EMOTION: EMPIRICAL CONTRIBUTION

MATERNAL BORDERLINE PERSONALITY PATHOLOGY AND INFANT EMOTION REGULATION: EXAMINING THE INFLUENCE OF MATERNAL EMOTION-RELATED DIFFICULTIES AND INFANT ATTACHMENT

Kim L. Gratz, PhD, Elizabeth J. Kiel, PhD, Robert D. Latzman, PhD, T. David Elkin, PhD, Sarah Anne Moore, BA, and Matthew T. Tull, PhD

Evidence suggests that maternal borderline personality (BP) pathology increases offspring risk. This study examined the relations between maternal BP pathology and related emotional dysfunction (including emotion regulation [ER] difficulties and emotional intensity/reactivity) and infant ER difficulties. Specifically, we examined both self-focused and caregiver-focused ER behaviors and the modulation of emotional expressions (one indicator of ER in young children) in response to fear- and anger-eliciting stimuli among 101 infants (12 to 23 months old) of mothers with and without clinically relevant BP pathology. The authors also examined the moderating role of mother-infant attachment. Findings of a series of multiple regression mediation analyses revealed an indirect effect of maternal BP pathology on infant ER difficulties through maternal emotional dysfunction, with maternal ER difficulties facilitating an indirect effect of maternal BP pathology on expressivity-related indicators of infant ER difficulties and maternal emotional intensity/reactivity linking maternal BP pathology to lower self-focused ER for infants in insecure-resistant attachment relationships.

From University of Mississippi Medical Center (K. L. G., T. D. E., S. A. M., M. T. T.); Miami University (E. J. K.); and Georgia State University (R. D. L.).

The authors wish to thank Melissa Soenke, Mike McDermott, Rachel Brooks, Tiffany Owens, Amanda Hudson, and Ashley Martin for their assistance with data collection; Shenell Evans, Ashley Martin, and Rachel Brooks for their assistance with coding; Dr. William Sorey for his assistance with participant recruitment; and Dr. Gail Megason for the use of space within the University of Mississippi Medical Center’s Children’s Cancer Clinic to conduct the study. We also wish to thank the mothers and infants who participated in this study.

Address correspondence to Kim L. Gratz, Department of Psychiatry and Human Behavior, University of Mississippi Medical Center, 2500 North State Street, Jackson, MS 39216; E-mail: KLGratz@aol.com
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 health-compromising behaviors (Skodol et al., 2002). In addition to the individual dysfunction and personal costs associated with this disorder, BPD is associated with substantial economic and societal costs (van Asselt, Dirksen, Arntz, & Severens, 2007), as well as negative consequences for family members and loved ones (Hoffman et al., 2005). Indeed, interpersonal dysfunction is considered to be a core component of BPD (Gunderson & Lyons-Ruth, 2008), with implications for both adult social and romantic relationships and mother-child relationships (Macfie & Swan, 2009).

With regard to the latter, evidence suggests that children of mothers with BP pathology are at risk for a variety of negative outcomes (e.g., psychiatric disorders, emotional and behavioral problems, interpersonal difficulties; Barnow, Spitzer, Grabe, Kessler, & Freyberger, 2006; Herr, Hammen, & Brennan, 2008; Weiss et al., 1996). However, no studies have examined the pathways through which maternal BP pathology may lead to negative outcomes in children. Although there are likely a number of factors involved in the transmission of risk from mothers with BP pathology to their children (e.g., genetics, shared biological or trait vulnerabilities, parenting behaviors; Gunderson et al., 2011; Stepp, Whalen, Pilkonis, Hipwell, & Levine, 2012; Torgersen, 2000), one factor that may be especially important to consider is the impact of maternal BP and related pathology on key developmental tasks of infancy.

One such task that warrants particular attention is emotion regulation (ER), a foundational skill integral to normative development and adaptive functioning (Calkins, 1994; Cole, Michel, & Teti, 1994). ER begins to develop in infancy in the context of the attachment relationship (Calkins, 2004; Eisenberg, Cumberland, & Spinrad, 1998). Specifically, a secure attachment relationship allows the infant to express distress freely with the expectation that the caregiver will respond (facilitating both the effective use of caregivers for soothing and the development of more independent self-soothing strategies). Conversely, insecure attachment relationships impede the development of adaptive ER, with insecure-resistant relationships prompting heightened distress expressions to maintain proximity with inconsistent caregivers (impeding the development of self-reliant ER) and insecure-avoidant relationships prompting dampened expressions of distress around punitive caregivers (interfering with caregiver-focused ER; Cassidy, 1994). Individual differences in ER become salient in the second year of life, as motor and cognitive development during this period allow infants to display a variety of means to manage distress (Calkins, 1994). Both ER strategies (caregiver-focused and self-focused) and the intensity of emotional expressions (with modulated expressivity indicating more adaptive ER than high or low levels of expressivity) have been linked to more adaptive emotional development and adjustment (Calkins, Gill, Johnson, & Smith, 1999; Cole, Zahn-Waxler, Fox, Usher, & Welsh, 1996). Furthermore, because early disruptions in ER may increase the risk for later childhood difficulties (Calkins, 1994), any
negative influence of maternal BP and related pathology on the development of adaptive ER in infants could have far-reaching consequences.

