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The Impact of Borderline Personality Pathology on Mothers' Responses to Infant Distress

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This study sought to extend extant research on the association between borderline personality (BP) pathology and at-risk parenting by examining the dynamic nature of parenting in response to infant distress in mothers with and without clinically relevant levels of BP pathology. Findings revealed that mothers with clinically relevant levels of BP pathology were less likely than those without BP pathology to display positive affect in response to infant distress. There were no differences in the overall likelihood of insensitive parenting behaviors as a function of BP pathology, either in general or in response to infant distress. However, consistent with literature emphasizing the transactional nature of parent–child relationships, findings revealed that the likelihood of insensitive parenting behaviors among mothers with clinically relevant levels of BP pathology changed over time, increasing significantly as infant distress persisted for longer durations (a pattern not present for mothers without BP pathology). Moreover, maternal responses to infant distress were found to influence infant distress, with the likelihood of infant distress decreasing after maternal positive affect and increasing after maternal insensitive behaviors. The implications of findings for understanding the mechanisms of risk for children of mothers with BP pathology, as well as the transactional nature of mother-infant relationships in general, are discussed.

Keywords: infants, parenting, emotional responding, borderline personality

Borderline personality disorder (BPD) is a serious mental health problem associated with severe functional impairment, high rates of co-occurring psychiatric disorders, and elevated risk for a variety of self-destructive and health-compromising behaviors (Skodol et al., 2002). Symptoms of BPD span multiple domains of functioning, including emotional (intense anger and difficulties controlling anger, marked emotional reactivity, and emptiness), interpersonal (unstable relationships and fears of abandonment), behavioral (self-harm, suicidal, and other impulsive behaviors), and cognitive (transient dissociation, identity disturbance) domains. Further, providing support for its public health significance, BPD is associated with substantial economic, societal, and personal costs (van Asselt, Dirksen, Arntz, & Severens, 2007).

Despite an increase in BPD research over the past two decades, one key area that remains relatively unexplored is the impact of maternal BP pathology on mother-infant relationships. This is a particularly important area of inquiry, however, as research in this area has implications for understanding the intergenerational transmission of BP and related pathology (Nigg & Goldsmith, 1994; Weiss et al., 1996), as well as the transmission of risk from mothers with BP pathology to their children more broadly. Indeed, although most children of mothers with BP pathology will not themselves develop BPD (Macfie & Swan, 2009; Nigg & Goldsmith, 1994), there is increasing evidence to suggest that children of mothers with BPD are at heightened risk for BPD and Axis I psychopathology (Nigg & Goldsmith, 1994; Weiss et al., 1996), as well as a variety of other clinically relevant difficulties, including insecure attachment (Hobson, Patrick, Crandell, García-Pérez, & Lee, 2005) and self- and emotion-dysregulation (Macfie & Swan, 2009). Although there are likely a number of factors involved in the transmission of risk from mothers with BP pathology to their children (e.g., shared biological vulnerabilities, co-occurring maternal psychopathology, genetics), one factor that holds particular promise is maternal parenting behaviors and the emerging pattern of mother-infant interactions.

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Indeed, the prominent relationship instability in BPD (Gunderson, 2007) is just as likely to influence mother-infant relationships as it is to influence the adult social and romantic relationships that have been the primary focus of BPD researchers to date (Clifton, Pilkonis, & McCarty, 2007). Moreover, although past research examining mother-infant interactions among women with BPD has emphasized the relevance of BPD features related to insecure attachment and disrupted object relations to these interactions (Crandell, Patrick, & Hobson, 2003; Hobson et al., 2005), the significant emotion dysregulation in this disorder (Koenigsberg et al., 2009; Linehan, 1993) is also likely to influence the ways in which mothers interact with and respond to their infants.

Considered to be one of the most central and defining features of BPD, difficulties regulating emotional arousal are thought to underlie many of the symptoms and associated difficulties of this disorder (Koenigsberg et al., 2009; Linehan, 1993). These emotion regulation difficulties are thought to stem from a combination of an invalidating environment (including experiences of childhood abuse and neglect) and biologically based emotional vulnerability (resulting from a variety of factors that may impact the development of the brain and central nervous system, including genetic influences, aversive intrauterine events, or early childhood experiences; see Koenigsberg et al., 2009; Linehan, 1993). Although the role of these emotion regulation difficulties in the emotional and behavioral symptoms of BPD (e.g., inappropriate anger expressions, emotional reactivity, self-harm and impulsive behaviors) has received the most attention (Gratz, Breetz, & Tull, 2010; Koenigsberg et al., 2001; Linehan, 1993), evidence suggests that difficulties regulating emotions may influence interpersonal functioning as well (Kim, Pears, Capaldi, & Owen, 2009; Linehan, 1993), including mother-child interactions. For example, parental emotion dysregulation has been found to be associated with maladaptive parenting behaviors (Kim et al., 2009). Moreover, there is some evidence to suggest that maternal emotion dysregulation may influence mothers' responses to their children's emotional distress, interfering with their ability to respond adaptively to this distress. Specifically, a recent study found that mothers who reported greater difficulties engaging in adaptive coping skills evidenced increased negative emotional reactions to their infants' distress (Leerkes & Crockenberg, 2009). Likewise, research indicates that engagement in sensitive behaviors in response to infant distress requires adequate maternal emotion regulation (Hill-Soderlund et al., 2008). Thus, the emotion dysregulation characteristic of BPD may impede adaptive maternal responses to infant distress, interfering with the development of secure attachment and thereby contributing to later difficulties in self- and emotion-regulation (Macfie & Swan, 2009).

