The Main and Interactive Effects of Maternal Interpersonal Emotion Regulation and Negative Affect on Adolescent Girls' Borderline Personality Disorder Symptoms

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Abstract

The transaction of adolescent's expressed negative affect and parental interpersonal emotion regulation are theoretically implicated in the development of borderline personality disorder (BPD). Although problem solving and support/validation are interpersonal strategies that foster emotion regulation, little is known about whether these strategies are associated with less BPD severity among adolescents. Adolescent girls (age 16; $N = 74$) and their mothers completed a conflict discussion task, and maternal problem solving, support/validation, and girls' negative affect were coded. Girls' BPD symptoms were assessed at four time points. A 3-way interaction of girls' negative affect, problem solving, and support/validation indicated that girls' negative affect was only associated with BPD severity in the context of low maternal support/validation and high maternal problem solving. These variables did not predict changes in BPD symptoms over time.

Although high negative affect is a risk for BPD severity in adolescent girls, maternal interpersonal emotion regulation strategies moderate this link. Whereas maternal problem solving coupled with low support/validation is associated with a stronger negative affect-BPD relation, maternal problem solving paired with high support/validation is associated with an attenuated relationship.

Keywords

Borderline personality disorder; Mother; adolescent conflict; Parenting; Interpersonal emotion regulation

Introduction

Borderline personality disorder (BPD) is a severe mental health disorder that emerges by adolescence or early adulthood (American Psychiatric Association 2013; Beauchaine et al. 2009). Characterized by affective instability, impulsive and often self-damaging behaviors, and stormy interpersonal relationships (American Psychiatric Association 2013), BPD results in high personal, economic, and societal costs (van Asselt et al. 2007). Prevailing models suggest that BPD arises as a result of the complex interplay between a child's biologically-based emotional vulnerability, such as intense negative affectivity, and maladaptive caregiver responses to (and efforts to regulate) the child's expression of negative emotions (Bateman and Fonagy 2004; Crowell et al. 2009; Fruzzetti et al. 2005; Hughes et al. 2012; Linehan 1993). For instance, the biosocial theory states that repeated transactions between invalidating responses made by caregivers to their children's expressions of negative affect contribute to the later development of BPD (Linehan 1993). Children with more intense negative affect may elicit putatively invalidating responses from parents who do not understand this emotional intensity. In response to perceived recurring invalidation, children may suppress their emotions, or alternately, escalate their emotional expressions. Over time, this type of caregiver-child relationship may set the stage for the emergence of BPD. On the other hand, this theory predicts that children with these same biological emotional vulnerabilities are likely to be protected from the development of BPD if the child's emotional expressions are consistently met with validating parental responses. As such, parental efforts to regulate children's negative emotional expressions may play a pivotal role in the onset and maintenance of BPD.

These dynamic parent–child processes central to the onset and maintenance of BPD may be particularly relevant during adolescence, which is a critical time to develop independent, adaptive ER skills (Steinberg et al. 2006). Such responses and efforts to influence another person's affective experiences are commonly referred to as 'emotion socialization' practices (Morris et al. 2007) in the parent-child literature, and 'extrinsic interpersonal ER' strategies in the adult literature (Zaki and Williams 2013). Given that children's ability to independently engage in ER grows during early adolescence (Gnepp and Hess 1986), a crucial developmental milestone between parents and adolescents involves negotiating the emerging adolescent's autonomy in ER (Steinberg et al. 2006). In light of the similarities between these constructs and our focus in this paper on late adolescence, we will refer to these caregiver responses herein as interpersonal ER strategies. Interpersonal ER efforts

likely interact with BPD features across the lifespan (Hill et al. 2011), with some interpersonal ER efforts likely exacerbating problems associated among children and adults alike, whereas other interpersonal ER strategies may ameliorate BPD-related difficulties. In particular, caregiver interpersonal ER strategies have been posited to play a key etiological role in BPD. Despite this central role, few studies have compared the relative influence of different interpersonal ER strategies in decreasing risk for BPD.

Converging empirical research has identified several interpersonal ER strategies used by caregivers and linked use of these strategies with BPD severity in their children. Consistent with the biosocial theory, findings from self-report research suggest that parental behaviors consistent with invalidation, involving ignoring, neglecting, or dismissing their child's emotional experiences, are associated with greater ER difficulties in children (Johnson et al. 2006) and retrospective reports of these parental behaviors have been associated with BPD symptoms in young adults (Sauer and Baer 2010). Looking specifically at observations of parent-adolescent conflict, research suggests that other potentially invalidating behaviors, such as perceived maternal rejection and overprotection, are concurrently associated with BPD features (Schuppert et al. 2014). Whereas these invalidating parental responses are associated with greater BPD severity, it is possible that validating and supportive parental responses may constitute protective factors against BPD. Indeed, in a previous examination of the present sample, positive maternal behaviors predicted decreases in adolescents' BPD severity over time (Whalen et al. 2014), although this study examined positive maternal behaviors aggregated across a number of specific interpersonal ER strategies and positive affect, precluding the identification of specific strategies of relevance to BPD. Furthermore, this work did not examine these maternal behaviors in interaction with adolescent's expressed negative affect. Although few studies have looked at positive parental interpersonal ER strategies in relation to the onset and maintenance of BPD, support/ validation and problem solving are specific strategies that appear to be negatively related to depression (McMakin et al. 2011) and aggressive behavior in children (Sheeber et al. 2000). Taken together, this growing body of literature suggests that maternal problem solving and support/validation are two interpersonal ER strategies that may protect youth from the development of psychopathology, and may be candidates to consider with regard to BPD.