In support of this theory, maternal BPD has been found to be related to both heightened risk for insecure attachment in infants (Gunderson & Lyons-Ruth, 2008; Hobson, Patrick, Crandell, García-Pérez, & Lee, 2005) and heightened levels of ER difficulties in toddlers (Macfie & Swan, 2009). Moreover, many of the difficulties observed in children of mothers with BP pathology (e.g., behavior problems/disorders, attention-deficit/hyperactivity disorder, anxiety and depression, and BP pathology itself; Barnow et al., 2006; Weiss et al., 1996) have been empirically and theoretically linked to ER difficulties (Beauchaine, Hinshaw, & Pang, 2010; Campbell-Sills & Barlow, 2007; Gratz & Tull, 2010; Linehan, 1993; Neumann, van Lier, Gratz, & Koot, 2010).

Likewise, given the centrality of ER difficulties and related emotional vulnerability (e.g., emotional intensity/reactivity) to BPD (Linehan, 1993; Rosenthal et al., 2008), mothers with BP pathology likely exhibit ER deficits themselves, interfering with their ability to model and teach adaptive ER skills to their children. Indeed, literature suggests that maternal ER may have a direct effect on child ER due to modeling or shared genetics (Cole et al., 1994; Goldsmith, Pollak, & Davidson, 2008; Morris, Silk, Steinberg, Myers, & Robinson, 2007), consistent with findings of a significant direct relation between mother and offspring ER difficulties (Kim, Pears, Capaldi, & Owen, 2009). Moreover, maternal ER difficulties have been linked to maladaptive reactions to infant distress (Leerkes & Crockenberg, 2006), which play a central role in the development of ER (with supportive and negative reactions related to the use of adaptive and maladaptive ER strategies, respectively; Eisenberg et al., 1998). Of particular relevance to this article, mothers with BP pathology have been found to display more negative reactions to infant distress (Kiel, Gratz, Moore, Latzman, & Tull, 2011). Furthermore, given that one way in which caregivers influence children’s ER is by modeling ER strategies (Cole et al., 1994), the greater use of avoidant ER strategies found in BPD (Linehan, 1993; Rosenthal et al., 2008) could have implications for infants’ ER as well. Nonetheless, given that infant ER is theorized to arise in the context of the attachment relationship, the quality of that attachment relationship is likely to moderate the relation between maternal emotional dysfunction and infant ER. This is particularly relevant when examining maternal BP pathology and its relation to infant ER. Indeed, despite findings of an association between maternal BPD and insecure attachment in infants (Hobson et al., 2005), some infants of mothers with BPD do evidence secure attachment (which may buffer the effects of maternal BP pathology and related emotional dysfunction on infant ER).

Thus, the goal of the current study was to examine the extent to which maternal BP pathology and related emotional dysfunction (including ER difficulties and emotional intensity/reactivity) predict infant ER difficulties in the laboratory. To this end, we examined both specific ER behaviors and the modulation of emotional expressions (one indicator of ER in young children; Cole et al., 1996) in response to fear- and anger-eliciting stimuli among 12- to 23-month-old infants of mothers with (high-BP) and without (low-BP)
clinically relevant BP pathology. Given that ER first develops in the context of the attachment relationship, we also examined the moderating role of mother-infant attachment in the relations between maternal BP pathology and related emotional dysfunction and infant ER. We hypothesized that (a) maternal BP status (high vs. low) would have an indirect relation to infant ER difficulties through maternal emotional dysfunction; and (b) mother-infant attachment would moderate these relations, such that the indirect effects on lower self-focused ER and heightened expressivity would be most relevant for infants in insecure-resistant relationships and the indirect effects on lower caregiver-focused ER and incompressivity would be most relevant to infants in insecure-avoidant relationships.

METHOD
PARTICIPANTS

Mother-infant dyads were recruited through advertisements (some of which specifically requested mothers with mood, relationship, and impulse control difficulties) for a “mother-child research study” posted online and in nursery schools, daycare facilities, hospitals, churches, coffee shops, and stores in the greater Jackson, Mississippi, area. 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 101 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 (comparable to patients with a BPD diagnosis) and those in the low-BP group endorsing minimal BP pathology (see Measures).

High-BP Group. Consistent with past research examining BP features among adults in nonclinical settings (Gratz, Breetz, & Tull, 2010; Trull, 1995), 23% (n = 23) of mothers were classified as high-BP. Providing support for this classification, the mean BPD symptom severity of mothers in the high-BP group was 39.17, consistent with the mean of BPD outpatient samples (37.5; Gratz & Gunderson, 2006). Mothers in this group were ethnically diverse (65% African American; 26% White), ranged in age from 20 to 42 (M = 29.0 ± 6.4), and reported a mean annual income between $26K and $35K. Their infants (11 female) had a mean age of 17.4 ± 3.8 months.

