Perceived parental protection and cortisol responses among young females with borderline personality disorder and controls

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ABSTRACT

Borderline personality disorder (BPD) has been associated with deviations in cortisol in response to interpersonal stressors. Identifying mechanisms contributing to such deviations may help to address emotional dysregulation and the increased risk of self-destructive behavior. While dysfunctional relationships to caregivers have been widely reported among individuals with BPD, their contribution to cortisol hyperresponsiveness has yet to be investigated. Fifty-one females (aged 18–24 years) participated to assess the impact of BPD and the quality of protective care in mother-daughter relationships on stress responsiveness. Seventeen females with BPD and twenty females without BPD participated with their mothers in a videotaped parent-young adult conflict discussion. Fourteen non-BPD females without their mothers were assessed for cortisol levels without stress exposure. Salivary cortisol samples were collected at lab entry and 20 and 40 min after the onset of the discussion. Results revealed a higher overall cortisol response in the BPD group upon lab entry. BPD participants reported less experienced protection in the mother-daughter relationship which was associated with higher cortisol levels on lab entry and higher distress at study end. Results point to the perceived quality of parental protection as likely to modulate the activity of the stress response system among BPD patients.

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1. Introduction

Borderline personality disorder (BPD) is defined as a “pattern of instability in interpersonal relationships, self-image, and affect, and marked impulsivity” (American Psychiatric Association, 2000, p. 706). Genetic factors, childhood trauma and dysfunctional parent-child interactions have been identified in the etiology of BPD (Zanarini et al., 2006; Gunderson, 2009; Nemoda et al., 2010). BPD’s core symptoms, namely, impulsive behavior, self-injury and affective instability, are reactive to stress, particularly stress related to interpersonal conflict (Zimmerman and Choi-Kain, 2005). Evidence is accumulating that the hypothalamic–pituitary–adrenal (HPA) axis, normally responsible for behavioral and physiological regulation of stress, functions abnormally in those with a diagnosis of BPD, leading to problems in stress resiliency and emotional regulation (Wingenfeld et al., 2010). Recent neuroimaging studies in adults with BPD also have demonstrated increased amygdala reactivity to emotional stimuli, which may also contribute to emotional hyperreactivity (Herpertz et al., 2001; Donegan et al., 2003). BPD is also marked by affective instability, which contributes to high rates of self-destructive behavior and increased risk of suicide (Yen et al., 2004). Improving our understanding of factors underlying abnormal stress responsiveness may thus be beneficial for tailoring interventions to enhance regulation of emotions and thereby reduce risk behavior.

1.1. BPD and interpersonal relationships

Dysregulated and unstable relationships with caregivers or partners constitute one of the main clinical features of BPD. This feature often continues well into adulthood and is more resistant to change over time than other impulsive features of BPD (Zweig-Frank and Paris, 1991; Allen and Farmer, 1996; Zanarini et al., 2010). The development of these maladaptive child-caregiver patterns of relationship is thought to contribute to the continuous difficulties in dyadic interactions associated with BPD (Macfie and Swan, 2009). In addition, individuals with BPD retrospectively report high rates of abusive and neglecting interactions with parents during the childhood years (Zanarini et al., 1989).

1.2. Cortisol secretion

In a naturalistic study by Lieb et al. (2004), higher daily cortisol secretion and more cortisol non-suppressors were reported in patients with BPD relative to healthy controls. Moreover, in response to a stress manipulation, research has found increased cortisol secretion among BPD patients. More recently, research has shown increased cortisol secretion in response to psychological stress manipulations (Lieb et al., 2004; Zanarini et al., 2006; Donegan et al., 2003). Moreover, recent neuroimaging studies have demonstrated increased amygdala reactivity to emotional stimuli in adults with BPD (Herpertz et al., 2001; Donegan et al., 2003). These findings suggest that increased cortisol secretion and amygdala hyperreactivity may be related to each other in BPD.
secretion and reduced feedback sensitivity of the HPA axis in individuals with BPD compared to healthy controls (Wingenfeld et al., 2010). For example, using a mother-child conflict discussion task as an interpersonal stressor among adolescents with BPD, Walter et al. (2008) found delayed cortisol recovery following the conflict discussion in the BPD group compared to healthy controls. Nonetheless, not all studies report an increase in cortisol among adults with BPD. Nater et al. (2010) reported decreased mean salivary cortisol concentrations among female BPD patients when completing the Trier Social Stress Test (TSST; Kirschbaum et al., 1993). Therefore it appears that both hyper- and hypo-reactivity of the stress response system could play a role in emotional dysregulation in individuals with BPD (Nater et al., 2010).