With regard to the extant literature on mother-infant interactions among women with BPD, research to date provides support for more insensitive and less sensitive parenting behaviors among mothers with BPD. Specifically, studies have found that mothers with BPD engage in more intrusively insensitive behaviors with both their 2 month old infants during 2 min of normal face-to-face play in the laboratory (Crandell et al., 2003) and their 12 month old infants during 2 min- of semistructured play in the laboratory (Hobson et al., 2005), and display less sensitive behaviors with their 3 to 36 month old infants during 10 min- of free-play in the laboratory (Newman, Stevenson, Bergman, & Boyce, 2007). Furthermore, preliminary evidence suggests that mothers with BPD may be more likely to display insensitive or problematic behaviors in response to their infants' distress in particular. Specifically, Hobson et al. (2009) found that mothers with BPD were more likely to display disrupted affective communication (including insensitive and intrusive behaviors) with their 12 to 18 month old infants during the Strange Situation Paradigm. Finally, providing some support that these same parenting behaviors may have a negative impact on infants, the aforementioned studies also found that infants of mothers with (vs. without) BPD display less positive (more depressed) affect following the still-face paradigm (Crandell et al., 2003), are less responsive to (and less willing to interact with) their mothers during free play (Newman et al., 2007), and show more negative affect and less organized behavior in response to an initially unresponsive stranger (Hobson et al., 2005).

These studies provide preliminary support for more insensitive and less sensitive behaviors in general (as a static characteristic) among mothers with BPD, as well as more emotional and behavioral dysfunction among their infants. However, no studies to date have examined the transactional nature of these mother-infant relationships or the ways in which maternal BP pathology influences mothers' ongoing interactions with, and moment-to-moment affective and behavioral responses to, their infants. Furthermore, no studies have examined if the tendency toward insensitive (vs. sensitive) parenting behaviors displayed by mothers with BPD is contingent upon particular infant expressions or part of a more general pattern of behavior that is not dependent on their infants' current state. Finally, the temporal dynamics of these maternal responses remain unclear, as the likelihood of these responses may change over the course of the interaction. For example, mothers with BP pathology may have increasing difficulty inhibiting insensitive behavior and/or displaying sensitive behavior as their infants' distress persists. More fine-grained analyses, including moment-by-moment assessment of the dynamic nature of contingencies between infant emotional states (e.g., distressed vs. nondistressed) and maternal affective and behavioral responses, are needed to more fully answer these questions.

The Current Study

To extend research on the dynamic nature of mother-infant interactions and examine the ways in which BP pathology influences parenting in the context of infant distress in particular, methods allowing for examination of the dynamic aspects of maternal responses to infant distress are required. To this end, we observed mothers with (high BP) and without (low BP) clinically relevant levels of BP pathology with their infants in the Strange Situation, a paradigm developed for the assessment of infant-caregiver at-

tachment quality (Ainsworth, Blehar, Waters, & Wall, 1978). This procedure was chosen because the last stage of the paradigm (reunion of mothers with their infants after a brief separation) typically elicits both a moderate amount of distress in infants and individual differences in maternal responses to that distress (Ainsworth et al., 1978). Furthermore, observations of behavior during the reunion episodes of the Strange Situation are theorized to reflect the history of the mother-child relationship, providing insight into patterns of dyadic interaction despite the brief period of observation (Ainsworth et al., 1978). For the purposes of this study, we were particularly interested in examining the specific affective and behavioral responses more likely to occur following infant distress, as well as the ways in which maternal responses to infant distress change as a function of the duration of infant distress.

We hypothesized that mothers in the high-BP (vs. low-BP) group would be less likely to respond to expressions of infant distress with positive affect or sensitive behavior, and more likely to respond with negative affect and insensitive behavior. Further, we expected the contingencies between infant distress and maternal responses to change for mothers with high-BP (vs. low-BP) pathology as the duration of infant distress increased. Specifically, as infant distress continued, we hypothesized that mothers in the high-BP group would be increasingly likely to respond with less positive affect and sensitive behaviors, and with more negative affect and insensitive behaviors. Finally, to explore further the transactional nature of mother-infant interactions, we examined the likelihood of infant distress following specific maternal affects and behaviors. We expected infant distress to be less likely following maternal positive affect and sensitive behaviors, and more likely following maternal negative affect and insensitive behaviors.

Method

Participants

Mother-infant dyads were recruited through advertisements posted in nursery schools, day care facilities, grocery stores, coffee shops, bookstores, hospitals, and churches in the greater Jackson, Mississippi, area, as well as on several Web sites. Mother-infant dyads were eligible for participation if the infant was 12–23 months of age and typically developing, and the mother was fluent in English; no other exclusion criteria were used. Data were collected from 99 infants and their mothers. Based on their responses to the measure of BPD symptoms included in this study, mothers were classified as high versus low BP, with those in the high-BP group endorsing clinically relevant levels of BP pathology and those in the low-BP group endorsing minimal BP pathology (see Measures for further details).

High-BP group. Consistent with past research examining levels of BP features among adults in nonclinical settings (Chapman, Leung, & Lynch, 2008; Gratz et al., 2010; Trull, 1995), 22% ($n = 22$) of mothers were classified as high BP. Mothers in this group were ethnically diverse (68% African American; 22% White) and ranged in age from 20 to 42 years ($M = 28.55 \pm 6.18$). Their infants (10 female) ranged in age from 12 to 23 months ($M = 17.23 \pm 3.77$). The mean annual income of this group was between $26,000 and $35,000, with 50% reporting less than $25,000 per year. With regard to the educational background of these mothers, 14% had completed high school or received a GED, 50% had attended some college or technical school, and 36% had graduated college. Forty-eight percent of these mothers were married to their infants' fathers.

Low-BP group. Low-BP mothers ($n = 77$; 78%) were ethnically diverse (48% African American; 49% White) and ranged in age from 18 to 39 years ($M = 28.33 \pm 4.91$). Their infants (45 female) ranged in age from 12 to 23 months ($M = 16.27 \pm 3.65$). The mean annual income of this group was between $36,000 and $50,000, with 31% reporting less than $25,000 per year. With regard to the educational background of these mothers, 7% had completed high school or received a GED, 31% had attended some college or technical school, and 49% had graduated college. Sixty-two percent of the mothers in this group reported being married to their infants' fathers.