Although historically considered a positive parenting strategy, parental problem solving may exhibit unique associations with adolescent BPD severity, relative to other forms of psychopathology in youth. An important aspect of Linehan's theory (and others) is that the child's interpretation of the caregiver's response to his or her emotions is what determines whether that particular response is invalidating or validating (Linehan 1993). One implication of this theory is that well-intended or seemingly helpful parental responses, such as problem solving, may be interpreted by the child as invalidating in specific contexts, such as those evoking negative affect. Rather, it could be hypothesized that in the moment, a parent's attempts at using problem solving to ameliorate their adolescent's experience of intense negative affect may be viewed by the adolescent as "overcontrolling" or unresponsive to his or her distress. Indeed, an absence of responsiveness or acknowledgement of youth's distress is consistent with Linehan's definition of invalidation (Linehan 1993). Evidence suggests that such unresponsive parenting (as reported by the young adult/adolescent with BPD) has been associated with concurrent BPD severity

(Schuppert et al. 2014) as well as future BPD risk (Johnson et al. 2006). In other samples, low parental responsiveness to children's distress has demonstrated associations with lower ER ability among children (Davidov and Grusec 2006). Thus, it might be expected that such task-oriented, unresponsive parental interpersonal ER strategies to adolescents expressing high levels of negative affect may be perceived as invalidating of the adolescents' distress. The same might be true for problem solving. We hypothesize that maternal problem-solving behaviors on their own may be interpreted as invalidating by the adolescent, especially in the face of intense negative affect expressed by the adolescent, thus exacerbating any already existing BPD symptoms.

The confluence of maternal problem solving and support/validation, however, may constitute particularly useful responses to expressed negative affect in BPD. Incorporating supportive/ validating responses may reduce adolescents' negative affect in the moment (Shenk and Fruzzetti 2011), and promote the effective sequelae of parental problem solving (McMakin et al. 2011; Sheeber et al. 2000). Indeed, one study suggests that preceding advice-giving with emotional support improves the perception of the advice (Feng 2009). This combination of problem solving and support/validation may be of particular importance in the context of high expressed negative affect, in which problem solving on its own may be most likely to be perceived as insensitive and invalidating.

Despite the theoretical relevance of parental interpersonal ER responses to children's expressed negative affect in the development of BPD symptoms in adolescents, as well as the purportedly adaptive nature of maternal problem solving and support/validation, no research has examined the interactive effects of behaviorally-measured parental interpersonal ER strategies and youth negative affect on the course of BPD severity in adolescence. Thus, the present study aimed to investigate the main and interactive effects of adolescent expressed negative affect and maternal interpersonal ER strategies on BPD severity in adolescence. In positing these relationships in the course of BPD severity over adolescence, it is important to consider whether the observed relations are unique to BPD or heightened severity of psychopathology more generally. This consideration is especially relevant to the examination of interpersonal ER and BPD relations, given the hypothesized transdiagnostic relevance of interpersonal ER difficulties (Hofmann 2014), as well as the high rates at which mental health disorders co-occur with BPD (Zanarini et al. 1998). In particular, BPD co-occurs at high rates with depression and anxiety disorders, and in fact co-occurring anxiety disorders differentiate BPD from other personality disorders (Zanarini et al. 2004). As such, depression and anxiety disorders constitute relevant diagnoses to consider controlling for to examine unique associations between BPD and interpersonal ER.

Several hypotheses guided this research. Consistent with a wealth of literature (Carlson et al. 2009), we hypothesized that observed adolescent negative affect would be associated with greater BPD severity and steeper increases in BPD severity over time, whereas maternal support/validation would be associated with lower BPD severity and decreases in BPD severity over time. We further hypothesized that maternal support/validation and maternal problem solving would interact with adolescent negative affect in the prediction of BPD severity both concurrently and prospectively. Specifically, we expected that the association between high expressed negative affect and BPD severity and increases in BPD severity over

time would be attenuated in the presence of high maternal problem solving and support/ validation, but not in the presence of high maternal problem solving and low support/ validation. Finally, we expected that these associations would be unique to BPD, and remain even when controlling for depression and anxiety severity.

Methods

Participants

Participants were a subsample of girls and their biological mothers recruited for a personality sub-study from the larger Pittsburgh Girls Study (Hipwell et al. 2006; Keenan et al. 2010), an urban community sample of four age cohorts who were ages 5, 6, 7 and 8 at the first assessment in 2000/2001. Participants in the PGS have been followed with annual interviews over the past 14 years. To identify the PGS sample, low-income neighborhoods (i.e., those in which at least 25 % of families were living at or below the poverty line) were fully enumerated and a random selection of 50% of households in all other neighborhoods were enumerated. 2450 families (out of 2875 identified) agreed to participate in the larger PGS and provided informed consent (see Hipwell et al. 2006; Keenan et al. 2010 for further details PGS design and recruitment).

A total of 131 16 year-old girls were selected from the larger PGS for participation in the personality sub-study in 2010–2012 (girls in cohort 7 in 2010, cohort 6 in 2011, and cohort 5 in 2012). Girls were recruited for this sub-study based on their scores on the Affective Instability subscale of the *Personality Assessment Inventory—Borderline Features* (PAI-AI) scale (Morey 1991), which was administered as part of the annual PGS assessment battery. Specifically, to ensure the sample had a high degree of variability in terms of affective instability, a core feature of BPD, participants with high affective instability (scores > 11 on the PAI-AI) were oversampled (resulting in 26 % of the sample endorsing clinically significant levels of affective instability). The remainder of the sample was randomly selected from girls endorsing low levels of affective instability (scores < 11). Of the 131 participants who were contacted for the Personality sub-study, 113 (86.3 %) were successfully enrolled in the study. Of these enrolled individuals, 74 participants chose to complete the parent-adolescent conflict discussion task, which forms the basis for the present study.

