Stability and Variability of Affective Experience and Interpersonal Behavior in Borderline Personality Disorder

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This study examined both mean levels and intraindividual variability in the mood and interpersonal behavior of individuals with borderline personality disorder (BPD) and nonclinical control participants over a 20-day event-contingent recording period. Individuals in the BPD group experienced more unpleasantly valenced affect and were less dominant, more submissive, more quarrelsome, and more extreme in overall levels of behavior than control participants. In addition to these mean-level differences, individuals with BPD also reported more intraindividual variability in overall affect valence and in pleasantly valenced affect; displayed greater variability in dominant, quarrelsome, and agreeable behaviors; and exhibited an increased tendency to “spin” among interpersonal behaviors relative to nonclinical control participants. The findings document behavioral and affective manifestations of BPD in the context of naturally occurring interpersonal situations.

Keywords: borderline personality disorder, social behavior, interpersonal circumplex, intraindividual variability, affect instability

Borderline personality disorder (BPD) is defined as a pervasive pattern of affective instability, impulsivity, and unstable interpersonal relationships (American Psychiatric Association, 2000). Although much attention has been paid to the investigation and characterization of affective instability in this population (e.g., Henry et al., 2001; Koenigsberg et al., 2002), there has been little investigation of unstable interpersonal patterns in individuals with BPD. Moreover, much of the extant research has focused on retrospective self-reported data and clinical observation rather than the systematic investigation of ongoing affective and behavioral patterns in naturalistic environments. Despite recent advances in the conceptualization and analysis of intraindividual variability in both affect (Eid & Diener, 1999) and behavior (Moskowitz & Zuroff, 2004, 2005), innovative tools and methods used to examine intrapersonal processes in normative samples have not yet been applied to the examination of instability in individuals with BPD. The aim of the present research was to investigate mean levels and intraindividual variability in BPD by applying contemporary statistical techniques to records of naturally occurring affect and behavior during everyday social interactions.

Affective Experience and BPD

Individuals with BPD are similar to individuals with affective disorders in reporting elevated levels of global negative affect (Conklin, Bradley, & Westen, 2006; Cowdry, Gardner, O’Leary, Leibenluft, & Rubinow, 1991; Stein, 1996). However, the pattern of affective experience associated with BPD differs from that observed in affective disorders. In contrast to the temporally stable dysphoria associated with mood disorders, clinicians have reported that individuals with BPD experience rapid, frequent, and extreme changes in mood that are highly responsive to environmental factors (Gunderson & Phillips, 1991). The association between BPD and affective instability is reflected in diagnostic criteria for this disorder (American Psychiatric Association, 2000) and supported by clinical observations and self-reports (e.g., Blais, Hilsenroth, & Fowler, 1999; Conklin et al., 2006; Koenigsberg et al., 2002). There is some indication that mood instability may endure in individuals with BPD even after other symptoms have subsided (Paris & Zweig-Frank, 2001; Zanarini, Frankenberger, Hennen, & Silk, 2003) and that higher levels of affective instability may predict more negative clinical outcomes within this population (Bagge et al., 2004).

Given the clinical importance of affective instability, there is a need for sound approaches to the measurement of this construct. One-occasion self-report measures of affect instability have been developed (e.g., the Affective Instability Scale; Harvey, Greenberg, & Serper, 1989) and used to examine mood variability in BPD (e.g., Koenigsberg et al., 2002). However, there are intrinsic...
limitations to measuring affective instability through one-occasion self-report. The extent to which many measures of affective instability distinguish clearly between trait instability and intensity of affect valence has been questioned (Eid & Diener, 1999). For example, Links, Heisel, and Garland (2003) reported that mood instability as measured by the Affective Instability Scale showed greater convergence with an aggregate measure of affective intensity than with variability in mood ratings collected over a 2-week time period. The potential confound between aggregate valence of affect and affect variability highlights the importance of developing measurement techniques that assess the construct of affective instability separately from mean affect valence. In addition, a trait such as affect instability that requires the integration of complex information that changes over time may be difficult to measure retrospectively. These considerations suggest the need to develop an approach to the measurement of affective instability that involves more direct access to individual experience.

A few studies on affect instability (e.g., Eid & Diener, 1999; Woyshville, Lackamp, Eisengart, & Gilliland, 1999) have used instruments requiring participants to report about affective experience on a daily basis or even several times a day. Eid and Diener (1999) demonstrated that affective variability can be reliably measured and separated from mean-level affect using an intraindividual standard deviation and that mood instability is both stable and distinct from neuroticism. Thus, there is evidence that a measure based on the repeated sampling of affect over time produces a stable characterization of the individual that reflects variability in affective states and is distinguishable from mean affect valence.

Two previous studies have described measures of affective instability in BPD that incorporate the immediate recording of mood data collected over time. Cowdry et al. (1991) assessed mood using a visual analog scale that was completed twice daily over a 2-week period. They found that mood variability distinguished individuals with BPD from individuals with mood disorders and individuals without psychopathology. Stein (1996) used a more fine-grained methodology in which participants provided 50 affect ratings over a 10-day period. Individuals with BPD reported higher levels of unpleasant affect and greater intraindividual variability in unpleasant affect relative to asymptomatic control participants. Notably, these studies did not control for mean levels of unpleasant affect or the quadratic mean level of affect in the analysis of mood instability. Intraindividual variability scores can display a strong linear association with mean levels, and quadratic effects can indicate possible floor and ceiling effects; consequently, controlling for mean and quadratic mean levels is important in evaluating the presence and influence of affective instability (Eid & Diener, 1999).