Procedure

All procedures were approved by the institution's institutional review board. Study advertisements instructed mothers to call the laboratory for further details about the study. Upon calling, mothers were informed that the purpose of the study was to examine the mother-infant relationship and the factors that influence this relationship, including personality traits. Eligible participants who expressed an interest in participating met with a research assistant to obtain informed consent and schedule the laboratory visit. After providing written informed consent, mothers were provided with a questionnaire packet (see Measures) and informed that they could complete the questionnaires before the laboratory session or at the end of the laboratory session.

During the laboratory session, mothers and infants participated in the Strange Situation, a standardized protocol involving episodes characterized by interactions with an unfamiliar, but friendly, female stranger, and brief separations and reunions between the infant and mother (Ainsworth et al., 1978). The experimenter provided the mother with instructions and cues throughout the procedure. At the beginning of the procedure, the experimenter brought the mother and infant to an experimental room with two chairs and a variety of toys on a rug. Mothers were instructed to facilitate their infants' involvement with the toys and then allow them to play independently. When mothers returned to the room after a brief separation, the experimenter instructed them to "respond naturally" to their infants' cues, "in whatever way they would typically respond following a brief separation." Separation episodes were ended early if infants displayed strong and unremitting distress or if the mother asked to return to the room early. The current study focuses on the second of the two reunion episodes, which follows the separation that typically elicits moderate infant distress (and the most distress of any of the episodes;

Ainsworth et al., 1978). At the end of the laboratory session, mothers were compensated $30 and infants received a small gift. Visits were videotaped for later scoring.

Measures

Maternal borderline personality pathology. Mothers completed the Borderline Evaluation of Severity over Time (BEST; Pfohl et al., 2009), a 15-item, self-report measure of BPD symptom severity, or the degree of impairment from each of the 9 BPD criteria over the past month. Research indicates that the BEST has adequate test–retest reliability as well as good convergent and discriminant validity (Pfohl et al., 2009). For the purposes of this study, and consistent with past research using this measure with nonclinical adult samples (Gratz et al., 2010), a score of >30 was used as the cutoff to indicate the presence of clinically relevant levels of BP pathology, with individuals above this cutoff classified as high BP and those below the cutoff classified as low BP. In support of the validity of this cutoff, a score of >30 on the BEST falls within a one half *SD* of the mean BPD symptom severity of BPD outpatient samples (37.50 ± 12.02), and more than 1 *SD* above the mean for outpatients without a personality disorder (21.46 ± 7.83; Gratz & Gunderson, 2006). Further, research using this cutoff within other community adult samples has provided support for its construct validity, finding higher rates of deliberate self-harm (one of the most common behaviors among individuals with BPD; Linehan, 1993) among individuals classified as high versus low BP on this measure (Gratz et al., 2010, in press). Internal consistency in this sample was good (α = .86).

Maternal emotion regulation difficulties. Mothers also completed the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), a 36-item self-report measure that assesses individuals' typical levels of emotion dysregulation across various domains (e.g., nonacceptance of negative emotions, difficulties controlling behaviors when distressed, lack of access to effective regulation strategies, and lack of emotional awareness and clarity). The DERS has been found to have good test–retest reliability and construct and predictive validity (Gratz & Roemer, 2004). Internal consistency in this sample was excellent (α = .92).

Maternal depression and anxiety symptoms. Mothers' general mood symptoms were assessed using the Depression, Anxiety, Stress Scales (DASS; Lovibond & Lovibond, 1995), a 21-item self-report measure that provides separate scores of depression, anxiety, and stress. The DASS has been found to have good test–retest reliability as well as adequate construct and discriminant validity (Lovibond & Lovibond, 1995). The depression and anxiety subscales were included here to control for the influence of general psychopathology on maternal responses to infant distress. Internal consistency in this sample was good (αs ≥ .82).

Infant affect and maternal affect and behavior. Trained research assistants coded infant and maternal affective and behavioral expressions continuously (on a second-by-second basis) for the first 180 s of the second reunion of the Strange Situation (the standard amount of time for this episode). Infant affect, maternal affect, and maternal behavior were each scored according to groups of mutually exclusive codes. *Infant affect* was scored as either distressed (crying, whimpering, vocalizations with negative valence) or nondistressed (i.e., positive [smiling, laughing, vocalizations with positive valence] or neutral). *Maternal affect* was scored as either positive (smiling, laughing, positive vocalizations), negative (angry facial expression, harsh tone of voice, negative vocalizations), or neutral. *Maternal behavior* was scored as one of four codes derived from previous studies examining mother-infant interactions (Crockenberg & Leerkes, 2004; Grolnick, Kurowski, McMenamy, Rivkin, & Bridges, 1998), as well as review of the recorded sessions and a principal components analysis (PCA) of the observed behaviors: comforting (both physical and verbal), distraction/engagement with toys, insensitive behavior (either ignoring or rough physical handling of the child), and neutral behavior (no interaction, neutral conversation, or monitoring only). See Table 1 for a description of these codes. Although codes were developed to be mutually exclusive (such that insensitive behavior requires an absence

Table 1
Descriptions of Maternal Behaviors

Maternal Behavior	Description
Comforting	Mother hugs infant, has arm around or holds infant, rubs infant's back or engages in similarly soothing behavior, verbally reassures infant (e.g., "It's okay, I'm here"), etc. Scored when done alone or while distracting/engaging the infant with toys.
Distraction/engagement	Mother directs infant's attention to the toys, demonstrates how to play with the toys, or plays with a toy while the infant is also engaged with that toy.
Insensitive behavior	Ignoring: Mother looks away or otherwise does not engage with the infant when she/he is crying or trying to get her attention. Rough physical handling: Mother abruptly pulls or picks up the infant in an inept/awkward manner without apparent concern for the infant's comfort.
Neutral	Mother does not engage with infant (e.g., reads a magazine, looks around room) while infant is engaged with the toys and playing independently. Neutral conversing: Mother greets infant or speaks to the infant about a subject unrelated to the infant's affect, the toys, or the current situation. Monitoring: Mother watches the infant.

of comforting or distraction, and neutral behavior requires an absence of any of the other specified behaviors), coding revealed that comforting and distraction behaviors occurred simultaneously at times. Thus, to maintain mutual exclusivity of these codes as well (and consistent with the results of the PCA), comforting was scored if both comforting and distraction occurred simultaneously.