Therefore, data for the current study come from 74 adolescent girls and their biological mothers who received observational ratings based on their participation in a conflict discussion task. Independent samples t-tests and Chi Square analyses indicated that these 74 girls were comparable to the Personality sub-study sample of 113 in terms of race, poverty, and BPD dimensional scores (all p's > .05). Reflecting the demographic characteristics of the PGS, the current sample was racially and socioeconomically diverse. The majority of participants identified as Black or African American (65 %, $n = 48$), and the remainder identified as White, and 55 % of families reported receiving public assistance in the past year (e.g., food stamps, WIC, Temporary Assistance for Needy Families).

Procedures

As part of the personality sub-study, adolescent personality disorder symptoms were assessed via semi-structured clinical interviews across 4 assessment waves, approximately 6 months apart, over the course of 18 months. Wave 1 occurred when girls were approximately 16 years of age. Additionally, at the wave 2 assessment, mothers and daughters were videotaped while completing a structured conflict discussion task. All study procedures were approved by the University Institutional Review Board. Families were compensated for their participation.

Measures

Affective Instability—As noted above, affective instability was assessed in the larger PGS study with the PAI-AI subscale (Morey 1991). This subscale contains six items, each of which is rated on a scale from 0 to 3 (0 = *false/not at all true,* 3 = *very true*). The PAI-AI subscale assesses the affective instability associated with BPD symptoms. In contrast with measures of neuroticism or negative affect, the PAI-AI subscale assesses emotional intensity as well as variability (e.g., "My mood can shift quite suddenly"). Scores greater than 11 on the PAI-AI (two standard deviations above the mean score for community participants) suggest clinical significance (Morey 1991; Trull 1995). Our recruitment strategy of oversampling participants high (> 11) in affective instability on the PAI-AI resulted in adequate variability on this measure (range: 0–17, M = 3.40, SD = 5.00). In the present sample, the PAI-AI items demonstrated adequate internal consistency (αs = .67–.82).

BPD Criteria—BPD diagnostic criteria were assessed dimensionally at each wave using the Structured Clinical Interview for DSM-IV Personality Disorders (SIDP-IV; (Pfohl et al. 1997), a semi-structured interview with established reliability and validity for assessing the presence and severity of personality disorders in adolescents. Interviewers were post-baccalaureate, masters, or doctoral-level clinicians who were trained to reliability by the corresponding author (SDS).

The nine items corresponding to individual DSM-5 diagnostic criteria for BPD were rated on a 0–3 scale (0 = *not present*, 1 = *subthreshold*, 2 = *present*, 3 = *strongly present*). Per *DSM-5* (APA 2013) guidelines for the diagnosis of personality disorder in adolescence, criteria were only rated "present" at the wave 1 assessment if they were present for at least the past year and judged to be pervasive, persistent, and unlikely to be limited to developmental stage or an episode of another disorder. Criteria at the follow-up assessments were rated "present" if they were present during the last 6 months. The nine BPD items were summed to yield a dimensional score for BPD criteria, which was used as a continuous measure of BPD severity. Twenty-one participants' wave 1 SIDP-IV interviews (28 % of the analyzed sample) were videotaped and rated by at least one additional independent rater for calculation of interrater reliability. The number of raters per case ranged from 2 to 6 (N = 14 cases had 2 raters, 3 had 3 raters, 2 had 4 raters, and the remaining 2 had 5 and 6 raters). ICC's were calculated based on one-way random effect models for the unequal number of raters per case, and demonstrated excellent interdiagnostician agreement for BPD dimensional scores (ICC = .91). The prevalence of diagnosable BPD (i.e., 5 symptom criteria met) at the wave 1 assessment in this sample was 6.8 % (n = 5), which is similar to

reported prevalence rates in other community adolescent and mixed-age samples (e.g., 3–6%; (Chabrol et al. 2004; Zanarini et al. 2011; Zanarini et al. 2003). Consistent with previous studies using adolescent samples (Becker et al. 2006), intense anger (29 %) and affective instability (28 %) were the most frequently met BPD criteria.

Anxiety and Depression Severity—Anxiety and depression severity were assessed at wave 1. Anxiety symptoms were assessed with the Screen for Child Anxiety Related Emotional Disorders (SCARED) (Birmaher et al. 1997), a self-report measure that assesses a range of anxiety symptoms. The SCARED has demonstrated excellent psychometric properties in adolescent samples (Hale et al. 2005). For the present study, 29 items were administered, assessing generalized anxiety (nine items), social phobia (seven items), panic/somatic symptoms (13 items), whereas the separation anxiety and school phobia scales were not administered, as they were theorized to be less relevant to adolescents. Each item was rated on a scale from 0 to 2 (0 = *not true or hardly ever true,* 2 = *very true or often true*). The total anxiety summary score from all three scales was used as a measure of anxiety symptoms in the present study, and demonstrated adequate internal consistency in the present sample ($\alpha = .93$). Depressive symptoms were assessed with the Adolescent Symptom Inventory-4 (ASI-4R), using the youth inventory, which assesses symptoms of major depressive disorder, as well as 17 other emotional and behavioral disorders (Gadow & Sprafkin, 1998). For the present study, we calculated depressive severity based on the sum of responses to the 11 items assessing depressive symptom, each of which was rated on a 1–4 scale (1 = *never,* 4 = *all the time*). The ASI-4 depression scale has demonstrated excellent psychometric properties and correspondence with diagnoses of major depression in adolescent samples (Gadow et al. 2002). The total depression severity score demonstrated adequate internal consistency in the present sample ($\alpha = .86$).