Interpersonal Behavior and BPD

Unstable interpersonal relationships, marked impulsivity, and difficulty with anger expression are also core diagnostic features of BPD (American Psychiatric Association, 2000). In clinical settings, individuals with BPD often report impulsive behavior and involvement in intense, chaotic, and conflicted relationships (Linehan, 1993). Individuals with BPD have been described as experiencing difficulty with being alone; seeking out intense contact with others; becoming quickly involved; and then running into difficulty with hostility, submission, and relationships that end quickly in disillusionment (Gunderson, 2001). These individuals are also generally regarded as prone to “splitting,” a tendency to oscillate between extreme perceptions of the self and others that often generate abrupt shifts in behavior and mood (Horowitz, 2004).

Despite the centrality of disturbed interpersonal relatedness to clinical descriptions of BPD pathology, there is a dearth of empirical research investigating the social behavior of individuals with BPD. Such work would be important in documenting and clarifying specific manifestations of BPD within the social domain. Clinical reports offer some indication of particular interpersonal behaviors that may be elevated among members of this population. Linehan (1993) noted that difficulties with the appropriate expression of anger may involve both intense outbursts of interpersonal hostility and the overcontrol of anger, leading to submissive displays. Clinical descriptions also suggest that BPD is associated with variable interpersonal behavior patterns (Horowitz, 2004). For example, Gunderson (1996) observed that individuals with BPD tend to fluctuate between overtly needy or coercive reassurance seeking and detached interpersonal avoidance in response to separation. These reports suggest that the interpersonal behavior of individuals with BPD is characterized by elevated quarrelsomeness, elevated submissiveness, and greater intraindividual variability.

Event-Contingent Recording in the Examination of Affect and Interpersonal Behavior

The present study used an event-contingent recording procedure (Moskowitz, 1994) that permits the assessment of both mean levels and variability in the affect and behavior of individuals with BPD. This measurement strategy gathers reports of interpersonal behavior and affective experience close in time to naturally occurring social interactions over the course of several weeks, thus reducing potential retrospective distortion from one-occasion measures and specifically focusing on interpersonal events that clinicians have identified as key to mood and behavior shifts among individuals with personality disorders (Gunderson & Phillips, 1991). This method was used to investigate how the interpersonal and affective patterns identified as core features of BPD might be manifested in the everyday experiences of a clinical sample, with a specific emphasis on the differentiation of intraindividual variability from mean-level patterns.

Interpersonal behaviors were sampled from the domain of social behavior described by the interpersonal circumplex model. According to this model, interpersonal behavior can be organized around a circle defined by the two orthogonal dimensions of agency and communion (Wiggins, 1991). Agentic behavior is represented as a bipolar dimension ranging from assertive–dominant to unassertive–submissive behavior and can be conceptualized as behavior that asserts status relative to others. Communal behavior, which is represented as a bipolar dimension ranging from warm–agreeable to cold–quarrelsome behavior, can be conceptualized as behavior that promotes interpersonal ties. The scales used in the present investigation focus on behavior and label the four poles of the interpersonal circumplex as dominant, submissive, agreeable, and quarrelsome.

Research on intraindividual variability in behavior has demonstrated that instability in interpersonal behavior is a stable feature...
of the individual, distinct from personality traits such as the Big Five factors (e.g., Moskowitz & Zuroff, 2004, 2005). The present investigation examined three indices of intraindividual variability, referred to as flux, pulse, and spin (Moskowitz & Zuroff, 2004). Flux represents variability about an individual’s mean score (i.e., individual standard deviation) on a particular dimension and may be calculated for each pole of the interpersonal circumplex (i.e., flux in dominant, submissive, agreeable, and quarrelsome behavior). Flux is analogous to indices constructed by other investigators who have used intraindividual standard deviations to examine stable instability in repeated measures data (e.g., Eid & Diener, 1999). Thus, it is not exclusively applicable to the examination of behavioral instability and may be used to investigate affect instability as well. In the present investigation, flux scores were calculated for pleasant affect, unpleasant affect, and overall affect valence.

Pulse and spin are linked to the circular geometry of the interpersonal circumplex. Interpersonal behavior within a given interaction may be represented as a vector extending from the origin to a point in circumplex space and defined with respect to the polar coordinates of vector length ($r$), which indicates extremity, and angular displacement ($\theta$), which indicates degree of rotation from the horizontal axis (i.e., type of behavior). Pulse is defined as the variability (standard deviation) of the extremity coordinate about an individual’s mean value of $r$ ($r_m$) and represents the extent to which an individual fluctuates from more extreme to less extreme interpersonal behaviors across social interactions. Spin is defined as intraindividual variability (standard deviation) over time in the angular rotation of an individual’s behavior and indicates the extent to which an individual’s behavior changes around the interpersonal circumplex (e.g., from dominant to submissive to quarrelsome) across interactions. Pincus (2005) proposed that “spin and pulse are constructs of behavioral variability that can differentiate phenomenological expressions of personality pathology” (p. 302). The present investigation aimed to use the indices of pulse and spin to more precisely document behavioral instability in BPD.

Research Overview

Individuals with BPD and nonclinical control participants completed structured record forms subsequent to social interactions occurring across a range of contexts (e.g., work, home, recreational settings) over a 20-day data collection period. For each interaction recorded, participants provided information concerning their affect and interpersonal behavior.