Different coders scored infants and mothers to prevent coding bias. Coders were required to achieve minimum training reliability ($\kappa = .80$) with a master coder (EJK). Interrater reliability with the master coder was assessed on 20% of cases throughout coding to prevent coder drift. Cohen's kappas were adequate for infant distress (.86) and maternal affect (.84) and behavior (.87) overall, and across each specific maternal state (positive affect = .84, negative affect = .94, comforting = .84, distraction = .92, insensitive behavior = .76).

For descriptive purposes, we computed the following summary variables for infant distress and maternal affect and behavior: (a) latency (number of seconds from the beginning of the episode to first occurrence), (b) duration (total number of seconds across episodes in which the behavior was displayed), and (c) frequency (number of discrete displays of each behavior). Descriptive statistics for these variables across both BP groups are presented in Table 2.

Results

Preliminary Analyses

Providing support for the classification of BP pathology used here, the mean BPD symptom severity of mothers in the high-BP group (39.6) was consistent with the mean of BPD outpatient samples (37.5), and the mean BPD symptom severity of mothers in the low-BP group (20.1) was consistent with the mean of outpatients without a personality disorder (21.5; Gratz & Gunderson, 2006). Moreover, the high-BP group reported significantly higher levels of emotion dysregulation than the low-BP group, $t[24.5] =$

Table 2
Descriptive Statistics of Primary Study Variables

Variable	Low-BP Group		High-BP Group		
	Mean (*SD*)	Range	Mean (*SD*)	Range	Group *t* test
BEST total score	20.06 (5.29)	12–30	39.59 (8.35)	31–56	−10.39***
DASS depression	4.13 (6.29)	0–34	8.54 (9.16)	0–28	−2.12*
DASS anxiety	4.86 (7.19)	0–34	8.54 (9.90)	0–38	−1.94
DERS total score	61.97 (13.57)	38–101	77.55 (25.47)	39–137	−2.76*
Infant Distress					
Latency	77.95 (81.68)	1–181	68.41 (78.80)	1–181	0.49
Duration	30.01 (40.32)	0–158	30.09 (34.80)	0–124	−0.01
Frequency	2.84 (3.10)	0–12	3.41 (3.05)	0–9	−0.76
Maternal Affect					
Positive affect latency	4.79 (21.62)	1–181	2.23 (4.12)	1–18	0.55
Positive affect duration	55.40 (52.03)	0–180	26.59 (24.45)	5–120	3.65***
Positive affect frequency	2.47 (2.02)	0–12	2.32 (1.43)	1–6	0.32
Negative affect latency	161.35 (48.91)	1–181	150.18 (61.58)	3–181	0.89
Negative affect duration	1.48 (5.32)	0–32	3.73 (10.05)	0–42	−1.01
Negative affect frequency	0.32 (0.99)	0–7	0.72 (1.45)	0–5	−1.26
Maternal Behavior					
Comfort latency	68.03 (82.38)	1–181	65.82 (81.34)	1–181	0.11
Comfort duration	43.39 (58.63)	0–180	30.50 (42.59)	0–170	1.14
Comfort frequency	1.17 (1.21)	0–5	1.41 (1.44)	0–5	−0.79
Distraction latency	74.19 (70.62)	1–181	83.95 (64.61)	9–181	−0.58
Distraction duration	32.64 (34.36)	0–154	26.55 (25.81)	0–83	0.77
Distraction frequency	2.25 (1.96)	0–8	2.27 (2.00)	0–7	−0.06
Insensitive latency	151.56 (52.45)	5–181	145.86 (63.36)	6–181	0.43
Insensitive duration	4.86 (10.66)	0–55	16.32 (35.90)	0–145	−1.48
Insensitive frequency	0.60 (1.05)	0–4	1.23 (2.35)	0–7	−1.22
Conditional Probabilities					
Positive affect|Distress	0.50 (0.40)	0.00–1.00	0.26 (0.30)	0.00–1.00	2.65**
Negative affect|Distress	0.03 (0.13)	0.00–0.74	0.02 (0.04)	0.00–0.15	0.52
Comforting|Distress	0.50 (0.41)	0.00–1.00	0.31 (0.30)	0.00–0.90	2.00
Distraction|Distress	0.19 (0.27)	0.00–1.00	0.19 (0.27)	0.00–1.00	−0.06
Insensitive|Distress	0.10 (0.20)	0.00–0.72	0.18 (0.26)	0.00–0.76	−1.04

Note. Latencies and durations were measured in seconds; frequencies were counts. Latencies were scored as the maximum length of the episode plus 1 s when the behavior did not occur. Observations were based on 77 mothers in the low-BP group and 22 in the high-BP group for latency, duration, and frequency and on 51 mothers in the low-BP group and 16 in the high-BP group for the conditional probabilities. Positive values of the BP group *t* test indicate low-BP group > high BP group, and negative values indicate high-BP group > low-BP group.
* $p < .05$. ** $p < .025$. *** $p < .001$.

2.76, $p < .05$, consistent with both theory and research on the centrality of emotion dysregulation to BP pathology (Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006; Linehan, 1993). Further, although the high-BP group also reported higher levels of depression symptoms than the low-BP group, $t[26.91] = 2.12$, $p < .05$, the mean depression symptom severity of both groups was in the normal range on the DASS, suggesting that neither group endorsed meaningful depression symptoms. No significant group differences were found for anxiety symptoms, $t(97) = 1.94$, $p > .05$. Finally, providing further support for the construct validity of our BP classification, results of a logistic regression analysis predicting BP status as a function of emotion dysregulation, depression, and anxiety revealed that only emotion dysregulation reliably improved the prediction of BP status ($b = .04$, Wald's $\chi^2 = 6.64$, $p < .01$); neither depression nor anxiety symptoms reliably predicted BP status ($ps > .50$). These findings suggest that the high-BP and low-BP groups are better distinguished by the core BPD feature of emotion dysregulation than by psychopathology in general.