Mother–Daughter Conflict Discussion—Mothers and daughters were videotaped while completing a structured conflict discussion task in the laboratory designed to elicit negative affect (O'Connor et al. 1995). Mothers and daughters completed a 25-item questionnaire assessing common areas of conflict between adolescents and their mothers (e.g., manners, chores, behavior toward parent) on two scales: (1) frequency, ranked from 1 (*never*) to 6 (*more than once per day*), and (2) intensity, ranked between 1 (*not at all bad*) and 5 (*extremely bad*). Topics were selected by trained research assistants based on the highest intensity and frequency combination endorsed by either mother or adolescent report. Dyads were asked to discuss the conflict and "try and come up with some possible solutions" during an 8-min videotaped discussion (Furman and Shomaker 2008; McMakin et al. 2011). The most common argument selected was the "attitude and manners" of the adolescent. Most often, the argument chosen was a topic that the mother and dyad argued about daily (31.1 % of the dyads). The majority of the sample (60.9 %, n = 55) reported that the level of intensity/severity of the arguments surrounding the topic chosen was somewhat, very, or extremely bad.

Observational Coding—The Revised Interactional Dimensions Coding System (IDCS-R; Furman and Shomaker 2008) was used to code the mother–daughter interactions. This coding system was originally designed to observationally measure couples' interactions

during problem solving and was modified for use with adolescents (Furman and Shomaker 2008). The IDCS-R coding system contains the following individual codes: positive affect, negative affect, problem solving, denial, dominance, task avoidance, support, conflict, withdrawal, communication skills, promoting autonomy, support seeking. The coding systems also contain the following dyadic codes: positive escalation, negative escalation, mutuality, relationship quality, and satisfaction. Coders were blind to each participant's BPD symptom scores and study hypotheses. Tapes were randomly assigned to each coder; ratings were based on observable behavior, facial expressions, and the verbal content of both mothers and daughters in each interaction. The current project focuses on the subset of IDCS-R maternal and adolescent behavior codes that directly pertain to our study hypotheses. Mothers' interpersonal ER behavior was coded based on her own individual behaviors during the task, i.e., support-validation and problem-solving behaviors, reflected in the IDCS-R codes of the same names. Maternal support was defined as "positive listening and speaking skills that demonstrate understanding" of the adolescent. Maternal support included statements such as, "You are dealing with a lot right now," or "I can understand how you feel." Maternal problem solving was defined as "defining a problem and working toward a satisfactory solution." Maternal problem solving included statements such as, "Let's see if we can figure out what to do about this," or "Maybe you could try doing this instead of what you have been doing." In addition to the example statements above, to score high on maternal problem solving or support/validation, vocal tone would have needed to be consistently warm/neutral, and body language would have needed to be open, oriented toward the daughter, and maintaining appropriate eye contact. Adolescents' expressed negative affect was also coded during the task based on negativity of facial expressions, body positioning, and emotional tone. Girls negative affect includes statements such as, "I hate talking about this," overt behavior such as yelling, a negative vocal tone, and/or orienting her body away from the caregiver.

Mothers and daughters were rated on a five-point Likert scale with half-point intervals (1 = *extremely uncharacteristic* to 5 = *extremely characteristic*). Twenty-one percent of the tapes were coded by all members of the team (N = 6) and were used to calculate inter-rater agreement. Intra-class coefficients for the codes of interest were: 0.80 (support/validation), 0.82 (problem solving), and 0.87 (negative affect) are consistent with other research using the IDCS-R coding system in adolescent-parent dyads (Furman and Shomaker 2008; McMakin et al. 2011).

Data Analytic Plan

Our primary analyses examining the main and interactive effects of maternal interpersonal ER strategies and girls' negative affect in the prediction of girls' BPD severity were conducted using multilevel linear models (MLM) in SPSS version 22 (IBM), given the repeated measures of BPD symptoms (at waves 1–4) nested within participants (Raudenbush and Bryk 2002). We included an autoregressive error structure to account for dependencies due to the repeated measurement of BPD symptoms over time. To examine the main and interactive effects of each of the interpersonal ER strategies (i.e., maternal problem solving and support/validation) with girls' NA in the prediction of BPD symptoms over time, we included fixed effects in each MLM for time (i.e., within-individual change over time in

BPD symptoms across waves 1, 2, 3, 4; coded as time = −1, 0, 1, and 2, respectively, given that the conflict discussion occurred at wave 2), maternal problem solving (grand mean-centered), maternal support/validation (grand mean-centered), girls' NA (grand mean-centered), and their interactions. Random effects for the BPD symptoms intercept were included in all models to account for individual variability in mean levels of BPD symptoms (with a variance components error matrix), although the residuals for the slopes of time were not permitted to vary because they resulted in lack of convergence, perhaps due to the complexity of the models and the small sample size. Use of public assistance (coded 1 = family received public assistance, 0 = family did not receive public assistance) and minority race (coded 1 = Black or African American, 0 = White) were included as covariates, consistent with past research in this sample (Scott et al. 2015; Stepp et al. 2014; Whalen et al. 2014). We probed significant interactions using simple slopes tests for multilevel models (Preacher et al. 2006). Slopes are reported at 2 SD above and below the mean for continuous variables. As a secondary analysis, we examined whether these associations remained when controlling for concurrent depression and anxiety severity.

Results

Preliminary Analyses

Descriptive statistics and intercorrelations of primary variables are presented in Table 1. As we expected, girls' negative affect and BPD severity were significantly correlated at every assessment wave. Of interest, maternal interpersonal ER strategies were not significantly associated with girls' negative affect or BPD severity at any wave. Given evidence of skew in BPD severity variables (skew/SE > 2), symptom scores were logarithmically (base 10) transformed. Before examining the full MLM, we tested a model examining change in BPD symptoms over waves 1–4, controlling for public assistance and race. The random effect of the intercept indicated significant individual variability in average levels of BPD symptoms at age 16 to be explained by predictors ($\sigma^2 = 0.09$, SE = 0.02, Wald $Z = 5.21$, $p < .001$).