Hypotheses

The hypotheses concerned patterns of affective experience and interpersonal behavior reported by individuals with BPD relative to nonclinical control participants. An important goal was to distinguish between means levels and variability in affect and behavior. It was hypothesized that individuals with BPD would report more unpleasantly valenced affect, more flux (intraindividual variability) in affect valence, and more flux in unpleasant affect. It was also predicted that individuals with BPD would report higher levels of submissive and quarrelsome behavior and would report more extreme behavior. It was further predicted that BPD would be associated with greater flux in quarrelsome behavior and increased variability in the extremity of behavior (i.e., greater pulse). Finally, as the construct of spin is consistent with clinical descriptions of frequent behavioral shifts in BPD, it was expected that individuals with BPD would display greater spin than nonclinical control participants.

Method

Participants

BPD group. Individuals were recruited from a BPD treatment program. All participants met criteria for BPD as established by the Revised Diagnostic Interview for Borderlines (Zanarini, Gunderson, Frankenburg, & Chauncey, 1989) and the Diagnostic Interview for DSM–IV Personality Disorders (Zanarini, Frankenburg, Sickel, & Yong, 1996), administered by an experienced research psychiatrist (Joel Paris) to assess suitability for treatment program admission. A total of 43 individuals agreed to participate in the study after an orientation and introductory session; 2 individuals did not comply with the event-contingent recording procedure (i.e., their data did not arrive on a daily basis) and were consequently omitted from the sample.

Thirty-nine women and 2 men completed the procedure. As the number of men was not sufficient for the examination of sex differences, the 2 men were eliminated from further analyses. To further enhance homogeneity of the sample, and in view of evidence that BPD typically remits in middle age (Paris & Zweig-Frank, 2001), we also excluded 1 woman age 62 years. The final sample consisted of 38 women, ranging from 19 to 38 years of age ($M = 27.82$, $SD = 5.71$). There were 30 participants (79%) whose first language was English. Two individuals (5%) had not completed high school, 10 individuals (26%) had completed high school or trade school, 19 individuals (50%) had completed at least 1 year of college, and 7 individuals (18%) had graduated from university with a bachelor’s degree.

Control group. Newspaper advertisements recruited individuals to take part in a study of social interaction. For inclusion in the study, individuals were required to be at least 18 years of age and to hold paid employment. There were no psychiatric inclusion or exclusion criteria. Of the 124 individuals recruited, 119 (57 men, 62 women) completed the study (for more details about this sample, see Moskowitz & Zuroff, 2004). To match sample characteristics of the BPD group, we selected all female participants age 40 years or younger as members of the control group. These selection criteria resulted in a sample of 44 women, ranging in age from 20 to 40 years ($M = 28.32$, $SD = 4.97$). There were 31 participants (70%) whose first language was identified as English. With respect to educational background, 1 individual (2%) had not completed high school, 3 individuals (7%) had completed high school or trade school, 11 individuals (25%) had completed at least 1 year of college, 23 individuals (52%) had graduated from university with a bachelor’s degree, and 6 individuals (14%) held a postgraduate degree. The control group did not differ significantly from the BPD group with regard to either age, $t(80) = 0.43$, ns, or first language, $\chi(1, N = 80) = 0.29$, ns. The groups did differ with respect to educational level, $\chi(5, N = 82) = 20.44$, $p < .01$. The control group was generally more educated than the BPD sample, as would be expected given the association of BPD with impaired educational and occupational functioning (Skodol et al., 2005).
**Procedure**

First, participants attended a meeting during which procedures for the study were explained, their consent to participate was obtained, and a battery of questionnaires was administered. For participants in the BPD group, this meeting was held during the 1st week of their involvement in a cognitive–behavioral group treatment program. For control group participants, this meeting was held shortly following their recruitment. Beginning on the 1st day subsequent to this initial meeting, participants completed a 1-page record form as soon as possible following each social interaction of at least a 5-min duration every day for 20 days. Participants were provided with 10 forms per day and were asked to use as many or as few as their natural day-to-day social activity dictated. Forms were returned by mail to the researchers on the 1st day subsequent to recording. Incoming forms were examined on arrival to ensure that forms were completed correctly and had been returned to the researchers in a timely fashion. Participants were provided with $150 compensation on completion of the study.

BPD participants completed an average of 91.16 forms ($SD = 40.03$), or 4.56 per day, whereas control group participants completed an average of 128.36 forms ($SD = 27.83$), or 6.42 per day. The difference between the groups was significant, $t(80) = 4.94$, $p < .0001$. Although this disparity may indicate that individuals with BPD engaged in fewer social interactions, they may also have been less compliant with the procedure and reported fewer of the interactions they engaged in during the study.

**Measures**

**Event-contingent recording.** Event-contingent record forms requested information about characteristics of the social interaction (e.g., time, environment, interaction partners) and included measures of both interpersonal behavior and affect.

**Behavior.** Interpersonal behavior was measured using items developed by Moskowitz (1994) to assess the poles of behavior described by the interpersonal circumplex model. Each dimension was represented by 12 items. One item (i.e., “I criticized the other”) was used for both the dominant and quarrelsome behavior scales, and 1 item (i.e., “I went along with the other”) was used for both the submissive and agreeable behavior scales. Thus, there were a total of 46 items measuring interpersonal behavior. Agreeable behavior was represented by items such as “I smiled and laughed with others.” Items measuring quarrelsome behavior included “I made a sarcastic comment.” An example of an item measuring dominant behavior was “I took the lead in planning/organizing a project or activity.” Submissive behavior was measured with items such as “I gave in.” See Moskowitz (1994) for the complete list of behavioral statements, information concerning the development of the item pool, and initial reliability and validity studies. Further research has demonstrated the reliability, convergent validity, and discriminant validity of these items as behavioral measures of the four interpersonal circumplex dimensions in event-contingent recording studies (Brown & Moskowitz, 1997; Moskowitz & Côté, 1995; Moskowitz, Suh, & Desaulniers, 1994).