Low-BP Group. The remaining 78 mothers (77%) were classified as low-BP. The mean BPD symptom severity of mothers in the low-BP group was 19.60, consistent with the mean of individuals without a personality disorder (21.4; Gratz & Gunderson, 2006). Mothers in the low-BP group were ethnically diverse (49% African American; 49% White), ranged in age from 18 to 39 (M = 28.4 ± 4.9), and reported a mean annual income between $36K and $50K. Their infants (44 female) had a mean age of 16.2 ± 3.5 months.
PROCEDURE

Procedures were approved by the institution’s Institutional Review Board. 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. Eligible mothers 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, a lead experimenter (E1) guided mothers and their infants through several procedures. First, infants participated in four episodes from the Locomotor version of the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith & Rothbart, 1999), two of which elicited fear (Unpredictable Dog [UD]; Spider [S]) and two of which elicited anger (Gentle Arm Restraint [GAR]; Toy Behind Barrier [TBB]). Next, mothers and infants participated in the Strange Situation, a standardized protocol for assessing infant attachment involving episodes characterized by interactions with an unfamiliar but friendly female stranger and brief separations and reunions between the infant and the mother (Ainsworth, Blehar, Waters, & Wall, 1978).

MEASURES

Maternal BP Pathology. Mothers completed the Borderline Evaluation of Severity over Time (BEST; Pfohl et al., 2009), a 15-item measure of BPD symptom severity and dysfunction over the past month ($\alpha = .86$). The BEST has been found to have good test-retest reliability and convergent and discriminant validity (Pfohl et al., 2009). For the purposes of this study, and consistent with past research (Gratz et al., 2010, 2011; Trull, 1995), mothers were classified according to the severity of their BPD symptoms. Specifically, a score of $>30$ was used as the cutoff to indicate the presence of clinically relevant levels of BPD pathology (with individuals above this cutoff classified as high-BP, and those below this cutoff classified as low-BP; see Gratz et al., 2010, 2011). 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 ($37.5 \pm 12.0$) and more than 1 SD above the mean for outpatients without a personality disorder ($21.5 \pm 7.8$; Gratz & Gunderson, 2006). Furthermore, this cutoff is associated with a positive predictive power (PPP) value of .93 and a negative predictive power (NPP) value of .77 with respect to Diagnostic Interview for DSM-IV Personality Disorders (DIPD-IV) diagnoses of BPD in an outpatient sample (suggesting that this is an appropriate method of delineating individuals for the high-BP group). Indeed, the PPP and NPP values of this cutoff on the BEST are consistent with these diagnostic efficiency statistics for the Personality Assessment Inventory-Borderline Features Scale (PAI-BOR; a more widely used measure for classifying individuals as high- vs. low-BP; Jacobo, Blais, Baity, & Harley, 2007). More-
over, 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 in BPD) among individuals
classified as high- versus low-BP on this measure (Gratz et al., 2010, 2011).

Maternal ER Difficulties. Mothers completed the Difficulties in Emotion
Regulation Scale (DERS; Gratz & Roemer, 2004), a 36-item measure of mul-
tiple ER difficulties (including lack of emotional awareness and clarity, non-
acceptance of emotions, difficulties controlling behaviors when distressed,
and lack of access to adaptive ER strategies). The DERS demonstrates good
test-retest reliability and construct and predictive validity and is significantly
associated with objective measures of ER (Gratz & Roemer, 2004; Gratz &
Tull, 2010). In this study, Cronbach’s α was .92.

Maternal Emotional Intensity/Reactivity. Mothers completed the Affect In-
tensity Measure (AIM; Larsen, Diener, & Emmons, 1986), a 40-item mea-
sure of emotional intensity and reactivity. Research supports the reliability
and validity of the AIM (Larsen & Diener, 1987; Larsen et al., 1986). Given
evidence that (a) the AIM is multidimensional (measuring both positive and
negative emotional intensity and reactivity; Weinfurt, Bryant, & Yarnold,
1994; Williams, 1989), and (b) the association between emotional intensi-
ity/reactivity and BPD is specific to negative emotions (Levine, Marziali, &
Hood, 1997), this study examined only negative emotional intensity/reactivi-
(16 items; α = .76).

Maternal Depression and Anxiety. Mothers completed the Depression Anxi-
ety Stress Scales (DASS; Lovibond & Lovibond, 1995) to assess mood symp-
toms. The current study used the Depression and Anxiety scales (7 items
each; αs ≥ .82) to control for the influence of general psychopathology on
the relationships of interest. These scales have been shown to be reliable and
valid measures of the core symptoms of depression and anxiety (Lovibond
& Lovibond, 1995).