Primary Analyses

Estimates of fixed effects for the MLM are presented in Table 2. This model (−2LL = 129.26, AICC = 135.36) revealed a main effect of Time, with time associated with decreases in BPD severity. There was also a main effect of girls' NA, with higher negative affect associated with greater BPD severity. This effect of girls' negative affect, however, was qualified by a girls' negative affect × maternal problem solving × maternal support/validation interaction, which significantly improved the model (likelihood ratio test $\chi^2 - {}_{2LL}(1) = 3.89$, $p < .05$), as shown in Figs. 1 and 2. Specifically, girls' negative affect was only associated with greater BPD severity at wave 2 in the context of high maternal problem solving and low maternal support/validation, B = 0.50, SE = 0.24, z = 2.09, $p = .04$. Unexpectedly, in the context of low maternal problem solving and high maternal support/validation, girls' negative affect was marginally associated with BPD severity at wave 2, B = 0.54, SE = 0.30, z = 1.83, $p = .07$. In contrast, girls' negative affect was not associated with BPD severity in the context of low levels of both maternal problem solving and support/validation, B = −0.17, SE = 0.13, z = −1.29, $p = .20$, or high levels of both maternal problem solving and support/validation, B = 0.04, SE = 0.15, z = 0.27, $p = .78$. In terms of regions of

significance, simple slopes were significant outside the region demarcated by maternal problem solving at the lower bound (−2.79; 0 % below) and upper bound (0.83; 12.2 % above) of low maternal support/validation, whereas simple slopes were significant inside the region demarcated by maternal problem solving at the lower bound (−0.70; 14 % below) and upper bound (0.27; 51.4 % above) of high maternal support/validation. There were no significant interactive effects with time, suggesting that neither girls' negative affect, maternal problem solving, maternal support/validation, nor their interactions predicted changes in BPD severity over 18 months.[1],[2]

Secondary Analyses

This above-mentioned pattern of findings remained in the MLM controlling for anxiety severity, with a significant girls' negative affect × maternal problem solving × maternal support/validation interaction, B = −0.09, SE = 0.05, p = .05. Likewise, this pattern of findings emerged in the MLM controlling for depressive severity, with a significant girls' negative affect × maternal problem solving × maternal support/validation interaction, B = −0.09, SE = 0.05, p = .05.

Given that anxiety and depressive severity were only assessed at baseline, we conducted multiple regression analyses with girls' negative affect, maternal problem solving, maternal support/validation, and their interactions in the prediction of anxiety and depressive severity in two separate models, controlling for wave 2 BPD severity, public assistance, and race. In the model with total anxiety as the dependent variable, R^2 = 0.24, $F(10, 58)$ = 1.84, p = .07, only Wave 2 BPD severity was a significant predictor of anxiety, B = 10.35, SE = 4.22, t = 2.45, p = .02, whereas the main effects of girls' negative affect, maternal problem solving and support/validation, Bs = 0.96–2.67, SEs = 1.89–2.18, ts = −0.51–1.22, ps = .23–.61, and the two-way interactions, Bs = −1.39–2.04, SEs = 1.86–2.95, ts = −0.75–0.75, ps = .45–.63, were nonsignificant. Similarly, the girls' negative affect × maternal problem solving × maternal support/validation was nonsignificant, B = −0.48, SE = 1.96, t = −0.25, p = .81. In the model with depressive severity as the dependent variable, R^2 = 0.26, $F(10, 58)$ = 2.06, p = .04, only Wave 2 BPD severity was a significant predictor of depressive severity, B = 7.60, SE = 2.31, t = 3.29, p = .002, whereas the main effects of girls' negative affect, maternal problem solving and support/validation, Bs = −0.91–0.13, SEs = 1.03–1.19, ts = −0.76–0.11, ps = .45–.91, and the two-way interactions, Bs = −0.55–0.34, SEs = 1.02–1.62, ts = −0.37–0.21, ps = .71–.86, were nonsignificant. Similarly, the girls' negative affect × maternal

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[1]Of note, when maternal problem solving was considered as the independent variable, and girls' negative affect and maternal support/validation were considered as moderators, maternal problem solving was associated with lower BPD severity in the context of low girls' negative affect and low maternal support/validation, B = −0.28, SE = 0.12, z = −2.38, p = .02. In contrast, in the context of low girls' negative affect and high maternal support/validation, there was no significant association between maternal problem solving and BPD severity, B = 0.21, SE = .27, z = 0.77, p = .44. In the context of high girls' negative affect and low maternal support/validation, problem solving was marginally associated with BPD severity, B = 0.50, SE = 0.27, z = 1.87, p = .06, whereas in the context of high girls' negative affect and high maternal support/validation, maternal problem solving was marginally associated with lower BPD severity, B = −0.38, SE = 0.21, z = −1.76, p = .08. In terms of regions of significance, simple slopes were significant outside the region demarcated by girls' negative affect at the lower bound (−1.12) and upper bound (2.36) of low maternal support/validation.

[2]Although the incorporation of repeated measures of BPD severity increases our power to detect significant effects (Raudenbush and Xiao-Feng 2001), given the absence of significant interactions with time, we trimmed the interactions with time from the model and estimated the model again. The interaction of girls' negative affect, maternal problem solving, and maternal support/validation remained significant, B = −0.12, SE = 0.05, p = .02.

problem solving × maternal support/validation was nonsignificant, B = −0.30, SE = 1.07, $t =$ −0.28, $p = .78$.