1.3. Neural correlates

Studies investigating attachment security among BPD patients have found higher rates of unresolved attachment classifications in BPD groups (Barone, 2003; Buchheim et al., 2008). In BPD patients, Buchheim et al. (2008) found decreased activity in the parahippocampal gyrus and increased activity in the superior temporal sulcus in response to dyadic attachment-activating functions. Functional changes were interpreted as neural indicators for fear-based hypervigilance in dyadic interactions and reduced positive valence of memories associated with attachment relationships.

1.4. Resiliency

Recent cortisol studies highlight the role of sensitive and responsive caregiving as an important resiliency factor. In a non-clinical cortisol study, Kertes et al. (2009) showed that the sensitivity of the caregiver constituted an important buffer of the HPA axis response to stress in children with social inhibition. Similar buffering effects on cortisol response have been shown in infancy (Hertsgaard et al., 1995).

1.5. Goals

The current study investigated the contribution of perceived parental protection to stress anticipation and stress responsiveness using an interpersonal stressor among young females with BPD. Since behavioral and affective symptoms are reactive to interpersonal stress in close relationships in BPD, cortisol reactivity was expected to be related to interpersonal stressors with family members. The current study assessed the influence of BPD and of perceived maternal protection on the cortisol response of young adults by exposing participants to a conflict discussion with their mothers.

1.6. Hypotheses

Based on the reviewed research, we formulated three hypotheses. First, young females with BPD were expected to report lower levels of perceived parental protection from their mothers than controls. Secondly, young female adults with BPD were expected to show greater overall stress sensitivity reflected in higher levels of mean cortisol over the course of the conflict discussion session compared to the no-diagnosis controls. Thirdly, we expected variations in daughters’ perceptions of parental protection to be related to stress responsivity. Subjects with lower levels of perceived parental protection from their mothers were expected to show elevated cortisol responses over the course of the study compared to subjects reporting more perceived protection from their mothers.

2. Method

2.1. Participants

Participants were 51 females (aged 18 to 28, Mage = 21.62, SDage = 2.35). There were three groups in the study: (1) females with a diagnosis of BPD who participated in a conflict discussion with their mothers (BPD, n = 20) and (2) females without BPD diagnosis who participated in a conflict discussion with their mother (NC, n = 21) and (3) females without BPD diagnosis who participated by completing the self-report measures and the cortisol assessments but who did not come in with their mothers and did not engage in the conflict discussion task (NC_noM, n = 14). Both NC and BPD groups were recruited from the larger study sample (N = 368) of the McLean Family Study of Personality (Moff Guderson). In the McLean study, the BPD group was recruited both from the McLean inpatient services and from the community while the NC group was recruited from the community. The NC_noM group was also recruited from the community.

A single subject was excluded from each of the BPD and NC groups and two subjects were excluded from the NC_noM group due to unusable cortisol data. Forty-seven participants with cortisol samples contributed to the present study analyses (16 BPD, 19 NC, 12 NC_noM). As part of the McLean study, participants in the BPD and NC group were screened on the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First et al., 1995 and the Revised Diagnostic Interview for Borderlines (DIB-R; Zanarini et al., 1989)). Those in the BPD group received scores of eight or higher on the DIB-R (M = 8.87, SD = 0.83). Individuals in the NC group scored ≤3 on the DIB-R and did not meet criteria for BPD. The non-BPD group scored significantly lower on the DIB-R than the BPD group (M = 0.62, SD = 1.14; t(25) = 22.74, p < 0.0001). Participants in the BPD and NC groups in the current study were representative of the larger study from which they were recruited, with BPD participants showing no significant difference in DIB-R scores from the mean for the larger study.