Infant ER Behaviors. Based on the Lab-TAB manual (Goldsmith & Roth-
bart, 1999) and past studies of young children’s ER behaviors (e.g., Stifter
& Braungart, 1995), infants were coded for a number of putative regulatory
behaviors throughout the Lab-TAB episodes. These behaviors were scored as
present versus absent on a second-by-second basis within each episode. Reli-
bility between coders and a master coder (E. Kiel) was assessed through-
out coding on 20% of cases as a kappa coefficient. From this scoring, a
variety of summary variables (latency to first display [converted to a speed
score by calculating its inverse], proportion of episode shown [total number
of seconds shown divided by the episode length in seconds], and frequency
[number of discrete displays]) were derived. Summary variables were chosen
for composites based on their appropriateness (e.g., frequency or speed [vs.
duration] was used for behaviors that tend to be brief) and statistical analy-
(principal components analyses). Variables were standardized, assigned
z-scores, and averaged.
Self-focused regulation (kappa = .85) was scored when infants engaged in a self-directed ER strategy (fidgeting, self-stimulation, or self-touching). Each episode’s composite comprised the speed, proportion of time shown, and frequency variables; these variables were further aggregated within the fear and anger episodes. Caregiver-focused regulation (kappa = .92) was scored when infants either looked at or sought to increase physical proximity to their caregivers. The composite for fear episodes comprised the aggregate of the speed and frequency of these behaviors for UD and proximity seeking for S (in which it was difficult for infants to physically look at their caregivers). The composite for the anger episodes included the speed and frequency for TBB only, as caregiver-focused regulation was impeded in GAR by the mother restraining the infant.

Infant Emotional Expression. Intensity of infants’ fear and anger facial expressions was scored on a 0 (none) to 3 (strong expression in at least two regions of the face) scale according to the AFFEX coding system (Izard, Dougherty, & Hummert, 1983); bodily expressions (i.e., bodily fear, escape, struggle) on a 0 (none) to 3 (extreme) scale; and vocal distress expressions on a 0 (none) to 5 (full intensity cry/scream) scale across 5- to 10-s epochs of each Lab-TAB episode. Coders achieved and maintained reliability (intraclass correlation coefficients [ICCs] = .79 to .98) with the master coder throughout coding. The fear expression composite comprised average and maximum values of facial fear, bodily fear (UD only), escape, speed to first fear expression, and the average, maximum, and speed of distress vocalizations. The anger expression composite included the average and maximum values of facial anger and struggle and the average, maximum, and speed of distress vocalizations. Fear and anger expression composites were included in their dimensional forms as covariates in analyses of infant ER behaviors. Composites were also used to form groups for analyses examining infants’ level of expressiveness. Specifically, infants were assigned to the high and low groups if they were ≥1 SD above or below the mean, respectively, or to the moderate group if they were within these values.

Infant Attachment. In the reunion episodes of the Strange Situation, trained coders scored infants for proximity seeking, contact maintenance, resistance, and avoidance. Infants received classifications of secure, insecure-avoidant, or insecure-resistant based on the profiles of these scores according to established guidelines (Ainsworth et al., 1978). Coding was conducted by a master coder (E. Kiel, who received training from and established reliability with Drs. L. A. Sroufe and E. Carlson at the University of Minnesota) and a research assistant under her supervision. Minimum interrater reliability (kappa = .80) on the classifications was established on cases unique from this sample and then assessed throughout coding on 20% of cases (kappa = .83). All discrepancies were discussed and resolved. One Strange Situation was not recorded due to technical difficulties; of the others, 67 infants were classified as secure, 18 as insecure-avoidant, and 15 as insecure-resistant.
ANALYSIS PLAN

After descriptive and correlational analyses (to identify covariates) were conducted, examination of the indirect effect from high versus low maternal BP status to infant ER through maternal emotional dysfunction was completed in two steps. First, classic standards prescribe examination of pathways among predictor, mediator, and outcome variables (Baron & Kenny, 1986), so the relations between (a) BP group status and each of the maternal emotion-related variables and (b) the maternal emotion-related variables and infant ER variables (i.e., “A” and “B” paths) were examined using regression analyses. The A paths were examined in separate multiple regression equations. The B paths were examined using multiple regression for the continuous outcomes of infant ER behaviors and multinomial logistic regression for the categorical outcomes of infant expressivity status. For simple mediation, a mediator relates to the outcome above and beyond the effect of the predictor. However, in the case of the current study, we hypothesized that attachment classification would moderate the B path between maternal emotion dysfunction and infant ER, requiring a moderated mediation model. To this end, we created two dummy codes for the attachment variable with secure as the reference group (d1 = avoidant vs. secure; d2 = resistant vs. secure) and computed their interactions (cross-products) with maternal ER difficulties and emotional intensity/reactivity. These variables were examined for a significant relation to the outcome variable above and beyond the predictor (and main effects comprising the interaction). To simultaneously test the two attachment dummy codes, they were entered hierarchically and their significance was determined by model ΔR². The model was run twice so that each interaction could be examined above and beyond the effect of the other (which does not inflate Type I error because it is within the same model). Specific attachment group differences were determined by individual parameter tests of the dummy codes. If interactions were not significant, the main effects of the maternal emotional dysfunction variables were examined (i.e., simple mediation).

