Negative maternal behavior		.42**	.44**		.23**		.18*	
Extent of father caregiving		.12	−.66^{t}		−.47		−.40	
Exposure to conflict		.20^{t}	−.58^{t}		−.14		.11	
3. Fathers' aggression × father caregiving			.88*	.03*	.66^{t}	.02^{t}	.57^{t}	.02^{t}
Mothers' aggression × exposure to conflict			1.21*	.75*	.41	.25	.38	.23
4. Observed distress to novelty					.50**		.52**	.44**
5. Reported distress × observed activity							.60^{t}	.31^{t}
Reported distress × observed look away							−.85^{t}	−.53^{t}

Note: $R^2 = .10^{t}$ for step 1; $\Delta R^2 = .33^{**}$ for step 2; $\Delta R^2 = .07^{**}$ for step 3; $\Delta R^2 = .16^{**}$ for step 4; $\Delta R^2 = .02^{t}$ for step 5. $^{t}p < .10$; $^{*}p < .05$; $^{**}p < .01$: β is standardized beta; B is unstandardized beta, reported only for interactions.

As shown in Table 6, maternal behavior was significant at entry, and remained significant after all simple effects and interactions had entered the equation, as shown in step 5, demonstrating its robustness as a predictor of infant withdrawal and its independence from mothers' and fathers' marital aggression and infant temperament. The interactions (of mothers' marital aggression × infant exposure and fathers' marital aggression × father caregiving) explained significant and non-overlapping variance in infant withdrawal from novelty. When the temperament variables, including observed infant distress, entered the equation, the mother aggression interaction was no longer significant (as shown also in Table 4) and the father aggression interaction was reduced to a trend; the temperament interactions were trends as well.

4. Discussion

Verbally aggressive marital conflict predicts and appears to increase the likelihood that infants will withdraw when they are exposed to novel stimuli (i.e., noisy, moving toys) at 6 months of age, though whether is does so depends on infants' exposure to the conflict and the extent to which fathers engage in direct caregiving with their infants. These findings confirm and extend earlier research linking marital conflict with poor emotion regulation (Moore et al., 2004, Porter et al., 2003) by demonstrating a connection between a specific type of marital conflict, aggression, and a specific form of emotion regulation, withdrawal, under certain conditions.

Evidence that infant exposure to marital arguments in the months following birth moderates the impact of mothers', and to a lesser extent fathers', marital aggression on infant withdrawal is consistent with a direct effect of marital conflict on infant emotion regulation. It suggests further that infants are sensitive to emotional aspects of the caregiving context in which they are not directly involved. Presumably, infants exposed to marital arguments, which by definition imply intensity, and likely are louder than the exchanges to which infants are typically exposed, experience increased negative arousal (Moore et al., 2004). Data from this study support that association. Not only did observed infant distress to novel (loud, moving) toys mediate between exposure to marital aggression and infant withdrawal, but also infants with high exposure to aggressive marital arguments exhibited elevated distress to novelty when they were exposed to novel toys. Moreover, as argued by Crockenberg and Leerkes (2004), once infants have become highly distressed, they may be less able to modulate their distress using other regulatory behaviors, such as attention shifting and self-soothing, and hence more likely to withdraw from novelty. Withdrawal may be heightened also by parents' preoccupation with their arguments at a time when their infants need help to regulate their increasing negative arousal.

For fathers, evidence that the association between fathers' aggression and infant withdrawal is apparent *only* when fathers take on a substantial share of caregiving responsibilities with their infants suggests that angry feelings associated with marital aggression may spill over into fathers' interactions with their infants. In the absence of data on the qualitative aspects of father–infant interaction, this remains an untested inference. However, that the "father caregiving" effect is independent of the interactive infant exposure effect lends credence to the possibility that spillover between marital aggression and fathers' caregiving behaviors explains some of the variation in infants' withdrawal from novelty at 6 months of age.

In contrast, there was no support in this study for the mediating role of maternal behavior in explaining the association between marital aggression and infant withdrawal. Although as expected, negative maternal behavior, which included both intrusiveness and disengagement, predicted infant withdrawal strongly and independently of all other predictors, it was unrelated to marital conflict. Frosch and Mangelsdorf (2001) reported a similar lack of parental mediation between marital conflict and observed behavior problems in 3 years old, despite significant associations between marital conflict and hostile/intrusive parenting, and between parenting and child behavior. It is possible, of course, that parents were less attentive and responded more insensitively to their infants in the context of ongoing marital conflict, an association that we may have attenuated in this study by assessing maternal behavior without fathers present and outside the home. Additionally, the strong association between negative maternal behavior and infant withdrawal may reflect in part the proximity of their assessments and the similarity of the contexts in which they were assessed: withdrawal during infant exposure to a novel toy when *mothers were not involved* with their infants; negative maternal behavior when mothers *were involved* with their infants during their exposure to another novel toy.