Control subjects participating without their mothers (NC_noM) were added to the study at a later date and were recruited from the same communities as the McLean study sample. Participants in the NC_noM group were assessed using the McLean International Neuropsychiatric Interview (Sheehan et al., 1997) and screened for BPD diagnosis using the McLean Screening Instrument for BPD (Zanarini et al., 2003), excluding those with a screening score greater than 3.

As expected, comorbidity of disorders was common in the BPD group (major depressive disorder (75%), social phobia (12.5%), panic disorder (6.2%), posttraumatic stress disorder (12.5%), substance and alcohol abuse (50%), eating disorder (25%)). A pattern of complex comorbidity among Axis I disorders has previously been suggested as a marker for the likelihood of a BPD diagnosis (Zanarini et al., 1998; Wingenfeld et al., 2010). Over both control groups (NC and NC_noM), no major psychopathology emerged (phobia (3%), pain disorder (3%), alcohol abuse (3%)).

2.2. Procedure

Procedure is diagrammed in Fig. 1. Upon arrival at the laboratory, participants in the BPD and NC groups and their mothers completed informed consent. Participants and their mothers were then separated and completed the Derogatis Affect Balance Scale (DABSpere). Mother and daughter were also asked independently to identify areas of disagreement or conflict in their relationship using the Parent-Adolescent Conflict Issues Checklist, following the procedures described by Kobak et al. (1993) and Klimes-Dougan et al. (2001). The young adult then audiotaped a brief statement presenting her or his view on the area of conflict. Next, the participants and their mothers were videotaped in two brief sequential interactions: a 5-minute unstructured reunion topic, which included the audio-playback of the young adult's conflict statement. Interpersonal conflict discussions with caregivers have been efficient as psychological stressors to activate the HPA axis and to elicit changes in cortisol (Walter et al., 2008; Kobak et al., 2009).

Interpersonal stress responses were assessed from cortisol levels in saliva samples from the young adults. Saliva samples were collected by asking participants to spit through a straw into a vial, following guidelines established by Granger et al. (2007). All participants were assessed in an afternoon session, between 2 pm and 7 pm, due to the steep declining slope of cortisol levels over the morning hours. Water was offered prior to collection of saliva samples to avoid contamination by food particles. In total, three saliva samples were collected. To establish an initial lab entry value, the first sample (lab entry) was collected within 20 min of arrival to the research laboratory, after informed consent procedures and explanation of study procedures but prior to the completion of any questionnaires. The second sample (early post-discussion) was collected 20 min after the onset of the conflict discussion, 40 min after the first cortisol assessment. The third sample (late post-discussion) was taken 40 min after the onset of the conflict discussion. Subsequent to the conflict discussion, mother and daughter were separated to complete discussions with their mothers about their relationship (Mother-Daughter Relationship Inventory [MDRI]). The young adults also completed the Beck Depression Inventory (BDI). At the end of the session, all subjects completed a three-question Distress at End of Study questionnaire to rate their perceived level of discomfort and distress throughout the study.

The NC_noM participants, who came to the study without their mothers, were assessed with the same timed cortisol assessments and sequencing of self-report measures. They read magazines during the 15-min portion of the session in which other groups were having the interpersonal discussions.
2.3. Measures

2.3.1. Cortisol

The collected saliva samples were thawed and spun at 3000 rpm for 5 min to obtain samples with low viscosity. Clear saliva (100 μl) was removed for duplicate analysis of cortisol levels using a time resolved fluorescence immunoassay (DELFIAs) that has been previously described (Dressendoerfer et al., 1990). The lower limit of sensitivity was <0.003 μg/dl, and the inter- and intra-assay coefficients of variance were less than 10%. The range of cortisol levels collected in this sample ranged from 0.004 μg/dl (0.10 nmol/l) to 0.235 μg/dl (6.47 nmol/l).

2.3.2. Revised Diagnostic Interview for Borderlines (DIB-R)

The DIB-R is a semi-structured diagnostic interview which dimensionally measures borderline features (Zanarini et al., 1998). Cutoff scores for a diagnosis of BPD are 8 or higher and for non-BPD participants ≤3. Excellent reliabilities (kappa ≥0.75) were reported for the diagnosis of BPD using this measure (Zanarini et al., 2002).