The event-contingent record form asked participants to endorse the behavior items they had engaged in during the social interaction being reported. Each form contained a subset of the behaviors to guard against the tendency for participants to adopt a response set when presented with the same form daily. Four different versions of the form were used, with items representing dominant, agreeable, submissive, and quarrelsome behavior divided equally among them. Thus, each version of the form contained three items representing each of the four circumplex dimensions. On the basis of previous work (Moskowitz, 1994), the items were distributed onto the four forms to balance frequency of endorsement and item–total correlation with the behavior scale. Participants completed Form 1 on Day 1, Form 2 on Day 2, Form 3 on Day 3, and Form 4 on Day 4, returning to Form 1 following each 4-day cycle.

**Affect.** The event-contingent record form asked participants to rate how they felt during the interaction, on a scale ranging from 0 (not at all) to 6 (extremely), for each of nine items previously used by Diener and Emmons (1984) to assess affect valence. Pleasant affect items included “happy,” “pleased,” “enjoyment/fun,” and “joyful,” and unpleasant affect was represented by the items “worried/anxious,” “frustrated,” “angry/hostile,” “unhappy,” and “depressed/sad.” These represent each half of the pleasant–unpleasant dimension on circumplex models of emotion (Larsen & Diener, 1992; Russell, 1980).

**Construction of event-specific behavior scale scores.** For each participant, a score for each behavior scale was calculated for each interaction. First, event-specific raw scores were constructed by calculating the mean number of items (between 0 and 3) endorsed within each event for each behavior scale. Then, event-specific ipsatized scores were constructed by subtracting the mean score for all scales within an event from each raw score for that event. The ipsatized scores, therefore, represented the frequency with which the behaviors corresponding to a behavioral dimension were checked within a given event, adjusted for the participant’s overall rate of responding (cf. Horowitz, Rosenberg, Baer, Ureno, & Villaseñor, 1988). The ipsatizing procedure controls for response sets (e.g., the tendency to check many items or few items). Validity evidence for the behavior scales has been established based on the ipsatized scores. Past event-contingent recording studies of interpersonal behavior have indicated that agreeable and dominant behaviors are the most common event-level behaviors, whereas submissive and quarrelsome behaviors are relatively less frequent. As a result, ipsatized values for submissive and quarrelsome behaviors are typically negative, indicating that the mean levels of these behaviors are lower than the mean level of the four interpersonal behaviors combined.

**Construction of event-specific affect scale scores.** Pleasant and unpleasant affect scores were constructed for each participant for each episode. The event-level pleasant affect score was calculated by averaging the intensity ratings of the pleasant affect items (i.e., happy, pleased, enjoyment/fun, and joyful). The event-level unpleasant affect score was calculated by averaging the intensity ratings of the unpleasant affect items (i.e., worried/anxious, frustrated, angry/hostile, unhappy, and depressed/sad). As pleasant and unpleasant affect tend to be negatively correlated in brief time intervals (Diener & Emmons, 1984; Green, Salovey, & Truax, 1999), event-specific scores for affect valence were also calculated by subtracting mean unpleasant affect from mean pleasant affect.

**Construction of flux scores.** To assess flux for each behavioral and affective dimension, we calculated a standard deviation across all interactions for each participant. Flux scores were calculated for each of the behavior scales, affect valence, pleasant affect, and unpleasant affect.
Construction of pulse and spin scores for behavior scales. An agentic behavior score for each event was calculated by subtracting the submissive behavior score for that event from the dominant behavior score for that event. A communal behavior score for each event was constructed by subtracting event-specific quarrelsome behavior from event-specific agreeable behavior. Communal and agentic behavior scores for each event were treated as Cartesian coordinates (x, y) and then transformed to polar coordinates (r, θ). θ was expressed in radians; r was calculated as the square root of (agency2 + communion2). Means for θ and r were calculated over all 20 days. Pulse was the standard deviation of the values of r around each participant’s mean (r_m). Conceptually, spin was the standard deviation of the values of θ. Calculations of the means and standard deviations of θ were based on Mardia’s (1972) formulas for the circular mean and circular standard deviation (see Mardia, 1972, or Moskowitz & Zuroff, 2004, for formulas).

Results

Mean Levels of Affect and Behavior

Multilevel modeling was used to examine differences between the BPD and control groups in mean levels of interpersonal behavior and affect. This statistical procedure permits the analysis of unbalanced data (unequal numbers of data points among participants due to varying numbers of event records) and the simultaneous investigation of between-subjects and within-subject effects. Analyses were conducted using PROC MIXED, Version 8.1 (SAS Institute, 2000) and maximum-likelihood estimation. The degrees of freedom for F tests were determined by dividing the residual degrees of freedom into between-subjects and within-subjects portions, following Singer’s (1998) recommendation. Separate analyses investigated event-level affect valence, event-level pleasant and unpleasant affect scores, ipsatized event-level behavior scale scores, and vector length (behavioral extremity). Group differences in mean angular coordinate (θ) for behavior were not examined, because θ is not a linear variable and is thus not amenable to traditional data analytic techniques.

All models included a random intercept and the default error covariance matrix used by PROC MIXED. Alternate specifications of the error covariance structure, including both autoregressive and heterogeneous compound symmetry, were explored. These modifications did not improve the fit of any model as assessed by the Akaike information criterion and the Bayesian information criterion. Hence, specifications of the random effects model were left unchanged. The fixed-effects portion of each model included group (i.e., BPD vs. control) as a predictor.