Next, a series of *t* tests and chi-square analyses were conducted on demographic characteristics to determine equivalence across groups (high-BP vs. low-BP). No significant differences were found for infant age or gender, maternal age, maternal education, marital status, or income ($ps > .05$), and all effect sizes were small ($\eta_p^2 s < .04$, contingency coefficients $< .27$). Moreover, although non-European American participants were overrepresented in the high-BP group ($\chi^2 = 4.94$, $p < .05$), the effect size was small (contingency coefficient = 0.22), this difference was fully accounted for by income (when controlling for income, $\beta = -.14$, $p > .20$), and race/ethnicity was not significantly associated with any outcome variable. Given this, as well as the fact that BP pathology is a predictor variable (vs. outcome variable) in subsequent analyses, race/ethnicity was not included as a covariate (Miller & Chapman, 2001).

Finally, we examined the primary study variables for relations to demographic variables in a multiple analysis of variance (MANOVA) framework to assess for potential covariates. Few significant associations were found, with the exceptions that infant age was significantly associated with longer latencies to infants' distress, $F(11, 46) = 2.50$, $p < .05$, and longer latencies to mothers' comforting responses, $F(11, 46) = 2.98$, $p < .01$, and maternal age was significantly associated with longer latencies to mothers' expressions of positive affect, $F(19, 46) = 2.59$, $p < .01$. Results for the primary analyses remained the same (in direction and in level of significance) regardless of whether or not these variables were included as covariates; thus, results without these covariates are reported.

BP Group Differences

Differences between the high-BP and low-BP groups on the primary variables of interest were examined using *t* tests (see Table 2). Results revealed no significant group differences in the temporal qualities of infant distress, suggesting that any differences found between mothers in the high-BP and low-BP groups are not due to differences in the distress levels of their infants. With regard to maternal affective and behavioral responses, mothers in the high-BP and low-BP groups differed significantly on only duration of positive affect, with mothers in the high-BP group displaying significantly shorter durations than those in the low-BP group.

Contingencies Between Infant Distress and Maternal Responses

Primary analyses examined BP group differences in the contingencies between infant distress and specific maternal affective and behavioral responses. Specifically, and consistent with both recommendations (Bakeman & Gottman, 1997) and extant literature (Crockenberg & Leerkes, 2004), we used sequential analyses to determine the contingency between infant distress and maternal responses. Because infant and maternal states were coded continuously throughout the observation period, each second of the infant's state could be matched to a corresponding maternal affect or behavior. To be consistent with both the conceptualization of maternal affect and behavior as *responses* to the infant's state and recommendations for sequential analyses (Bakeman & Gottman, 1997), we lagged maternal affect and behavior so that each second of the infant state was matched with the maternal affective or behavioral state that occurred 2 s later. This provides time for mothers to respond to infant distress without allowing so much time as to introduce uncertainty about their responses' relations to infant distress.

We assessed contingency in three steps. First, for each group (high- and low-BP), we computed two contingency tables across all mothers in the group, including a cross-tabulation of infant state (distress vs. nondistress) and maternal affect (positive, negative, or neutral), and a cross-tabulation of infant state and maternal behavior (comforting, distraction, insensitive, neutral). Each table provided both observed frequencies and expected frequencies based on chance. A significant chi-square value for the table indicates that maternal responses to infant distress occurred at significantly different rates than expected by chance. Second, when the chi-square was significant, we examined the standardized residuals within each cell to determine the direction in which maternal responses deviated from chance levels. As Z-scores, these standardized residuals indicate a significant difference between observed and expected frequencies when values are outside of $\pm$ 1.96. This provides group-level patterns in contingent responses to distress. Third, we computed similar contingency tables for each dyad and looked at the number of dyads that showed a similar pattern (significant chi-square for the table and significant standardized residual for a particular cell). We used sign tests to determine the statistical significance of the number of dyads showing a consistent pattern within each group. It is important to note that some infants in each group (i.e., six in the high-BP group and 26 in the low-BP group) did not display any distress throughout the observation

period; thus, not all dyads contributed information about distress.

Results for these contingency tables are presented in Table 3. Significant chi-square values for all four contingency tables indicated that maternal affective and behavioral responses occurred after infant distress at significantly different rates than expected by chance. With regard to the specific contingent responses to infant distress within each group, positive affect, comforting, and insensitive behavior met all three criteria for contingent responses to infant distress among mothers in the low-BP group. However, only positive affect emerged as a contingent response to infant distress for mothers in the high-BP group. Thus, although both groups responded to their infants' distress with positive affect, only the low-BP group responded with contingent comforting and insensitive behaviors. Because the insensitive behavior of ignoring infant distress required that the infant be in a distressed state, however, the contingency between infant distress and overall insensitive behavior may have been artificially inflated; thus, this finding should be interpreted with caution.

Although these results point to potential group differences in contingent responses to infant distress, they do not provide information on the magnitude or significance of these group differences. Rather, testing group differences in the strength of the relation between infant distress and contingent maternal responses requires calculating the probability of a mother's specific response given that the infant had been distressed (i.e., conditional probabilities).

BP Group Differences in Probability of Responses

Conditional probabilities were calculated by dividing the frequency of the maternal affect or behavior of interest (still lagged 2 s) co-occurring with infant distress by the total number of seconds of infant distress (Bakeman & Gottman, 1997). The resulting number indicated the conditional probability (*P*), or likelihood of that maternal state or behavior occurring, given that the infant was distressed 2 s prior. As probabilities, these values range from 0 to 1, with higher values indicating higher likelihoods of occurring after infant distress. Of course, given the variability in the duration of distress expressed by infants, it is important to note that some individual contingencies were estimated using relatively few observation points.

We examined mean differences in these conditional probabilities between mothers in the high-BP and low-BP groups using *t* tests. These analyses were limited to dyads in which infants displayed distress (16 in the high-BP group and 51 in the low-BP group). To control for Type I error, a Bonferroni correction was used within each set of analyses (maternal affect, $p = .05/2$; maternal behavior, $p = .05/3$). To examine whether group differences in probabilities existed above and beyond other forms of psychopathology, we conducted analyses with maternal depression and anxiety as covariates.