2.3.3. Parent-adolescent conflict issues checklist

This checklist asked both daughter and mother to separately identify topics of conflict, choosing from topics such as dating, money, alcohol, drugs, sex, chores, clothes, lifestyle, friends, school, music, work, and plans for the future. Other topics could also be added. Subjects rated on five-point scales the degree of conflict in each area. Themes identified by both mother and daughter as causing the greatest conflict were selected for the videotaped conflict discussion.

2.3.4. Derogatis Affect Balance Scale (DABS pre and post)

The DABS (Derogatis, 1996) was completed before and after the conflict discussion. Twenty-five positive and twenty-five negative adjectives were rated from 1 (never) to 5 (always) asking how frequently a person felt a certain way during the past few minutes. The DABS contains eight separate dimensions with four comprising the global positive score (joy, contentment, vigor, affection) and four contributing to the global negative affect score (anxiety, depression, guilt and hostility). The instrument has demonstrated sufficient reliability and validity (Derogatis, 1996).

2.3.5. Mother-Daughter Relationship Inventory (MDRI)

Following the second cortisol data collection, the BPD and NC participants and their mothers filled out the MDRI. The MDRI was developed for the purposes of this study to assess role-confusion in the mother–daughter relationship, based on previous data linking observed role-confusion in parent–young adult conflict discussions to higher levels of borderline features (Lyons-Ruth, submitted for publication). In that study, interview data from young adults in role-confused relationships revealed a paradoxical pattern. These participants often said they could talk to their mothers about anything, but in other parts of the interview indicated that they could not turn to their mothers when under stress because of the parent’s lack of reliability. Thus, items were developed to tap both confiding and responsible, protective dimensions of the parent-child relationship. Twenty-five items were rated on a 5-point Likert scale indicating how much each item characterized the daughter’s perception of the mother-daughter relationship. On the MDRI, two factors emerged from the principal components analysis with varimax rotation. Factor 1, labeled Confiding Relationship, contained nine items describing the degree of trust, support, and confiding, with item loadings ranging from 0.61–0.91 (e.g. “When I need to talk to someone, I often turn to my mother”; “There is no topic too private to talk to my mother about”). Factor 2, labeled Responsible Protective Care, contained eight items describing degree of parental protection, responsible behavior, and caretaking, with item loadings ranging from 0.54 to 0.81 (e.g. “When my mother has difficulties in life, she can’t take care of me”; “I feel my mother acts responsibly”).

2.3.6. Beck Depression Inventory (BDI)

The BDI-II is a validated 21-item self-report measure indicating levels of depressive symptoms according to DSM-IV criteria. Scores of 21 or greater index the threshold associated with likelihood of clinical depression (Beck et al., 1996).

2.3.7. Distress at end of study

Participants were asked to rate their current levels of discomfort, stress, and distress on three five-point scales at the end of the session, following the final saliva sample collection. The distress total score consisted of the summed responses to all three scales.

2.4. Analysis

All statistical analyses were performed with SPSS 16.0 for Windows (ANOVA, t-test, correlation, linear regression). Repeated measures general linear modeling was performed to compare cortisol levels over time across the three groups. Greenhouse–Geisser correction was calculated to adjust for the potential violation of sphericity. An alpha level of 0.05 was used for all statistical tests. Analyses were guided by the three hypotheses and Bonferroni correction was conducted where needed to adjust for multiple comparisons.

3. Results

3.1. Sample characteristics and control variables

Control variables known to affect cortisol levels were first assessed to characterize the sample (see Table 1). BPD and control groups did not differ in age, intake of oral contraceptives, luteal or follicular phase, or quality of recent sleep. Although smoking was more prevalent among those with BPD, it was not significantly related to any cortisol measures in the current study (cortisol − lab entry: r(47) = 0.07, p = 0.63; cortisol − early post-discussion: r(47) = 0.02, p = 0.90; cortisol − late post-discussion: r(47) = 0.05, p = 0.77). Similar results were found for the number of medications taken (antidepressants, mood stabilizers, antipsychotics, stimulants, anxiolytics). While the number of medications taken was significantly greater in the BPD group, only the number of stimulants were related to cortisol and only to the cortisol levels post-discussion (late post-discussion cortisol: r(47) = 0.36, p = 0.011). If Bonferroni adjusted alpha levels of p = 0.005 per test (0.05/9) were applied, this difference would no longer reach significance.