In the analyses of both the mean levels and the flux, pulse, and spin variables, the effect size correlation was calculated for each significant effect using the formula r = [F(F + df)]1/2 (Rosnow & Rosenthal, 1996). Cohen (1988) characterized r = .10 as a small effect, r = .30 as a medium effect, and r = .50 as a large effect. Mean-level analyses, in addition to descriptive statistics for vector length, angular rotation, and event-level measures of affect and interpersonal behavior by group membership, are summarized in Table 1.

Affect. As predicted, individuals with BPD reported lower levels of affect valence than did control group participants. When pleasant and unpleasant affect were examined separately, individuals with BPD were found to report significantly elevated levels of unpleasantly valenced affect. In contrast, no significant difference was found between the BPD and control groups with respect to pleasant affect reported across the 20-day investigation period. This indicates that the decreased affect valence observed in the reports of individuals with BPD was specifically due to elevated unpleasant affect rather than decreased levels of pleasant affect.

Interpersonal behavior. As predicted, individuals with BPD reported more submissive behavior and more quarrelsome behavior than control group participants. The expected between-groups difference also emerged with respect to vector length, indicating that BPD was associated with reports of more extreme levels of behavior. Individuals with BPD also reported less dominant behavior than control participants. The two groups did not differ in level of agreeable behavior.

Intraindividual Variability in Affect and Behavior

Differences between the BPD and control groups with respect to intraindividual variability in interpersonal behavior and affect were examined using PROC GLM, Version 8.1 (SAS Institute, 2000). Separate analyses investigated flux in each affect variable, flux in each behavioral dimension, pulse in the extremity of behavior, and spin among behaviors. Each model included group as an independent predictor. To ensure that the effect was specific to intraindividual variability, we entered the mean level of behavior and affect first in each analysis. To examine the possibility of floor and ceiling effects, we entered the square of the mean level for each affective and behavioral dimension second in each analysis. Angular coordinates cannot be said to have a floor or ceiling, as variability about a mean angle is not constrained in the way that variability about a high or low mean behavior score may be constrained. Thus, neither mean nor quadratic level of θ was controlled in the analysis for spin. Table 2 presents descriptive statistics for indices of intraindividual variability, including both raw scores and estimated values adjusted for the inclusion of terms for mean level and quadratic mean level. Analyses of between-groups differences in the intraindividual variability of affect and behavior are summarized in Table 3.

Variability of affect. Flux in affect valence, pleasant affect, and unpleasant affect were predicted by the mean level of the corresponding affect; higher mean levels of pleasant affect, higher mean levels of unpleasant affect, and lower mean levels of affect valence were associated with greater intraindividual variability in each affective state. The squared mean levels of both pleasant and unpleasant mood were also significant predictors of flux. Examination of the quadratic effects indicated that the linear increase in the association of higher mean levels of positive and negative affect with greater variability flattened out at the high end of these variables. This is consistent with the presence of ceiling effects and suggests that mean levels of pleasant and unpleasant affect predict elevations in affective instability to a certain extent, beyond which affect instability does not increase along with mean levels.

As predicted, individuals with BPD reported more flux in affect valence than did control group participants. This indicates that BPD was associated with increased affective variability across all social interactions reported. When pleasant and unpleasant affect were examined separately, individuals with BPD were found to exhibit more flux in pleasant affect than control group participants. Contrary to prediction, there was no significant between-groups
difference for flux in unpleasant mood. Thus, when controlling for mean levels of affect, we found that BPD was associated with increased variability in affect valence and pleasant affect, but not unpleasant affect, relative to nonclinical control participants.

**Variability of interpersonal behavior.** The mean level of the interpersonal behavior variable predicted flux in submissive behavior, quarrelsome behavior, and pulse. Individuals who reported higher mean levels exhibited greater variability in submissive behavior, quarrelsome behavior, and the extremity of their social behavior. Significant effects of the squared mean level were found for quarrelsome behavior and pulse. There was a U-shaped effect for quarrelsome behavior, such that individuals with particularly elevated and particularly low mean levels of quarrelsome behavior displayed the greatest intraindividual variability in quarrelsome-ness. Examination of the quadratic effect for pulse indicated that mean vector length was most strongly associated with increased pulse at the lower and midrange, with the slope gradually flattening out as behavioral extremity increased. This is consistent with the presence of a ceiling effect and suggests that mean vector length predicts elevations in pulse to a certain extent, beyond which pulse does not increase with mean level of behavioral extremity.

Even when these effects were controlled, group remained a significant predictor of flux in dominant, agreeable, and quarrel-some behavior. Individuals with BPD exhibited greater variability in reported dominant, agreeable, and quarrelsome behavior across the 20 days of investigation. Contrary to expectation, there were no group differences in pulse.

As hypothesized, BPD predicted greater spin. Individuals with BPD exhibited a broader dispersion of behavior around the interpersonal circumplex, suggesting that these individuals switched more among interpersonal behaviors than did control group members. Although the most frequent form of behavior for both groups was located in the dominant–agreeable quadrant of the interpersonal circumplex, BPD was associated with a greater distribution of behavior in both the dominant–quarrelsome and the submissive–quarrelsome quadrants. Between-groups differences were particularly apparent with regard to the combination of submissive and quarrelsome behaviors; the range of behavior styles observed among individuals with BPD extended well into the submissive–quarrelsome quadrant, whereas this combination of behavior was rare among control group participants.

**Discussion**

The present study applied investigative tools from individual-differences research to the detailed examination of affective and

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Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>BPD group</th>
<th>Control group</th>
<th>Group differencea</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td></td>
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<tr>
<td>Affect valence</td>
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<td>Unpleasant affect</td>
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<td>Submissive behavior</td>
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<td>Agreeable behavior</td>
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<td>Quarrelsome behavior</td>
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<td>Vector length (r)</td>
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<td>Angular rotation (θ)</td>
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Note. n (participants) = 38 for BPD group, 44 for control group. BPD = borderline personality disorder. Dashes indicate that this value was not calculated. a df for between-groups effects = 1, 80. b r indicates effect size. * p < .05. *** p < .001.