Second, in addition to examining the individual pathways, newer approaches recommend examining the strength of the indirect effect (which avoids problems associated with both Type I and Type II errors that occur when relying only on the pathways; Preacher & Hayes, 2004). Conditional indirect effects (which imply that the indirect effect depends on the level of the moderator) were examined using bootstrapping techniques via the PROCESS macro for SPSS (Hayes, 2012). Because PROCESS cannot accommodate a three-level categorical moderator, a binary dummy code for attachment security was created with the mediator (avoidant or resistant) coded as 1 and the other two groups (secure and either resistant or avoidant) coded as 0. With nonsignificant interactions, the indirect effect was tested with PROCESS for infant ER behaviors and with the Monte Carlo Method for Assessing Mediation (MCMAM) for infant expressivity status. Both maternal emotion-related mediators were included in analyses for indirect effects. These modern approaches outperform Sobel’s test for indirect effects (e.g., Preacher & Hayes, 2004). Given both our relatively small sample size and
small number of hypothesis-driven analyses, an alpha correction was not applied to analyses (for support, see Perneger, 1998; Tutzauer, 2003).

RESULTS
MISSING DATA

In addition to one infant missing an attachment classification, one mother did not complete the AIM, three mothers did not provide demographic information, and one infant each could not be scored for fear and anger, resulting in 94 participants with complete data.

PRELIMINARY ANALYSES

Descriptive statistics for the primary variables of interest across BP status are reported in Table 1. Mothers in the high-BP group reported significantly greater emotional intensity/reactivity and ER difficulties than mothers in the low-BP group. Mothers in the high-BP (vs. low-BP) group also reported significantly greater depression symptoms and marginally greater anxiety symptoms. The BP groups did not differ significantly on any demographic characteristic (i.e., maternal or infant age, maternal education, infant gender, race/ethnicity, household income) or infant variable (i.e., ER behaviors, expressivity group status, emotional expression, attachment status; all ps > .05).

Bivariate correlations were conducted between demographic variables and primary variables to determine potential covariates. Infant age, maternal age, maternal education, and household income were related to a number of mediator and outcome variables and, thus, were included as covariates in all analyses. To increase specificity of the results to BP pathology, maternal depression and anxiety symptoms were also included as covariates in primary analyses.

INDIRECT EFFECTS THROUGH MATERNAL EMOTIONAL INTENSITY/REACTIVITY AND ER DIFFICULTIES

The primary analyses examined whether BP status (high vs. low) related to infant ER through maternal negative emotional intensity/reactivity and ER difficulties, and whether indirect effects depended on mother-infant attachment security. Multiple regressions revealed that BP group status related to both maternal emotional intensity/reactivity ($b = 7.75, SE(b) = 2.45, 95\%$ CI [2.89, 12.62], $\beta = .32, t = 3.17, p < .01$) and ER difficulties ($b = 11.26, SE(b) = 4.07, 95\%$ CI [3.17, 19.34], $\beta = .27, t = 2.77, p < .01$), controlling for covariates. Thus, in traditional mediation terms, requirements for a significant Path A were fulfilled for both variables. Subsequent analyses examined whether maternal emotion-related variables predicted infant ER above and beyond BP status and relevant covariates (Path B), and whether attachment security moderated these paths (see Table 2 for the results of these analyses across all three infant dependent variables).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Low-BP Group</th>
<th>High-BP Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>BEST total score</td>
<td>19.60 (5.16)</td>
<td>12.00–29.00</td>
</tr>
<tr>
<td>AIM intensity/reactivity</td>
<td>54.68 (9.86)</td>
<td>32.00–80.00</td>
</tr>
<tr>
<td>DERS total score</td>
<td>61.85 (13.53)</td>
<td>38.00–101.00</td>
</tr>
<tr>
<td>DASS depression</td>
<td>4.13 (6.23)</td>
<td>0.00–34.00</td>
</tr>
<tr>
<td>DASS anxiety</td>
<td>4.77 (7.18)</td>
<td>0.00–34.00</td>
</tr>
<tr>
<td>Self-focused ER (Fear)</td>
<td>-0.01 (0.64)</td>
<td>-0.77–2.02</td>
</tr>
<tr>
<td>Self-focused ER (Anger)</td>
<td>0.99 (0.31)</td>
<td>0.55–2.44</td>
</tr>
<tr>
<td>Caregiver-focused ER (Fear)</td>
<td>0.04 (0.57)</td>
<td>-0.85–1.72</td>
</tr>
<tr>
<td>Caregiver-focused ER (Anger)</td>
<td>0.01 (0.68)</td>
<td>-0.81–1.93</td>
</tr>
<tr>
<td>Attachment classification</td>
<td>Secure</td>
<td>54</td>
</tr>
<tr>
<td>Emotion expression (Fear)</td>
<td>-0.004 (0.56)</td>
<td>-0.88–1.49</td>
</tr>
<tr>
<td>Emotion expression (Anger)</td>
<td>0.03 (0.65)</td>
<td>-1.47–1.53</td>
</tr>
<tr>
<td>Fear expression group</td>
<td>Low</td>
<td>8</td>
</tr>
<tr>
<td>Anger expression group</td>
<td>Low</td>
<td>16</td>
</tr>
</tbody>
</table>