Individuals with BPD displayed significantly higher BDI mean scores compared to NC and NC_noM groups (F(2, 44) = 10.78, p = 0.001) (Table 1). Post hoc follow-up tests (Fisher’s least significant difference (LSD) and Bonferroni) confirmed no significant differences in depressive symptoms between the two control groups. To ensure that any significant relations in the current study reflected BPD
### Table 1
Characteristics of study sample.

<table>
<thead>
<tr>
<th>Sample characteristics (N = 47)</th>
<th>BPD (n = 16)</th>
<th>NC (n = 19)</th>
<th>NC_noM (n = 12)</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>21.06 (2.32)</td>
<td>22.53 (2.57)</td>
<td>20.52 (1.56)</td>
<td>ns*</td>
</tr>
<tr>
<td>Smoking</td>
<td>6 (37.5%)</td>
<td>0</td>
<td>0</td>
<td>p = 0.0001b,c</td>
</tr>
<tr>
<td>Intake of oral contraceptives</td>
<td>4 (25%)</td>
<td>11 (57.9%)</td>
<td>3 (25%)</td>
<td>nS*</td>
</tr>
<tr>
<td>Poor sleep in past 48 h</td>
<td>1 (6.2%)</td>
<td>3 (15.8%)</td>
<td>3 (25%)</td>
<td>nS*</td>
</tr>
<tr>
<td>BDI</td>
<td>16.43 (10.50)</td>
<td>7.95 (7.67)</td>
<td>2.75 (2.30)</td>
<td>p &lt; 0.001*</td>
</tr>
<tr>
<td>Types of medications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antidepressants</td>
<td>10 (62.5%)</td>
<td>0</td>
<td>0</td>
<td>p = 0.0001b,c</td>
</tr>
<tr>
<td>Mood stabilizers</td>
<td>6 (37.5%)</td>
<td>0</td>
<td>0</td>
<td>p = 0.005h,c</td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>3 (18.8%)</td>
<td>0</td>
<td>0</td>
<td>p = 0.005h,c</td>
</tr>
<tr>
<td>Stimulants</td>
<td>3 (18.8%)</td>
<td>0</td>
<td>0</td>
<td>p = 0.005h,c</td>
</tr>
<tr>
<td>Anxiolytics</td>
<td>4 (25%)</td>
<td>0</td>
<td>0</td>
<td>p = 0.005h,c</td>
</tr>
<tr>
<td>Pre-post affect assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DABS-prepositive affect</td>
<td>55.75 (12.41)</td>
<td>54.79 (13.70)</td>
<td>–</td>
<td>ns*</td>
</tr>
<tr>
<td>DABS-postpositive affect</td>
<td>48.75 (17.16)</td>
<td>48.58 (7.88)</td>
<td>–</td>
<td>ns*</td>
</tr>
<tr>
<td>Distress at end of study</td>
<td>7.00 (2.50)</td>
<td>5.37 (1.83)</td>
<td>3.08 (0.29)</td>
<td>p &lt; 0.001*</td>
</tr>
<tr>
<td>Mother–daughter relationship quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 1: conflicting relationship</td>
<td>23.88 (5.60)</td>
<td>27.05 (7.34)</td>
<td>29.83 (5.64)</td>
<td>p = 0.058*</td>
</tr>
<tr>
<td>Factor 2: responsible protection</td>
<td>30.38 (6.37)</td>
<td>34.00 (4.64)</td>
<td>37.91 (2.23)</td>
<td>p = 0.001*</td>
</tr>
<tr>
<td>Total score: MDRI</td>
<td>87.56 (13.22)</td>
<td>99.42 (13.48)</td>
<td>105.33 (11.52)</td>
<td>p = 0.002**</td>
</tr>
</tbody>
</table>

*a* Means (standard deviations).