Results of analyses examining the contingency between infant distress and maternal positive affect revealed a significant between-groups difference, $t[33.15] = 2.65$, $p < .025$, with mothers in the high-BP group less likely ($p = .26$) to display positive affect than mothers in the low-BP

Table 3
Summary of Contingency Table Results

Infant distress	Maternal affect			Maternal behavior			
	Positive	Negative	Neutral	Comforting	Distraction	Insensitive	Neutral
Low-BP group							
Infant nondistress							
Observed (Expected)	3035 (3437)	53 (93)	8334 (7892)	2126 (2745)	2113 (2090)	170 (312)	7013 (6275)
Standardized residual	-6.85^{****}	-4.18^{****}	4.98^{****}	-11.82^{****}	0.50	-8.02^{****}	9.31^{****}
Infant distress							
Observed (Expected)	**1089 (687)**	59 (19)	1136 (1578)	**1168 (549)**	395 (418)	**204 (62)**	517 (1255)
Standardized residual	**15.33******	9.34^{****}	-11.13^{****}	**26.42******	−1.12	**17.95******	−20.83
Sign test	**21,6*****	2,0		**21,5*****		**12,1*****	
High-BP group							
Infant nondistress							
Observed (Expected)	406 (453)	64 (68)	2788 (2736)	462 (553)	513 (486)	133 (299)	2151 (1921)
Standardized residual	-2.23^{**}	−0.51	0.99	-3.88^{****}	1.23	-9.59^{****}	5.24^{****}
Infant distress							
Observed (Expected)	**139 (92)**	18 (14)	501 (553)	203 (112)	71 (98)	226 (60)	158 (388)
Standardized residual	**4.96******	1.14	-2.20^{**}	8.64^{****}	-2.74^{***}	21.34^{****}	−11.67
Sign test	**8,0*****			6,1	3,2	5,0*	

Note. Chi-square values for these four contingency tables were significant: maternal affect (low-BP: $\chi^2(2) = 535.07$, $p < .001$; high-BP: $\chi^2[2] = 36.88$, $p < .001$) and maternal behavior (low-BP: $\chi^2[3] = 1746.37$, $p < .001$; high-BP: $\chi^2[3] = 809.57$, $p < .001$). As Z-scores, significance of standardized residuals was determined by comparing values to standard cutoffs: 1.96 ($p < .05$), 2.58 ($p < .01$), 3.29 ($p < .001$). When this was significant in the infant distress row for a non-neutral response, sign tests compared the number of dyads showing a significant standardized residual in the same direction (number before comma) to the number of dyads showing a significant standardized residual in the opposite direction (number after comma). Cells significant for both the group-level standardized residual and the dyad-level sign test are bolded.

$^{*}p < .10$. $^{**}p < .05$. $^{***}p < .01$. $^{****}p < .001$.

group ($p = .50$) in response to infant distress. The between-groups difference in the contingency between infant distress and maternal negative affect was not significant, $t(65) = 0.52$, *ns*. Likewise, results revealed no significant differences between the groups in the likelihood of displaying distraction, $t(65) = -0.06$, *ns*, insensitive behaviors, $t[20.50] = -1.05$, *ns*, or comforting behaviors, $t[33.99] = 2.00$, *ns*, in response to infant distress. Of note, findings did not change when controlling for depression and/or anxiety, as the BP group difference in the probability of positive affect in response to infant distress remained significant ($p < .025$).

Thus, a clear difference emerged in the contingency between infant distress and maternal positive affect, such that positive affect was significantly more likely to be a contingent response to infant distress among mothers in the low-BP (vs. high-BP) group. Also clear was the equally noncontingent display of distraction by both groups. Finally, although both comforting and insensitive behaviors appeared to be contingent responses to infant distress only for mothers in the low-BP group, the nonsignificant difference between the two BP groups in the probabilities of these behaviors suggests that it was only a small number of contingent displays of these behaviors within the low-BP group that determined the former differences. Thus, the contingency analyses for these particular behaviors may have been affected by the unequal size of the groups.

Although these contingency analyses have the benefit of using all possible data observed from both infants and mothers, we sought to complement these results by examining maternal responses to each instance, rather than each second, of infant distress. We therefore performed one additional set of analyses to further explore BP group differences.

BP Group Differences in Latency to Respond to Infant Distress

As a final measure of BP group differences in maternal responses to infant distress, we examined the latency from the onset of each instance of infant distress (i.e., the first second of distress rather than each second, as in the contingency analyses) to the onset of the respective maternal response. Mothers who never engaged in a particular response following infant distress received a latency score of 181 s (the length of the episode plus 1 s), consistent with our previous coding of latencies. For each maternal response, these latencies were predicted by BP group status using multilevel modeling to account for the nesting of events of distress and responses within mother-infant dyads. Intraclass correlation coefficients for each of the dependent variables (latencies to positive affect, negative affect, comforting, distraction, and insensitive behavior) ranged from .51 to .77, indicating that between 51% and 77% of the variance in these responses were between dyads (thus warranting a multilevel approach). To control for the fact that instances of infant distress occurring late in the episode have less of an opportunity to receive a response before the end of the episode, latency to the particular event of distress was included as a covariate in all analyses. Likelihood change tests indicated that latency to distress event should have both random and fixed components in all analyses (all χ^2s $[1] > 30.00$, ps $< .01$). Additional covariates of maternal depression and anxiety were also included. Thus, each model included latency to the particular response as a dependent variable, and latency to the instance of distress, maternal depression, maternal anxiety, and BP group status as predictors.

BP group status emerged as a significant predictor only in the model examining latency to positive affect ($\gamma = 39.92$, $t[60.28] = 2.41$, $p < .025$), with mothers in the high-BP (vs. low-BP) group displaying positive affect significantly later following infant distress. The BP group difference for latency to comforting behavior was in the expected direction but did not reach significance ($\gamma = 30.39$, $t[59.97] = 1.60$, $p = .12$). BP status did not predict latencies to negative affect, distraction, or insensitive behavior (ts < 1.00, ps $> .40$). Thus, analyses considering each event of infant distress corroborated the results of the contingency analyses considering each second of infant distress, providing further evidence of a stronger association between infant distress and maternal positive affect among mothers in the low-BP (vs. high-BP) group.