Note. BP = borderline personality; BEST = Borderline Evaluation of Severity over Time; AIM = Affect Intensity Measure; DERS = Difficulties in Emotion Regulation Scale; DASS = Depression Anxiety Stress Scale; ER = emotion regulation.

Self-focused ER for anger episodes was subjected to square root transformation prior to analyses. Group test was a t test for all variables except attachment classification and expression groups, which were chi-square tests.

†p < .10, *p < .05, **p < .01, ***p < .001.
Infant Self-Focused ER Behaviors. For the fear episodes, no significant effects emerged for the main effect of maternal ER difficulties or its interaction with attachment security (Table 2). However, the interaction between maternal emotional intensity/reactivity and attachment security was significant. Examination of individual parameters revealed a difference in the simple effect of maternal emotion intensity/reactivity between resistant and secure groups. Probing of this interaction revealed that maternal emotional intensity/reactivity related to lower infant self-focused ER for the insecure-resistant group \( (b = -0.08, SE(b) = 0.03, 95\% \text{ CI } [-0.13, -0.03], \beta = -1.42, t = -2.93, p < .01) \) but had no relation for the secure group \( (b = -0.01, SE(b) = 0.01, 95\% \text{ CI } [-0.03, 0.01], \beta = -0.09, t = -0.52, p = .61) \). Investigation of the conditional indirect effect revealed that maternal BP status related to lower infant self-focused ER through maternal emotional intensity/reactivity for infants in resistant (indirect effect = -0.57, 95\% \text{ CI } [-1.42, -0.17]) but not secure or avoidant (indirect effect = -0.01, 95\% \text{ CI } [-0.13, 0.10]) relationships. Results for the anger episodes, although comparable in direction, did not reach significance (Table 2).

Infant Caregiver-Focused ER Behaviors. Neither the interaction terms nor the main effects emerged as significant for the fear episodes (Table 2). For the anger episode, the interaction between maternal emotional intensity/reactivity and attachment security was significant, with a significant difference emerging for the resistant versus secure groups (Table 2). Maternal emotion intensity/reactivity related to decreased use of caregiver-focused ER for the resistant \( (b = -0.07, SE(b) = 0.04, 95\% \text{ CI } [-0.14, 0.001], \beta = -0.95, t = -1.96, p = .05) \) but not the secure \( (b = 0.01, SE(b) = 0.01, 95\% \text{ CI } [-0.01, 0.03], \beta = 0.14, t = 0.87, p = .87) \) group. However, the indirect effect of BP group status on infant caregiver-focused ER through maternal emotional intensity/reactivity was not significant for either group (95\% CIs [-0.71, 0.15] and [-0.06, 0.45], respectively).

Infant Expressivity Status. Contrary to hypotheses, attachment security did not moderate the relations between maternal emotion-related variables and infant expressivity status for either the fear or the anger context; thus, interaction terms were dropped from all models. For expressivity in the fear conditions, maternal ER difficulties significantly predicted membership in the low-expressivity versus moderate-expressivity group (Table 2). The indirect effect of BP status on low-expressivity group membership through maternal ER difficulties was significant (95\% CI [0.11, 2.19]), suggesting that the greater ER difficulties found among high-BP mothers relate to an increased likelihood of blunted fear expressions in infants. As for expressivity in the anger episodes, maternal ER difficulties significantly predicted membership in the high-expressivity versus moderate-expressivity group (Table 2), and the indirect effect of BP status on membership in the high-expressivity versus moderate-expressivity group through maternal ER difficulties was significant (95\% CI [0.001, 1.28]). Conversely, maternal emotional intensity/reactivity predicted lower likelihood of membership in the high-expressivity versus
### TABLE 2. Summary of Regression Analyses for B Paths of Mediation Models