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Table 2

<table>
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<th>Variable</th>
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<td>Flux in affect valence</td>
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<td>Flux in pleasant affect</td>
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<td>Flux in dominant behavior</td>
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<td>Flux in agreeable behavior</td>
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<tr>
<td>Flux in quarrelsome behavior</td>
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<td>Pulse in behavior</td>
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<td>Spin in behavior</td>
<td>1.30</td>
<td>0.35</td>
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</table>

Note. n (participants) = 38 for BPD group, 44 for control group. BPD = borderline personality disorder. a Each intraindividual variability variable was adjusted for terms reflecting the mean level of that variable and the square of the mean level.
behavioral patterns associated with BPD. Analyses comparing reports of mood and behavior during naturally occurring social interactions revealed several intriguing differences between individuals with BPD and nonclinical control participants with respect to both mean levels and various indices of intraindividual variability.

**BPD and Affective Experience**

In line with clinical observations and past research findings (e.g., Conklin et al., 2006; Gunderson, 2001; Koenigsberg et al., 2002; Linehan, 1993; Stein, 1996), the present investigation found that individuals with BPD reported both more unpleasantly valenced affect and higher levels of intraindividual variability in affect valence than did nonclinical control participants. When pleasant and unpleasant affect were examined separately, however, a more complex pattern of findings emerged.

As expected, individuals with BPD reported elevated mean levels of unpleasant affect relative to nonclinical control participants. Contrary to prediction, the BPD and control groups did not exhibit significantly different levels of flux in unpleasant affect when controlling for mean and quadratic mean level. Although the raw mean level of flux in unpleasant affect was higher for the BPD group than for the control group, variability in negative mood states was accounted for by mean and quadratic mean level but not by group membership. Taken together, these findings indicate that individuals with BPD reported chronically high levels of unpleasant affect, around which their moods did not vary more than would be expected given this elevated mean.

This unexpected pattern of findings may suggest that the negative affect variability associated with BPD (Conklin et al., 2006; Herpertz, Gretzer, Muhlbauer, Steinmeyer, & Sass, 1998; Koenigsberg et al., 2002) is the product of chronic elevations in unpleasant mood states. Individuals with BPD generally experience higher levels of anger, sadness, and anxiety, which may broaden the range about which their moods did not vary more than would be expected given this elevated mean.

### Table 3

Between-Groups Differences in the Intraindividual Variability of Affect and Interpersonal Behavior

<table>
<thead>
<tr>
<th>Outcome</th>
<th>df</th>
<th>b</th>
<th>F</th>
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<tr>
<td>Flux in affect valence</td>
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<td></td>
</tr>
<tr>
<td>$M$</td>
<td>1, 80</td>
<td>-0.19</td>
<td>8.19**</td>
<td>.30</td>
</tr>
<tr>
<td>$M \times M$</td>
<td>2, 79</td>
<td>0.00</td>
<td>0.00</td>
<td>—</td>
</tr>
<tr>
<td>Group</td>
<td>3, 78</td>
<td>0.40</td>
<td>7.42**</td>
<td>.29</td>
</tr>
<tr>
<td>Flux in pleasant affect</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>1, 80</td>
<td>0.10</td>
<td>7.81**</td>
<td>.30</td>
</tr>
<tr>
<td>$M \times M$</td>
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<td>-0.43</td>
<td>10.47**</td>
<td>.34</td>
</tr>
<tr>
<td>Group</td>
<td>3, 78</td>
<td>0.16</td>
<td>5.49*</td>
<td>.26</td>
</tr>
<tr>
<td>Flux in unpleasant affect</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>1, 80</td>
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<td>83.41***</td>
<td>.71</td>
</tr>
<tr>
<td>$M \times M$</td>
<td>2, 79</td>
<td>-0.46</td>
<td>29.42***</td>
<td>.52</td>
</tr>
<tr>
<td>Group</td>
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<td>0.09</td>
<td>1.56</td>
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<tr>
<td>Flux in dominant behavior</td>
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</tr>
<tr>
<td>$M$</td>
<td>1, 80</td>
<td>0.07</td>
<td>1.10</td>
<td>—</td>
</tr>
<tr>
<td>$M \times M$</td>
<td>2, 79</td>
<td>-1.52</td>
<td>2.95</td>
<td>—</td>
</tr>
<tr>
<td>Group</td>
<td>3, 78</td>
<td>0.02</td>
<td>4.01*</td>
<td>.22</td>
</tr>
<tr>
<td>Flux in submissive behavior</td>
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<td></td>
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<tr>
<td>$M$</td>
<td>1, 80</td>
<td>0.36</td>
<td>23.87***</td>
<td>.48</td>
</tr>
<tr>
<td>$M \times M$</td>
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<td>0.10</td>
<td>0.02</td>
<td>—</td>
</tr>
<tr>
<td>Group</td>
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<td>2.40</td>
<td>—</td>
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<tr>
<td>Flux in agreeable behavior</td>
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<td></td>
<td></td>
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<td>-0.08</td>
<td>1.69</td>
<td>—</td>
</tr>
<tr>
<td>$M \times M$</td>
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<td>-0.31</td>
<td>0.17</td>
<td>—</td>
</tr>
<tr>
<td>Group</td>
<td>3, 78</td>
<td>0.02</td>
<td>8.46*</td>
<td>.31</td>
</tr>
<tr>
<td>Flux in quarrelsome behavior</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>1, 80</td>
<td>0.32</td>
<td>8.13**</td>
<td>.30</td>
</tr>
<tr>
<td>$M \times M$</td>
<td>2, 79</td>
<td>2.72</td>
<td>4.17*</td>
<td>.22</td>
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<td>Group</td>
<td>3, 78</td>
<td>0.03</td>
<td>7.74**</td>
<td>.30</td>
</tr>
<tr>
<td>Pulse in behavior</td>
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<td></td>
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<tr>
<td>$M$ ($r_{mc}$)</td>
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<td>0.31</td>
<td>50.22***</td>
<td>.62</td>
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<tr>
<td>$M \times M$</td>
<td>2, 79</td>
<td>-1.00</td>
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<tr>
<td>Group</td>
<td>3, 78</td>
<td>0.01</td>
<td>2.05</td>
<td>—</td>
</tr>
<tr>
<td>Spin in behavior</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>1, 80</td>
<td>0.24</td>
<td>15.81***</td>
<td>.41</td>
</tr>
</tbody>
</table>