Changes in Probability of Responses Across Duration of Infant Distress

As a final test of between-groups (high-BP vs. low-BP) differences in the dynamic nature of maternal responses to infant distress, we examined whether the likelihood of specific maternal affective and behavioral responses to infant distress changed as the duration of infant distress increased. To this end, a series of hierarchical multiple regression analyses was conducted, with each of the five outcomes of conditional probabilities of maternal response given infant distress (across the two maternal affects and three maternal behaviors) serving as the dependent variables, the main effects of BP group (dummy coded) and duration of infant distress entered in the first step of the model, and the interaction of BP group and duration of infant distress entered in the second step of the model. Bonferroni corrections were again used. Only the model examining maternal insensitive behavior was significant, $R^2 = .24$, $F(3, 63) = 6.65$, $p < .001$, revealing a significant interaction between BP group and duration of infant distress, $\Delta R^2 = .20$, $p < .001$; $t(65) = 4.08$, $p < .001$. To probe the nature of this interaction, we examined the simple effect of duration of infant distress for each BP group by recoding the dummy-coded variable of BP group and interpreting the simple effect for the respective reference group. Results revealed a significant association between duration of infant distress and the likelihood of insensitive behavior for the high-BP group, $\beta = 1.13$, $t = 4.22$, $p < .001$, but not the low-BP group, $\beta = -0.07$, $t = -0.57$, *ns*. Both the interaction term and the simple effect of duration of infant distress within the high-BP group remained significant (all ps $< .01$) when controlling for depression, anxiety, and both depression and anxiety. As such, although the probability of displaying

insensitive behavior was relatively low for both groups, findings indicate that mothers in the high-BP group (but not the low-BP group) were increasingly likely to respond with insensitive behavior to their infant's distress as this distress increased in duration (see Figure 1).

Transactional Relations

Finally, to examine how infant distress changes following specific maternal responses, we derived new contingency tables and computed conditional probabilities for the likelihood of infant distress given each specific maternal affect or behavior, limiting these analyses to dyads in which infants displayed distress. For each maternal affect (positive and negative) and behavior (comforting, distraction, insensitive), we derived three conditional probabilities assessing the likelihood of infant distress 2 s prior to, 2 s after, and 5 s after that particular maternal response (with the 5 s lag included due to the possibility that infant distress may take more time to change following a given maternal response). Using repeated-measures analysis of variance (ANOVA), we examined linear and quadratic changes in the likelihood of infant distress across these periods.

Results revealed a significant linear trend for infant distress to become less likely following maternal positive affect, $F(1, 65) = 5.02$, $p < .05$, consistent with evidence that infants are soothed by mothers' positive affective expressions. Further, there was a significant quadratic trend for maternal negative affect, $F(1, 13) = 5.06$, $p < .05$, suggesting that the likelihood of infant distress increased immediately after mothers expressed negative affect but then decreased in likelihood shortly thereafter. Finally, although neither the linear nor the quadratic effects reached significance for maternal comforting or distraction, results revealed a significant quadratic trend for maternal insensitive behavior, $F(1, 27) = 5.49$, $p < .05$, with the likelihood of infant distress increasing immediately following insensitive behavior and then decreasing later.

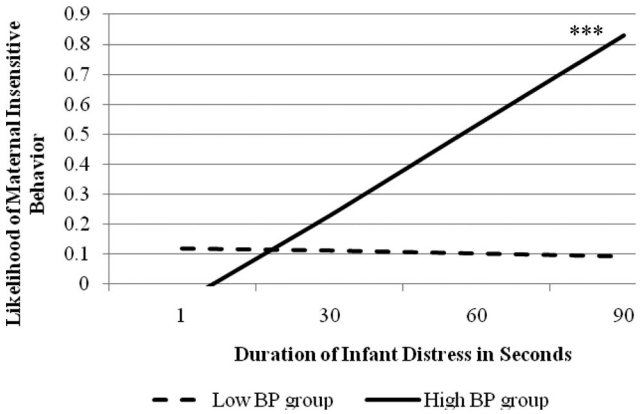

Figure 1. BP group and duration of toddlers' distress interact to predict the likelihood of maternal insensitive behavior in response to infant distress. Duration of infant distress was positively related to the likelihood of maternal insensitive behaviors only in the high-BP group. *** $p < .001$.

Discussion

Despite growing awareness of the importance of mother-infant interactions to children's adjustment and self- and emotion-regulation (Fonagy, 2001; Macfie, 2009), few studies have examined the influence of BP pathology on mother-infant interactions, and none have examined these mother's moment-to-moment affective and behavioral responses to infant distress. The current study sought to extend extant research in this area by examining the dynamic nature of maternal affective and behavioral responses to infant distress (vs. nondistress) expressions as a function of BP pathology. In so doing, we sought to elucidate the precise nature and extent of insensitive parenting in BP pathology, as well as its impact on infant emotional states.

The first primary finding is the relative lack of significant between-groups differences in responses to infant distress. Despite past findings of more insensitive parenting behaviors and disrupted affective communication among mothers with BPD, results of this study revealed that mothers with clinically relevant levels of BP pathology were not more likely than those without BP pathology to respond to infant distress in general with insensitive behaviors or negative affect. Moreover, they were just as likely to respond with the sensitive behavior of comforting. These findings highlight the importance of examining parenting behaviors as a dynamic process (vs. static characteristic), and suggest that, in many ways, mothers with BP pathology may not differ from their non-BP counterparts in their initial responses to their infants' distress.