<table>
<thead>
<tr>
<th>Variable</th>
<th>Self-Focused ER</th>
<th>Caregiver-Focused ER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Angr, $R^2 = .18$, F(16,75) = 0.99</td>
<td>Angr, $R^2 = .19$, F(16,75) = 1.08</td>
</tr>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>$\Delta R^2$</td>
</tr>
<tr>
<td></td>
<td>$\beta$</td>
<td>s$\beta$</td>
</tr>
<tr>
<td>BP group status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attachment D1 (Avoidant)</td>
<td>.06</td>
<td>.003</td>
</tr>
<tr>
<td>Attachment D2 (Resistant)</td>
<td>.41*</td>
<td>.070</td>
</tr>
<tr>
<td>ER difficulties</td>
<td>.10</td>
<td>.004</td>
</tr>
<tr>
<td>Emotional intensity/reactivity</td>
<td>.09</td>
<td>.003</td>
</tr>
<tr>
<td>ER difficulties $\times$ Attachment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.01</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. ER = emotion regulation. BP group status had low-BP as the reference group. Attachment D1 and D2 represent the three-level attachment variable, with secure attachment as the reference. All analyses controlled for maternal age, infant age, maternal education, household income, and maternal depressive and anxiety symptoms. Multiple regression analyses for self-focused and caregiver-focused ER also controlled for the level of infant fear or anger for the appropriate outcome. Effect sizes for multiple regression and multinomial regression analyses are represented by squared semipartial correlations (s$^2$) and odds ratios (OR), respectively. $*p < .10$, $*p < .05$, $**p < .01$. 

### Fear Expression Group, $\chi^2(22) = 44.23**$

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low vs. Moderate</th>
<th>High vs. Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wald</td>
<td>OR</td>
</tr>
<tr>
<td>BP group status</td>
<td>0.05</td>
<td>0.77</td>
</tr>
<tr>
<td>Attachment D1 (Avoidant)</td>
<td>0.30</td>
<td>2.05</td>
</tr>
<tr>
<td>Attachment D2 (Resistant)</td>
<td>5.12*</td>
<td>14.64</td>
</tr>
<tr>
<td>ER difficulties</td>
<td>6.23*</td>
<td>1.09</td>
</tr>
<tr>
<td>Emotional intensity/reactivity</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

### Anger Expression Group, $\chi^2(22) = 29.32$

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low vs. Moderate</th>
<th>High vs. Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wald</td>
<td>OR</td>
</tr>
<tr>
<td>BP group status</td>
<td>2.10</td>
<td>2.92</td>
</tr>
<tr>
<td>Attachment D1 (Avoidant)</td>
<td>0.78</td>
<td>2.01</td>
</tr>
<tr>
<td>Attachment D2 (Resistant)</td>
<td>0.27</td>
<td>0.61</td>
</tr>
<tr>
<td>ER difficulties</td>
<td>0.23</td>
<td>0.99</td>
</tr>
<tr>
<td>Emotional intensity/reactivity</td>
<td>2.75†</td>
<td>0.94</td>
</tr>
</tbody>
</table>
moderate-expressivity group, and the indirect effect of BP status on infant membership in the moderate- versus high-expressivity group through maternal emotional intensity/reactivity was significant (95% CI [-1.56, -0.0004]). Thus, whereas the heightened ER difficulties of high-BP mothers relate to an increased likelihood of infants displaying heightened anger expressivity, the heightened emotional intensity/reactivity of these mothers relates to a different infant response, promoting more adaptive anger expressions.

All findings remained the same in terms of direction, effect size, and statistical significance when examining BP pathology dimensionally (as a continuous measure of BPD symptom severity).

**DISCUSSION**

Given growing interest in how mothers with BPD may affect the developmental outcomes of their children, this study examined if maternal BP pathology relates to infant ER difficulties through the heightened emotional dysfunction (in the form of emotional intensity/reactivity and ER difficulties) that accompanies BPD. Although maternal BP pathology did not relate directly to indicators of infant ER, it did have an indirect relationship through the proposed mediators of maternal emotional dysfunction. These findings highlight the relevance of the emotional dysfunction associated with maternal BP pathology to the negative outcomes observed among children of mothers with BPD. Specifically, our results suggest that it may be the emotional dysfunction associated with BPD, rather than the presence of clinically relevant BP pathology per se, that places infants of mothers with BP pathology at risk for negative outcomes. Although the effects of maternal BP pathology on child outcomes may become stronger (and more direct) over the course of a child’s development (e.g., as children age and begin to assert their independence; Gunderson & Lyons-Ruth, 2008; Stepp et al., 2012), the impact of maternal BP pathology on offspring functioning in the early years of life may be less direct. Moreover, the absence of a direct effect of maternal BP pathology on infant ER is not without support in the literature, as a recent study found almost no differences in initial responses to infant distress (which play a role in the development of ER) between mothers with and without clinically relevant BP pathology (Kiel et al., 2011).