Discussion

The present study examined the influence of adolescent expressed negative affect and two maternal interpersonal ER strategies in the context of a mother–daughter conflict discussion task on their adolescent daughter's BPD severity assessed both concurrently and prospectively. Results from this study suggest that maternal problem solving in the absence of support/validation in response to adolescent girls' high expressed negative affect is associated with greater concurrent BPD severity, even after controlling for depression and anxiety severity. These findings set the stage for more a more nuanced understanding of the interplay between interpersonal and emotional processes in the pathogenesis of BPD severity.

Replicating past work (Carlson et al. 2009; Stepp et al. 2014), findings from the present study suggest that girls' negative affect expressed during a conflict discussion is concurrently associated with adolescent girls' BPD severity. Counter to expectations, however, maternal support/validation was not associated with lower concurrent BPD symptoms after controlling for the influence of adolescent negative affect, nor was support/validation predictive of change in BPD severity over time. Whereas theory suggests invalidation may contribute to the development of BPD (Linehan 1993), validation may represent an independent construct that is not as strongly associated with BPD. This finding also runs counter to past research which suggests that support/validation is associated with less risk for symptoms of psychopathology in a younger sample of adolescents (McMakin et al. 2011). It is possible that maternal support/validation may be important in the emergence of BPD severity, but is of less importance in maintaining such symptoms over time, although this remains a question for future study. It is further possible that maternal support/validation has a greater influence on some features of BPD, such as emotion dysregulation (Shenk and Fruzzetti 2014), but not overall BPD severity. An examination of this prospect was beyond the scope and power of the present study, but constitutes an important question for further study.

Extending this line of inquiry, the present study revealed an interaction between maternal problem solving, maternal support/validation, and adolescent negative affect on adolescent girls' BPD severity. Providing partial support for our hypotheses, maternal problem solving in the absence of maternal support/validation in to the context of girls' high levels of expressed negative affect was associated with greater concurrent BPD severity. Among adolescents high in negative affect, problem solving, and presumably other forms of instrumental maternal strategies in the absence of explicit support and validation, may be viewed as insensitive to their distress and possibly invalidating. Such perceived parental invalidation in the context of negative affect have been theoretically and empirically identified as crucial precursors to the development of BPD (Linehan 1993; Sauer and Baer 2010). Importantly, much of the existing research on invalidation as a predictor of BPD focuses on retrospective self-report measures (e.g., Krause et al. 2003). As such, the problem solving behaviors observed in the present study may, in some cases, actually overlap with

those recalled later as invalidating by adolescents. This possibility points to the importance of using observed behaviors as predictors of the emergence of BPD. When girls' high negative affect was expressed in the context of high maternal problem solving and high support/validation, however, the association between negative affect and BPD severity became nonsignificant. This finding provides support for enhancing communications of validation among families of individuals struggling with BPD (Fruzzetti et al. 2005; Stepp et al. 2012).

The cross-sectional nature of these associations raises the possibility of multiple interpretations of these data. For instance, it may be that maternal interpersonal ER is provided in response to girls' negative affect, but it is equally possible that girls' negative affect occurs in response to maternal interpersonal ER. The global coding system used in the current study did not allow for the time course of maternal-adolescent behaviors and responses to be assessed. Future research using more fine-grained, second-to-second coding systems to analyze mother–daughter interactions may be useful for exploring this interpretation. It is also possible that mothers of girls with high BPD severity exhibit greater negative affect themselves, and this complicates the provision of support/validation and problem solving, although an examination of this question is beyond the scope of the present work. Furthermore, despite the mutual influences between parental and child behaviors, adolescent behaviors may contribute more to changes in parental behaviors than the reverse during this developmental period (Stepp et al. 2014). As such, it is possible that maternal interpersonal ER is driven by girls' BPD features, rather than the reverse.

Of interest, future work using similar paradigms may wish to further explore the nonsignificant but notable relation between negative affect and BPD severity in the context of high maternal support/validation and low maternal problem solving. It is possible that, as suggested by Linehan in her description of responses to early efforts to treat BPD, excessive support and acceptance in the absence of change-directed behaviors may also be interpreted as invalidating (Linehan 1993). Thus, current interventions, such as dialectical behavior therapy, focus on balancing the dialectic of acceptance and change in BPD treatments. Furthermore, the present study focused on one component of the dyadic conflict discussion —namely, mothers' responses to their daughters' negative affect. Although it was not the focus of the present investigation, future work could also explore the influence of maternal emotional expressions.

This study adds to a small but growing line of research using structured parent-adolescent dyadic conflict tasks to identify factors related to the development of BPD (Crowell et al. 2008; Schuppert et al. 2014; Whalen et al. 2014). In light of etiological theories of BPD emphasizing the interplay of individual emotional vulnerability and interpersonal environments, this interactive paradigm is of particular relevance to BPD. Structured dyadic discussions offer the ability to assess both perceived and observed interpersonal and affective behaviors in a more ecologically-valid context, possessing similarity to contexts in which affect dysregulation and parental interpersonal ER occur in daily life.