*b* χ² test.

*c* Frequencies (percentages).

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3.2. Stress manipulation

Over the course of the study, participants exposed to the conflict discussion reported a significant increase in negative affect ($M_{pre} = 33.71$, $M_{post} = 40.17$; $t(34) = -2.66$, $p = 0.012$) and decrease in positive affect ($M_{pre} = 55.23$, $M_{post} = 48.66$; $t(34) = 2.66$, $p = 0.012$) as measured by the DABS. Between-group differences in self-reported affect only emerged for negative affect following the conflict discussion ($M_{BPD} = 46.00$, $M_{NC} = 35.26$; $t(33) = -2.33$, $p = 0.026$). In particular the BPD group reported significantly higher scores on the hostility subscale following the conflict discussion ($M_{BPD} = 12.44$, $M_{NC} = 7.79$; $t(33) = -3.013$, $p = 0.006$). There were no differences among groups on the pre-conflict DABS scores ($DABS_{pre}$: $F(1,33) = 0.05$, $p = 0.83$; $DABS_{neg}$: $F(1, 33) = 3.17$, $p = 0.08$). In addition, groups differed in their levels of subjective distress at the end of the study ($F(2, 44) = 14.90$, $p = 0.000$). Post-hoc tests (LSD) revealed that BPD females reported significantly more distress compared to NC females ($p = 0.014$) or NC_noM females ($p = 0.000$). Participating with their mothers in a conflict discussion also elicited more distress in the NC group compared to the NC_noM controls who did not participate with their mothers ($p = 0.002$).

Findings from both the DABS pre/post assessments and the final distress report suggest that participation in the conflict situation with a maternal caregiver functioning as a stressor, and that this stress effect was significantly heightened in the BPD group compared to controls. Results remained significant following conservative corrections for multiple comparisons using Bonferroni criteria.

These subjective reports were not sufficient to predict cortisol levels. Only distress at study end was significantly correlated with cortisol level, and then only to late post-discussion cortisol level ($r = 0.32$, $p < 0.05$), but this finding does not reach significance with Bonferroni correction.

3.3. Hypothesis 1: BPD and perceived quality of the mother–daughter relationship

Significant differences on the MDRI emerged among the three groups for total MDRI score ($F(2, 44) = 7.092$, $p = 0.002$) and for Factor 2: Responsible Protective Care ($F(2, 44) = 8.203$, $p = 0.001$). Factor 1: Confiding Relationship did not reach significance ($F(2, 44) = 3.046$, $p = 0.058$). The BPD group scored the lowest on both the overall score and on the two factors. Results were confirmed following correction for multiple comparisons using Bonferroni’s adjusted alpha levels of 0.017 per test (0.05/3). Follow-up tests of least significant difference (LSD) confirmed that the BPD group had significantly lower total MDRI scores than both control groups, NC ($p = 0.010$) and NC_noM ($p = 0.001$), indicating perceived difficulties in the mother-daughter relationship. Significant differences also occurred on MDRI: Factor 2 scores indicating differences in perceptions of responsible protective care for BPD vs. NC ($p = 0.034$) and BPD vs. NC_noM ($p = 0.000$). Females who participated without their mothers (NC_noM) also reported higher perceived parental protection than non-BPD controls (NC) who engaged in the conflict discussion with their mothers ($p = 0.035$).

3.4. Hypothesis 2: BPD and cortisol responses

In the analysis of cortisol levels over time by group, all repeated measures ANOVAs included BDI total scores, smoking, and use of each of the medication classes (antidepressants, mood stabilizers, antipsychotics, stimulants, anxiolytics) as covariates. Repeated measures linear models showed a main effect of time ($F(1,58) = 58.98$, $p < 0.000$), a main effect of group ($F(2, 37) = 4.431$, $p = 0.019$), and a significant interaction between group and time of assessment ($F(2, 44) = 3.19$, $p = 0.005$) and NC_noM ($p = 0.005$) groups. No differences in cortisol levels were found between the two control groups ($p = 0.24$). Follow-up tests of the
subjects with BPD would report lower levels of perceived protective care, (2) that subjects with BPD would show increased cortisol during a conflict discussion assessment with their mothers, and (3) that more negative perceived quality of protection in the mother–daughter relationship would contribute to elevated cortisol levels.