With regard to infant ER, both caregiver- and self-focused ER strategies have been shown to regulate infants’ distress (Stifter & Braungart, 1995). Early in life, the ability to use these strategies relates to more adaptive emotional expression and better outcomes, whereas relatively lower use of these strategies relates to increased negative affect and predicts adjustment difficulties (Calkins et al., 1999; Cole et al., 1996). Results of this study suggest that maternal emotional intensity/reactivity may be one pathway through which maternal BP pathology predicts lower use of self-focused ER strategies, particularly in fear-eliciting situations and for infants in insecure-resistant attachment relationships. These results are consistent with literature suggesting that insecure-resistant infants may have difficulty developing self-reliant ER
because their attachment relationship fosters hypervigilance for separation from caregivers (Cassidy, 1994). Notably, maternal emotional intensity/reactivity also related to the lower use of caregiver-focused ER strategies in anger-eliciting situations for infants in insecure-resistant attachment relationships. Although somewhat surprising (given that past research has emphasized the relevance of insecure-avoidant attachment to lower use of caregiver-focused ER strategies), infants in insecure-resistant relationships do not use caregiver-focused regulation effectively; although they are vigilant about contact, they do not soothe themselves with it. Rather, attachment researchers have suggested that the expression of distress itself may be the regulatory behavior for these infants because it maintains the caregiver's attention (Cassidy, 1994). Thus, the caregiver-focused ER strategies assessed here may not adequately capture this ER difficulty among insecure-resistant infants.

The modulation of emotional expressions is another indicator of ER abilities in young children (Cole et al., 1996), with modulated expressivity indicative of adaptive ER (vs. either low or high levels of expressivity). Specifically, research indicates that children with modulated emotional expressions have fewer difficulties than either inexpressive or highly expressive children, with highly expressive children evidencing externalizing difficulties and inexpressive children evidencing problems across both externalizing and internalizing domains (Cole et al., 1996). Our results suggest that one mechanism underlying these ER difficulties in infants of mothers with BP pathology may be maternal ER difficulties, which linked maternal BP status to both low-expressivity (for fear) and high-expressivity (for anger) group membership. These findings highlight the relevance of maternal ER difficulties to the development of ER in infants (consistent with past research; e.g., Kim et al., 2009), as well as the importance of targeting maternal ER difficulties among mothers with BPD. Indeed, these results suggest that early ER deficits among infants of mothers with BPD may be driven by the ER difficulties of these mothers.

Notably, several of our hypotheses regarding the moderating role of mother-infant attachment in the relations between maternal BP pathology and related emotional dysfunction and infant ER difficulties were not supported. Despite providing support for the hypothesized relevance of maternal BP pathology and related emotional dysfunction to self-focused ER difficulties for infants in insecure-resistant relations, findings provided no support for the hypothesized relevance of maternal BP and related pathology to caregiver-focused ER difficulties for infants in insecure-avoidant relations. It may be that looking to the mother and increasing proximity are not extreme enough behaviors to warrant minimizing by these infants (i.e., these may not elicit rejection by the caregiver). Likewise, the relations between maternal ER difficulties and both high and low expressivity in infants were not found to differ as a function of mother-infant attachment. Although the attachment relationship is theorized to have a direct relationship to expressivity in the presence of caregivers, it is possible that it does not determine how maternal emotional dysfunction relates to infant expressivity. Alternatively, our relatively small sample size, particularly with regard to the high-BP group and
insecure attachment classifications, may have limited our statistical power and ability to detect interaction effects.

Other limitations warrant consideration as well. First, in addition to limiting our statistical power, the small sample of mothers with clinically relevant BP pathology limits the statistical conclusion validity and generalizability of our findings. However, it is important to note that all relations associated with greater than a small effect size in this sample were statistically significant, and all nonsignificant relations in this study did not exceed the accepted range for a small effect. Thus, although we were likely underpowered to detect small effects, findings suggest that we were not underpowered to detect meaningful associations. Moreover, the replication of our findings using a continuous measure of BPD symptom severity suggests that our examination of high- and low-BP groups did not limit our power or influence our findings relative to a dimensional assessment of BPD pathology. Nevertheless, replication of these findings in larger samples of mothers with and without BPD is needed.

Additionally, our cross-sectional design precludes conclusions about the causative role of maternal BP pathology and related emotional dysfunction in infant ER. Likewise, whether these early ER indicators represent risk factors for ongoing ER difficulties and later emotion-related problems among children of mothers with BP pathology remains unknown, and prospective longitudinal studies are needed. Moreover, given our exclusive focus on infant ER in a laboratory setting, the extent to which these behaviors would be observed outside of the laboratory remains unclear. Future research should examine infant ER in contexts with greater external validity, such as the home or naturally occurring stressful situations (e.g., being left at daycare). In addition, this study examined clinically relevant levels of BP pathology among women in the community using an empirically supported cutoff score on a self-report measure of BPD symptom severity. Although this cutoff has been found to have high positive predictive power vis-à-vis BPD diagnoses, the extent to which our high-BP group represents women meeting diagnostic criteria for BPD is unclear. Future studies should examine the applicability of our findings to mothers diagnosed with BPD, as well as mothers seeking treatment for BPD-related difficulties. Finally, future research should examine the specificity of our findings to mothers with clinically relevant BP pathology (vs. others forms of psychopathology). Although all analyses controlled for maternal depression and anxiety symptoms (providing some support for the relevance of our findings to maternal BP pathology in particular), future studies comparing mothers with BP pathology to those with depression or other forms of personality pathology are needed.
REFERENCES


Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable me-