*Note.* Mean levels were entered in the first step, quadratic mean levels were entered in the second step, and group was entered in the third step. Parameters are from the step in which the predictor was first entered. Dashes indicate a nonsignificant effect for which the effect size was not calculated.

* $p < .05$. ** $p < .01$. *** $p < .001$. 584 RUSSELL, MOSKOWITZ, ZUROFF, SOOKMAN, AND PARIS
emotion-relevant stimuli) are characteristic of any individual experiencing heightened emotional arousal rather than being specific to BPD. The present findings suggest that variability in negative mood states may represent another component of affective dysregulation in BPD that is more generally associated with elevated emotional intensity. Alternatively, the ability of the present analyses to obtain a significant group difference for flux in unpleasantly valenced mood may have been limited by the large disparity in mean levels of negative affect reported by the BPD and control groups. If group membership was confounded with mean unpleasant affect, the group factor may have been left with relatively little power to predict flux once mean and quadratic mean levels were statistically controlled. Future research comparing individuals with BPD with clinical samples with similarly elevated mean levels of unpleasantly valenced affect (e.g., dysthymic disorder) is needed to clarify whether negative affect instability is a specific feature of BPD or a more general phenomenon associated with chronically negative mood states.

In direct contrast to the findings for unpleasant affect, individuals with BPD reported similar mean levels of pleasant affect but more intraindividual variability relative to nonclinical control participants. Individuals with BPD were more likely to characterize themselves as experiencing acute elevations and reductions in positive mood states, and this variability was greater than would be expected given their overall levels of pleasant affect. In sum, the findings indicated that individuals with BPD and nonclinical control participants differed with respect to mean levels of unpleasant affect and the intraindividual variability of pleasant affect. The unique pattern of findings for these discrete components of overall affect valence supports theoretical conjectures that the affective manifestations of BPD extend to positive as well as negative mood states (e.g., Linehan, 1993).

These results underscore the importance and potential impact of controlling for mean levels in the analysis of intraindividual variability. Furthermore, the strong association between mean levels of affect and indices of variability supports the clinical utility of viewing affect instability as a potential consequence of elevated emotional intensity and suggests that therapeutic interventions aimed at the global reduction of negative mood states may mitigate affect instability as well. The present use of mood reports collected in the context of specific social interactions provides evidence for both high mean levels of negative affect and elevated affective instability as intrinsic components of everyday social experience for individuals with BPD.

Contrary to our expectations, individuals with BPD did not report lower levels of agreeable behavior than nonclinical control participants. They did, however, display greater intraindividual variability in agreeableness, suggesting that the BPD and control groups arrived at similar means in disparate ways. Whereas control participants reported relatively consistent levels of friendly behavior across the 20 days of data collection, individuals with BPD were more likely to fluctuate between acute elevations and reductions of agreeable behavior. As predicted, the BPD sample also displayed greater flux in quarrelsome behavior than did the control group; in this case the increased variability occurred around elevated mean levels of quarrelsomeness. Agreeableness and quarrelsomeness together reflect the broader dimension of communion, characterized by strivings for intimacy and solidarity (Wiggins, 1991). Hence, the present findings suggest that BPD is associated with a heightened tendency to vacillate between the pursuit and avoidance of interpersonal connectedness. These results are consistent with clinical reports suggesting that individuals with BPD tend to fluctuate between proactive reassurance seeking and interpersonal avoidance in response to separation from significant others (Gunderson, 1996) and with evidence that BPD is strongly associated with an insecure attachment style (Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004) characterized by oscillations between fear of involvement and intense interpersonal dependency (Bartholomew, Kwong, & Hart, 2001). The present findings may also reflect the clinically reported tendency for individuals with BPD to fluctuate between dichotomous views of others, described in the diagnostic criteria as a predisposition to alternate “between extremes of idealization and devaluation” (American Psychiatric Association, 2000, p. 710). This encourages us to speculate that fluctuations in agreeable and quarrelsome behavior among individuals with BPD might co-occur with shifts in the individual’s perceptions of others; idealization of the other and dependency on the other likely trigger both spikes in warm–friendly behavior and drops in quarrelsomeness, whereas devaluation and avoidance of intimacy lead to elevated hostility and the inhibition of agreeable behavior. Future research should more closely examine the role of interpersonal perception in the activation of communal behavior shifts among individuals with BPD.