Despite the strengths of this work, several limitations of the present study are worth considering. First, the absence of any significant interactions with time precludes any

interpretations regarding how these factors may relate to the emergence or trajectory of BPD severity. Although this study incorporated several time points over an 18-month window during adolescence, this is a small snapshot of the onset and maintenance of BPD severity. Indeed, although adolescence constitutes a pivotal period in terms of the development of ER (or lack thereof) as well as BPD severity, the observed interaction occurred within the context of a well-established mother–daughter relationship and offers only a small snapshot into their emotions and behaviors. In addition, it is possible that some parental factors leading to the onset of BPD take precedence at specific developmental periods. For instance, although there is some evidence of reciprocal associations between parental and child behaviors, adolescent behaviors may be more likely to alter parental behaviors than the reverse during this period of development (Stepp et al. 2014). Second, although the use of a behavioral measure of dyadic emotional and interpersonal processes enhances the present study, this observation was completed at a single time point. Indeed, even within a single interaction, it could be useful to record the temporal sequencing of specific interpersonal ER strategies. For instance, it is possible that problem solving is beneficial if provided immediately following support/validation. In addition, we did not assess the context surrounding this interaction, including pre-task affect. Therefore, this interaction was not contextualized by the influences of other factors. Future work in this area should incorporate multiple behavioral assessments to permit a fuller examination of the reciprocal influences of these dynamics over time. Third, although the high-risk, community nature of this sample is a strength of the present study, the prevalence of threshold BPD was low. That said, evidence suggests that even subthreshold problems associated with BPD are clinically significant in adolescence, and are associated with poorer social functioning and clinical impairment (Wright et al. 2015).

Notwithstanding these limitations, this study constitutes one of the first to rigorously examine the interplay of adolescent affect and specific maternal interpersonal ER strategies in BPD. Importantly, the present study suggests that one purportedly adaptive interpersonal ER strategy, problem solving, may not confer benefits on its own to adolescents expressing high negative affect. Specifically, maternal problem solving in response to high levels of adolescent expressed negative affect may be associated with adverse outcomes, unless the problem solving is combined with support and validation. This finding is of particular interest given that those high in expressed negative affect are also most at-risk for BPD (Carlson et al. 2009). As clinical researchers pinpoint parental and family interventions to prevent the development of BPD (Chanen and McCutcheon 2013; Stepp et al. 2012), research such as the present study holds promise to refine existing interventions. Further research is needed to delineate more specific contexts in which maternal interpersonal ER strategies, such as problem solving and validation, may buffer girls from BPD pathology.

Acknowledgments

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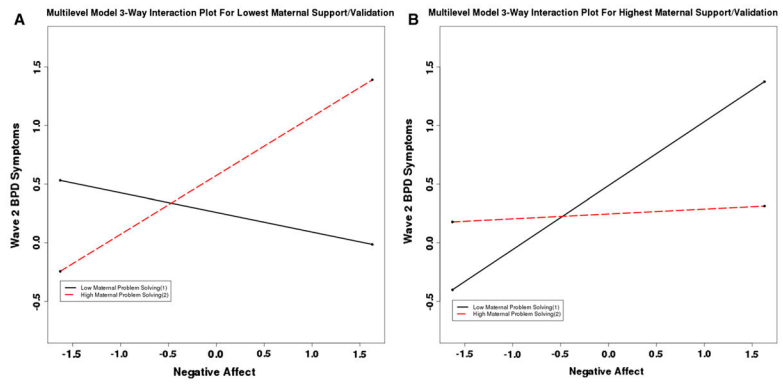
Fig. 1.
a Plot of three-way interaction at low (M − 2*SD) and (**b**) high (M + 2*SD) levels of maternal support/validation in the prediction of Wave 2 BPD symptoms. *Note* Maternal problem solving plotted at low (M − 2*SD) and high (M + 2*SD) levels. *BPD* borderline personality disorder at Wave 2
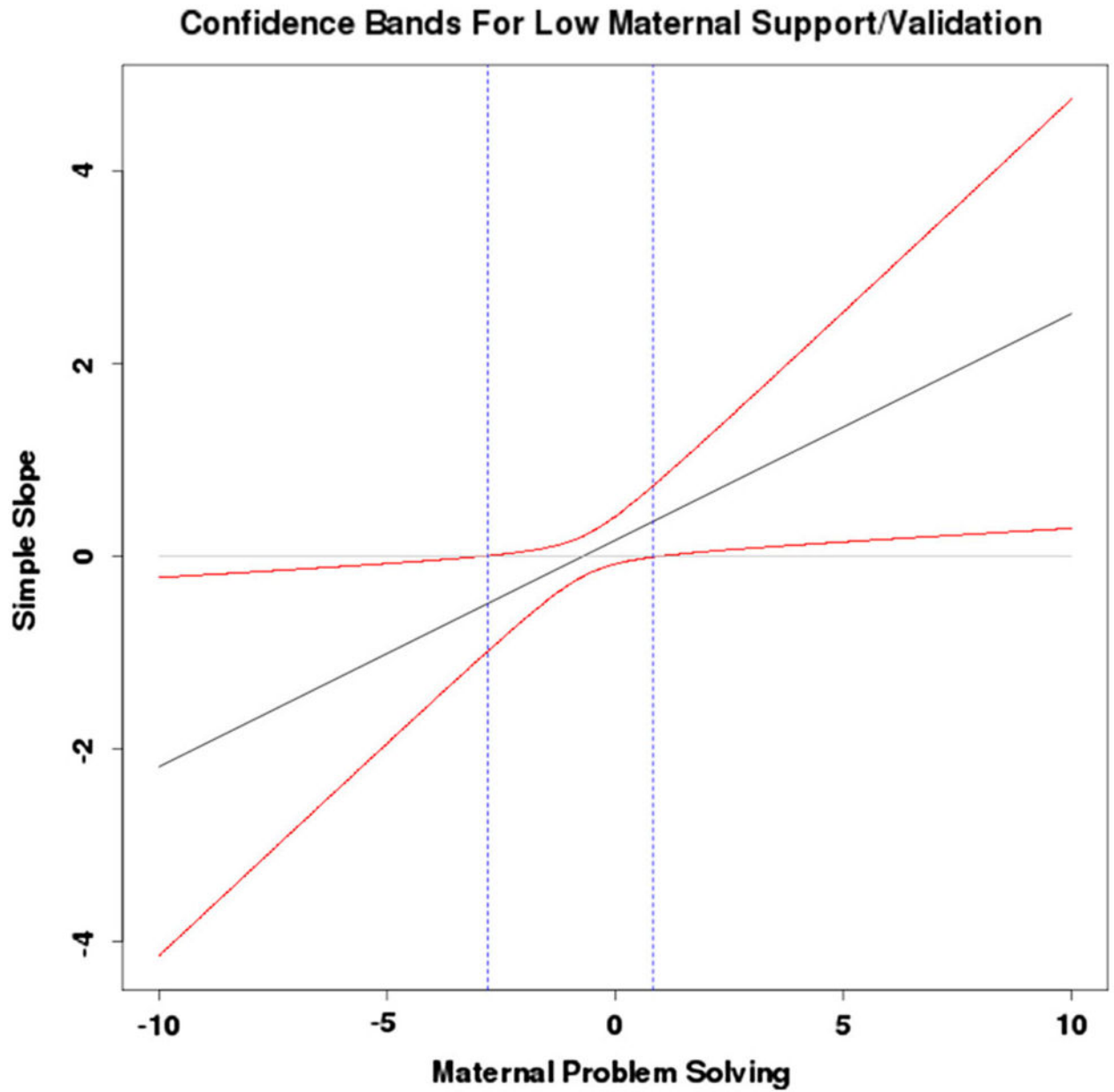
Fig. 2.
Plot of regions of significance of the simple slope of girls' negative affect and Wave 2 BPD
symptoms. *Note BPD* borderline personality disorder at Wave 2