One difference that did emerge was for contingent positive affect, however. Specifically, findings suggest that mothers in the high-BP group were less likely to respond with positive affect to their infants' distress than those in the low-BP group. Given past evidence that positive maternal affective expressions may be soothing to infants and help regulate their distress (Gunnar & Stone, 1984), as well as the findings from this study that infant distress decreased following mothers' expressions of positive affect, the lower likelihood of positive affect in response to infant distress among mothers in the high-BP group may represent a parenting deficit for mothers with BP pathology and one way in which the risk for later emotion regulation difficulties is transmitted over time. Notably, although lower levels of positive affective expressions in general (although not necessarily in response to infant distress) have been observed among mothers with others forms of psychopathology as well, including depression and anxiety (Field, 1984; Kaitz & Maytal, 2005), the differences observed here remained even when controlling for depression and anxiety. Thus, findings provide some support for the specificity of this maternal response to BP pathology.

The second notable finding involved the observed changes in the likelihood of insensitive parenting behaviors over time among mothers in the high-BP group. Specifically, although mothers with BP pathology were not significantly more likely to display insensitive behavior in general, or in response to initial expressions of infant distress, they were more likely to display insensitive behaviors as

infant distress persisted—a pattern that remained even when controlling for maternal depression and anxiety symptoms. Given evidence that insensitive parenting behaviors exacerbate infant distress (Nachmias, Gunnar, Mangelsdorf, Parritz, & Buss, 1996), and may interfere with the development of adaptive emotion regulation (Smith, Calkins, & Keane, 2006), findings of an increasing likelihood of insensitive responses to infant distress among women with BP pathology have important implications for their infants' development of emotion regulation. Indeed, findings from this study highlight an important transactional pattern that may exacerbate risk for infants of mothers with BP pathology; notably, the reciprocal influences between infant distress and maternal insensitive behavior over time. Although mothers with BP pathology did not immediately respond with insensitive behaviors to expressions of infant distress, they became increasingly likely to do so as infants' distress persisted. Furthermore, these insensitive behaviors were found to predict an immediate increase in the likelihood of infant distress. Thus, findings suggest a transactional pattern whereby the relative absence of initial positive affect on the part of mothers with BP pathology may result in longer durations of distress in their infants, which, in turn, increases their risk for insensitive behaviors, which lead to an increase in infant distress, which then further increases the likelihood of insensitive behaviors, and so on. These cyclical interactions likely increase negative affect in both infants and mothers, increasing the likelihood of negative interactions not only with one another but also with other people in their environments.

Although the results of this study add to the literature on at-risk parenting in mothers with BP pathology, several limitations warrant consideration. First, despite examining the dynamic nature of one particular mother-infant interaction, this interaction was relatively brief and our study was cross-sectional in nature; thus, it is unclear if findings from this study apply to the ongoing interactions of mothers and infants over longer periods of time. Moreover, given that some infants displayed little or no distress, some of the analyses used a reduced sample size, further limiting the generalizability of our results. In addition, given the variability in duration of infant distress, some individual contingencies were estimated using relatively few observation points. Contingencies based on a small number of seconds of distress may not have been as reliable as those based on longer durations. The contingency analyses are also limited in determining causality. Although lagging maternal responses behind infant distress, and examining the latency from onset of infant distress to a particular maternal response, provide stronger support for the interpretation that maternal responses may have followed infant distress, it is possible that ongoing maternal responses occurred before, during, and after infant distress. Thus, we caution against concluding causality between infant distress and maternal responses. Future research should address these limitations by using multiple, extended observations.

Further, the extent to which these transactional patterns represent risk factors for later emotion-related difficulties in these infants remains unknown. Longitudinal studies are needed to examine the longer-term outcomes of the dynamic interactions observed here for both mothers and their infants. Moreover, given that this study focused exclusively on mother-infant interactions in a laboratory setting, the extent to which the same patterns would be observed outside of the laboratory remains unclear. In particular, laboratory studies may not provide access to the full range of maternal responses to infant distress. Thus, future research is needed to examine the transactional patterns of maternal affective and behavioral responses to infant distress in other contexts with greater external validity, such as the home or naturally occurring stressful situations (e.g., being left at day care, going to the doctor).

Likewise, despite examining a range of maternal behaviors, and both positive and negative affect, the current study did not assess all possible maternal responses to infant distress. In particular, behaviors related to mothers' insecure attachment (including frightened/frightening and confusing behaviors) were not assessed. Given that these behaviors have previously been found to be heightened among women with BPD and associated with disorganized attachment in infants (Hobson et al., 2005; Levy, 2005), these particular maternal responses may also differ as a function of maternal BP pathology and have important implications for infant development and adjustment. Future research should expand the assessment of maternal behaviors examined here to include these key attachment-related behaviors as well. Finally, there are limitations associated with our assessment of infant distress. In particular, despite distinguishing between infant distress and nondistress expressions, and assessing certain dimensions of infants' distress reactions (e.g., frequency and duration), we did not assess the intensity of infant distress or the change in intensity of distress over time (or in response to specific maternal behaviors). However, as with the duration of distress, the intensity dimension of infant distress may very well have implications for the maternal responses it elicits, and may be particularly relevant to understanding (and differentiating) the parenting behaviors of mothers with BP pathology. Thus, future research is needed to examine the extent to which the intensity of infant distress differentially predicts, and is affected by, specific maternal parenting responses among women with and without BP pathology.

It is also important to note that this study examined clinically relevant levels of BP pathology rather than BPD per se. Given that we did not assess for the presence of BPD diagnoses among the mothers in our sample, it is unclear if our high-BP group represents individuals meeting diagnostic criteria for BPD. Although findings indicate higher levels of emotion dysregulation among our high-BP (vs. low-BP) group, as well as levels of BPD symptoms comparable to outpatients with a BPD diagnosis, the extent to which our findings are applicable to mothers with a diagnosis of BPD warrants further investigation. Research is also needed to examine the extent to which these findings generalize to mothers seeking treatment for emotion-related difficulties. Finally, future research should examine the specificity of our findings to mothers with BP pathology (vs. others forms of psychopathology). Indeed, although the aforementioned

BP group differences remained when controlling for depression and anxiety symptoms, levels of these symptoms were relatively low among both groups of mothers, precluding any systematic comparison of mothers with BP and other forms of pathology. Future research comparing mothers with BP pathology to those with depression and/or other forms of personality pathology would help elucidate the specificity of these findings to BP pathology.

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