Three main findings emerged from this study. First, consistent with our first hypothesis, the daughter’s perception of protection in the mother–child relationship was significantly lower for young adults with BPD. Secondly, higher levels of overall cortisol in subjects with BPD were found compared to non-BPD controls, confirming our second hypothesis. However, when timing of cortisol assessment was considered, group differences were significant at the time of lab entry but did not reach significance for the assessments at 20 or 40 min following the onset of the conflict discussion. BPD patients displayed the highest cortisol response to the anticipation of the conflict discussion with their mothers of any group. In relation to the third hypothesis, the association between the young adults’ perception of protective parental care and cortisol level was particularly strong when anticipating interpersonal stress (Time 1: lab entry) and was marginally significant in the initial cortisol response to the discussion (Time 2). In addition, young adults with BPD, compared to both other groups, reported the lowest levels of perceived maternal protection of any group. In accordance with other research discussed below, these results point to the potential role of the quality of caregiving in regulating anticipatory stress responses among young women with BPD.

4.1. Hyper-responsive cortisol secretion in young adults with BPD

Young females with a diagnosis of BPD demonstrated a higher overall secretion of cortisol, indicating a greater activation of the HPA axis when anticipating potential conflict. Generally, these results converge with previous findings of daily elevated cortisol levels in adults with BPD without stress manipulation (Lieb et al., 2004). More specifically, the present study showed significant differences between BPD and non-BPD groups in anticipation of a conflict discussion with the maternal caregiver. Upon lab entry, all participants were informed about the study procedures, including the conflict discussion task, but had not yet completed any self-report measures or selected conflict topics. In this anticipatory stress phase, no differences in cortisol levels were found between the two non-BPD control groups, one of whom faced a conflict discussion and one of whom did not. The anticipation of engaging in an uncertain stress situation with a caregiver perceived as unreliable may be a particularly potent elicitor of stress responses among young adults with BPD. Nater et al. (2010) also found an elevated subjective stress response on psychological measures among BPD participants after introducing their study design but prior to the onset of the actual stressor. In contrast to the present results, Nater et al. (2010) found lower cortisol levels among BPD participants than among controls during the stress assessment session, even though they reported higher subjective stress. BPD participants in the Nater et al. (2010) research, however, were involved in interactions with strangers rather than the mother, which may affect the type of cortisol response to the challenge. Compared to cortisol findings by Walter et al. (2008) who also reported elevations in cortisol among patients with BPD in a conflict discussion, the present study did not find elevated cortisol response specific to the post-discussion recovery phase. Walter and colleagues assessed cortisol levels in a sample of adolescents (M = 18.7, SD = 2.1) who had just entered a treatment program for the first time and were in an acute state of distress. Both the age of the sample and the acute phase of the symptoms may have led to different results. Common to all these studies, however, were differences in HPA regulation among BPD individuals. Given the potential for repeated stressors to result in both hypo- and hyper-activation of the HPA axis (Gunnar and Vazquez, 2001), more work is needed to differentiate the conditions leading to these contrasting types of dysregulation in stress responses.
4.2. Perceived parental protection in young adults with BPD

Results suggest that differences in parental relationships may partially explain why the anticipation of interpersonal conflict yielded greater cortisol responses among those with BPD. Decreases in perceived parental protection were associated with increases in cortisol levels across all groups, both when anticipating the conflict discussion with the caregiver (Time 1) and, to a lesser extent, when engaging in the conflict discussion itself (Time 2). In contrast, the subjects’ reported degree of confiding in the mother was unrelated to cortisol levels at any time point. This pattern of findings converges with descriptive data from a previous study indicating that young adults in role-confused relationships with parents often reported high levels of confiding combined with low levels of confidence in the parent’s reliable care at times of stress. Poor parental protection, as measured by the MDRI, described the subjects’ perceptions of their mothers as deficient in responsible caregiving and safeguarding (“When my mother has difficulties in life, she can’t take care of me”). Consistent with findings on attachment security and cortisol levels in infancy (Spangler and Grossmann, 1993), these results suggest that stress response when anticipating a conflict may be specifically linked to perception of the caregiver as failing to maintain a responsible and protective parental role. Parental protection may therefore serve as a buffer to help young adults cope with uncertainty and stress. Future studies may benefit from paying more attention to the assessment of the protective qualities of the caregiving relationship as one important contributor to stress reactivity and individual differences in HPA functioning.