It is noteworthy also that mother-reported distress to novelty was weakly, though significantly associated with infant withdrawal when it occurred in conjunction with high activity, and this effect explained predominantly independent variance in infant withdrawal when all marital effects were covaried. This finding provides additional support for previous research in which infants identified as highly distressed (more crying) and highly active in response to novel stimuli at 4 months were more likely to exhibit behavioral inhibition, characterized by withdrawal from novelty, at 14 and 21 months of age (Calkins et al., 1996, Fox et al., 2001; Kagan & Snidman, 1991), and extend that research to encompass infant withdrawal observed at 6 months of age. However, infant activity was *negatively* associated with withdrawal as a main effect (higher infant activity → lower infant withdrawal), replicating the negative prediction between fetal activity and toddler behavioral inhibition (DiPietro et al., 2002), and suggesting that infant activity that co-occurs with high distress to novelty functions differently than activity that occurs in its absence.

Additionally, and as predicted, infant distress to novelty (as reported by mothers) was positively associated as a trend with withdrawal for infants who looked away infrequently from the novel toy, whereas the association was negative when infants looked away frequently. Thus, whether temperamentally predisposed infants withdraw from novel toys depends to some extent on their ability to regulate negative affect by shifting attention away from novel stimuli and toward something else. Consistent with this possibility, infants who looked away from a novel toy and toward something else were less distressed during exposure to novel toys (Crockenberg & Leerkes, 2004), a variable that strongly predicted infant withdrawal in this study, and negatively reactive infants who engaged in high attention shifting during exposure to a novel toy were less likely to show elevated anxiety at 2.5 years than comparable infants who tended not to shift attention (Crockenberg & Leerkes, 2006). Taken together, these findings further support infant attention shifting (away from a novel stimulus and toward something else) as an adaptive type of emotion regulation, available to some infants as early as 6 months postpartum.

These interactive temperament effects on infant withdrawal may help to explain the absence of the hypothesized moderating effects of infant distress to novelty on the impact of mothers' and

fathers' marital aggression on infant withdrawal. We had anticipated such an effect on the grounds that infants predisposed to respond with high distress to novel stimuli may be expected to respond more negatively to their parents' marital arguments, and to demonstrate greater withdrawal as a consequence. That infant distress to novelty had no such effect could mean that the effect depends on the interaction of multiple moderators (e.g., a four-way interaction of infant distress to novelty, activity, marital aggression, and infant exposure to marital arguments) that could not be tested in this study due to sample size.

4.1. Limitations and conclusions

Though sufficient for testing the hypothesized associations between predictors and infant withdrawal separately, the sample of 80 mothers, fathers, and infants has relatively low power to explain multiple, interacting effects. This may be why both the significant marital and temperament interactions become trends when all interactions are included in the same regression model. Replication with a larger sample is needed to provide the statistical power needed to test the four-way interactions suggested by the current data.

Another limitation is the lack of data on qualitative differences in fathers' interactions with their infants. Tentatively, we interpret the finding that fathers' marital aggression is positively associated with infant withdrawal only if fathers spend significant amounts of time in direct care of their infants as evidence of "spillover". In future research, observations of father–infant interaction are needed *during periods of direct caregiving* to confirm this interpretation.

A third limitation is that observations of maternal behavior were obtained in a laboratory context, far removed from the contexts in which verbally aggressive marital conflict takes place. As a consequence, we may have underestimated any spillover effect between marital conflict and maternal behavior. On the other hand, Belsky and Youngblade et al. (1991) proposed that mothers are better able than fathers to compartmentalize any marriage-related anger, reducing spillover between the two relationships. Our data are consistent with this interpretation.

Despite these limitations, we conclude from the data that both mothers and fathers contribute to the development of infant withdrawal as a consequence of their aggressive marital behavior, and do so in part by the elevating effect of exposure to marital conflict on infants' negative reactions to novelty. We conclude also that the effects of fathers' marital aggression on infant withdrawal depend on the extent to which fathers engage in direct care of their infants, and that infant temperament characterized by high reactivity to novelty (distress/activity) increases the tendency to withdraw from novelty in some infants. Moreover, because measures of marital aggression were obtained prenatally, they could not have been a response to infant temperament. Thus, direction of influence appears to be primarily from parent to infant, rather than the reverse.

That characteristics of the marital relationship assessed pre birth appear to influence an important dimension of post-birth development, infant withdrawal, demonstrates the value of considering the broader context of family relationships for understanding development in infancy (Cox et al., 2001). It indicates also the potential value of intervening with families prenatally to foster infant development, as Cowan and Cowan (1992) demonstrated over a decade ago.

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Notes

[1] Data were missing for the following reasons: one mother was single at recruitment, one couple had separated by 5 months, one family participated in the 6-month observation but did not return their questionnaires, in eleven cases there were technical malfunctions that prevented the behavioral coding of mother or infant behavior, and four fathers opted not to participate.
[2] Three mothers stopped an activity prior to its completion.
[3] Specific behaviors included in these two composite measures and the basis for combining them has been reported previously (Crockenberg & Leerkes, 2004).
[4] Observed distress was entered after the marital aggression interactions to test the independence of the interactive effects involving mothers' and fathers' aggressive marital behavior.

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