Table 1

Descriptive statistics and intercorrelations among primary study variables

	N	1	2	3	4	5	6	7	8	9	10	11
1. Public assistance (0 = absent, 1 = present)	74	—										
2. Minority race (0 = absent, 1 = present)	74	0.37**	—									
3. Girls' negative affect	74	−0.06	−0.02	—								
4. Maternal problem solving	74	−0.27*	−0.21	−0.07	—							
5. Maternal support/validation	74	−0.25*	−0.09	−0.16	0.56***	—						
6. W1 BPD severity[a]	74	0.31**	0.12	0.36**	−0.09	−0.09	—					
7. W2 BPD severity[a]	69	0.30*	0.22	0.34**	−0.05	−0.16	0.74***	—				
8. W3 BPD severity[a]	56	0.11	−0.07	0.35**	−0.03	−0.08	0.74***	0.70***	—			
9. W4 BPD severity[a]	65	0.26*	0.06	0.29*	−0.04	−0.05	0.66***	0.70***	.68**	—		
10. Anxiety severity	74	0.01	0.16	0.21	0.10	−.003	0.47***	0.41**	0.42**	0.48***	—	
11. Depression severity	74	0.14	0.17	0.15	−0.13	−0.16	0.48***	0.48***	0.34*	0.45***	0.51***	—
Mean/%		55.41 %	64.86 %	2.98	2.65	2.53	3.93	3.20	3.20	3.48	15.35	8.85
SD/N		n = 41	n = 48	0.82	0.72	0.87	4.02	3.54	3.54	3.53	10.76	6.02
Range		—	—	1.50–5.00	1.00–4.50	1.00–4.50	0.00–15.00	0.00–15.00	0.00–15.00	0.00–15.00	0.00–44.00	2.00–22.00

BPD = borderline personality disorder severity, assessed with the Structured Interview for DSM-IV Personality Disorders (SIDP); W1–W4 = assessment waves 1, 2, 3, and 4, beginning at age 16 and occurring at approximately 6 month intervals

*
$p < .05$,

**
$p < .01$,

***
$p < .001$

[a] Analyses were conducted with logarithmically transformed variables, but raw descriptives are provided for interpretability

Table 2

Multilevel linear model examining the main and interactive roles of maternal interpersonal emotion regulation and girls' negative affect on borderline personality disorder symptoms

Effect	B	SE	t	df	p
Intercept	0.39	0.07	5.88	65.55	<.001
Race (0 = White, 1 = Black/African American)	0.05	0.08	0.67	63.73	.50
Public assistance (0 = does not receive, 1 = receives)	0.21	0.08	2.77	62.82	.01
Time	−0.03	0.01	−2.64	85.59	.01
Girls' NA	0.23	0.05	4.51	65.77	<.001
Maternal problem solving	0.01	0.06	0.21	66.06	.83
Maternal support/validation	−0.01	0.05	−0.29	65.94	.78
Time × girls' NA	0.00	0.02	0.05	85.19	.96
Time × maternal problem solving	0.00	0.02	−0.11	90.44	.91
Time × maternal support/validation	0.00	0.02	−0.05	86.35	.96
Girls' NA × maternal problem solving	0.03	0.08	0.36	66.30	.72
Girls' NA × maternal support/validation	0.04	0.07	0.52	66.43	.61
Maternal problem solving × support/validation	−0.06	0.05	−1.10	66.19	.27
Time × girls' NA × maternal problem solving	−0.03	0.03	−1.06	95.55	.29
Time × Girls' NA × Maternal support/validation	0.00	0.02	0.05	87.70	.96
Time × Maternal problem solving × support/validation	0.03	0.02	1.68	91.79	.10
Girls' NA × Maternal problem solving × support/validation	−0.12	0.05	−2.33	66.57	.02
Time × girls' NA × maternal problem solving × support/validation	−0.03	0.02	−1.51	95.38	.13

NA negative affect