4.3. Parental protection and cortisol levels in young adults with BPD

Finally, perceived lack of responsible parental protection was particularly pronounced among young adults with BPD. Consistent with previous research by Zweig-Frank and Paris (1991), adults with a diagnosis of BPD were significantly more likely to perceive their relationships with their mothers as unprotective, compared to both control groups. In contrast, the BPD group did not differ from the control group engaging in the conflict discussion in degree of confiding. In addition, confiding was unrelated to cortisol levels. This pattern of findings may suggest specificity to the aspects of care related to stress responsiveness in young adult BPD patients. In potentially convergent findings, Hooley and Hoffman (1999) found that criticism and emotional over-involvement of family members predicted better outcomes among BPD patients, in contrast to results with other patient groups in which family criticism and over-involvement predicted worse outcomes. The perceived lack of protection found here may be indexing a common underlying construct of parental withdrawal, helplessness, and lack of involvement in care that is particularly stress-producing for those with BPD. However, the Hooley and Hoffman (1999) finding awaits replication, so this interpretation is tentative.

It is striking that the lack of perceived protection was more strongly related to stress responses than the ability to confide in the parent. We hypothesize that the confiding questions index both genuinely trusting relationships and role-confused parent–child relationships in which there are high levels of mutual confiding on the part of both the parent and the child, parental confiding that may burden the child with parental worries. Further work is needed to assess whether it is the mutuality of confiding that may be associated with less adaptive parent-child relationships.

4.4. Limitations

Several caveats need to be acknowledged in the present study. Comorbid psychiatric diagnoses in the BPD group, particularly depression, may have an impact on cortisol secretion. However, the current cortisol results were obtained with extent of depressive symptoms controlled in all analyses. Thus, it is not likely that comorbid depression can account for the pattern of results. This control was instituted despite not all studies consistently finding significant differences in cortisol response in depression (Jogems-Kosterman et al., 2007). Dissociative symptoms were not assessed as part of this research although some studies suggest an association of dissociation and greater HPA reactivity to stress in BPD (e.g., Simeon et al., 2007). It should also be noted that a complex pattern of comorbidities of Axis I disorders are characteristic of BPD patients and eliminating comorbidities carries its own risk of biasing the findings (Zanarini et al., 1998; Wingenfeld et al., 2010). A second limitation is that we did not record histories of childhood abuse so we were not able to evaluate whether the obtained results could be explained by severity of abuse experiences among borderline patients (Rinne et al., 2002). Methodologically, collecting abuse-specific information required a much longer session than our funding allowed, as emotional arousal and distress potentially elicited by such a set of questions could affect cortisol levels. Finally, we stress that directionality of effects cannot be concluded from these cross-sectional data (e.g., that mother’s lack of protection produces stress reactivity). The young adult’s difficulty in regulating affect and behavior may lead to increased stress in any interpersonal interaction and may also lead to more negative perceptions of her mother’s protectiveness. In addition, the BPD patient’s difficulties over time may contribute to the parent’s becoming less protective by young adulthood. Prospective longitudinal data are needed to provide stronger insights into the early development of the parent-child relationship in pathways to BPD.

5. Conclusion

The present study indicated (a) that young adults with BPD report greater lack of perceived protection in their relationship with their mothers, (b) that those with BPD show elevated cortisol levels in the anticipation of a conflict discussion, and (c) that these perceptions of lack of protection were accompanied by higher cortisol levels in the anticipation of a conflict discussion. Findings emphasize the lack of perceived parental protection as a potential contributor to stress regulation. Future studies are encouraged to investigate whether enhancing the quality of parental protectiveness might enhance emotional regulation and stress resiliency among young adults with BPD.

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