The results indicated that individuals with BPD differed from nonclinical control participants with respect to mean level, but not variability, of submissive behavior. Individuals with BPD reported steadily high levels of submissiveness relative to the nonclinical sample. As would be expected based on the interpersonal complex framework, this elevated submissive behavior occurred in conjunction with low mean levels of dominant behavior. However, the dominant behavior reported by individuals with BPD was also characterized by significantly elevated intraindividual variability. In other words, individuals with BPD reported low mean levels of dominant behavior punctuated by both elevations and declines in dominance. This indicates that although individuals with BPD may report a general tendency to exhibit interpersonal passivity, their behavioral repertoires can include more assertive approaches to engaging the social environment. Acute increases in dominant behavior may occur alone, representing self-assured acts of social dominance, or in conjunction with elevations in other forms of behavior. For example, simultaneous increases in both dominance and agreeableness may reflect the active, prosocial pursuit of affiliative ties in response to interpersonal separation (e.g., Gun-
derson, 1996), whereas concomitant elevations in dominance and quarrelsomeness may reflect hostile–aggressive acts associated with the impulsive expression of anger (e.g., Linehan, 1993). Future research examining the contextual precipitants and interpersonal concomitants of intraindividual variability in dominance would help to clarify more precisely the implications of acute elevations and declines from generally low levels of dominant behavior among individuals with BPD.

Results for the spin dimension provide further evidence of the potential for a wide range of behavioral styles among individuals with BPD. The present investigation found that group was a moderately strong predictor of increased spin. Membership in the BPD group was associated with more broadly dispersed behavior around the interpersonal circumplex; the behavioral records of individuals with BPD were more likely to reflect the use of various dominant, submissive, agreeable, and quarrelsome behaviors. Although future research into the implications of this finding is clearly warranted, this tendency to fluctuate among different forms of social behavior may represent diverse attempts to cope with various social challenges. Individuals with BPD may experience particularly elevated levels of interpersonal and relational stress (e.g., Linehan, 1993) and use a variety of behavioral strategies in their attempts to cope with difficult interpersonal events. For example, they may avoid dominance and use submissive appeasement strategies, placate others with prosocial and affiliative behaviors, or attempt to fight back with hostile and argumentative responses. Switching among these various forms of behavior would contribute to the increased spin observed among members of the BPD group.

Limitations and Directions for Future Research

The present research compared the interpersonal patterns of individuals with BPD with those of a community sample of nonclinical control participants. The use of this comparison sample precluded the determination of whether observed between-groups differences were linked specifically to BPD or to the presence of any or all forms of psychopathology. Future research comparing individuals with BPD with other clinical populations, particularly those with whom they share key diagnostic features such as chronic negative affectivity, would permit more definitive conclusions concerning the specificity of the present findings to BPD.

In a related vein, the patterns of mood and behavior differentiating individuals with BPD from nonclinical control participants may reflect differences in the nature of the social interactions engaged in and reported on by the members of each group. Given the association between BPD and intense, unstable interpersonal relationships (e.g., American Psychiatric Association, 2000; Linehan, 1993), the social interactions reported by members of the BPD group may have involved more interpersonal conflict and relational stress than those experienced by nonclinical control participants. This consideration is particularly relevant in light of evidence that BPD symptoms may be influenced by interpersonal stressors. For example, the alleviation of acutely stressful relational situations (e.g., divorce) has been associated with the reduction of BPD symptoms (Gunderson et al., 2003). Thus, future research should compare individuals with BPD with individuals experiencing a comparable degree of interpersonal stress.

Members of the BPD group completed fewer record forms than did control group participants. Although this disparity may indicate that individuals with BPD engaged in fewer social interactions than did nonclinical control participants, it is also possible that they reported fewer of the interactions that they engaged in during the study. If BPD group members did in fact underreport social interactions, the omission of particular events may have been either random or systematic. Individuals with BPD may have reported only a subset of their interactions to reduce the time required for study participation. Alternatively, given the association of BPD with emotional avoidance (Bijttebier & Vertommen, 1999), individuals with BPD may have been less comfortable reporting particularly stressful experiences and selectively recorded information about interactions that were not associated with substantial emotional distress. As the BPD group participants were recruited from a treatment program, it is also possible that they may have selectively reported on distressing interactions that were of particular salience to themselves and their therapeutic goals. Thus, there are several plausible explanations for the observed between-groups difference in the number of social interactions reported. Given the naturalistic design of the present investigation, it was not possible to determine whether this difference may have increased or minimized group differences in affect and behavior.

Although the event-contingent recording procedure used in the present research offered several advantages over traditional one-occasion measurement, it should be noted that the methodology relies on self-reports and therefore does not allow for control over or the direct observation of behavioral and situational factors. Moreover, causal inferences based on the present data are not warranted. For example, the affective states reported by participants may have been preexisting and not the direct consequence of a particular interpersonal event. Given these limitations, the present findings would be augmented by research profiting from the greater experimental control and observational possibilities of laboratory-based investigation.

Several possibilities exist for the future application of event-contingent recording procedures to the study of ongoing affect and behavior in BPD. For example, social cognition may play a key role in the affective and behavioral responses of individuals with BPD, suggesting that future research should examine the impact of situational appraisals such as social comparison and interpersonal threat perception on mood and social behavior among members of this clinical population. Whereas data collection in the present study occurred subsequent to many different types of social interaction, future research could investigate more specific events of interest, such as interactions occurring within particular relationships (e.g., with family members, with romantic partners), in certain locations (e.g., at home), or at specific points in time (e.g., to track therapeutic response). This methodology could also be used to record other variables of potential relevance to the mood and behavior of individuals with BPD, such as substance use and self-harming behavior.

Summary and Conclusion

In the present investigation, we examined mean-level patterns and intra-individual variability in records of naturally occurring affect and behavior gathered from both individuals with BPD and
nonclinical control participants. The overall pattern of results demonstrated substantial variability in affect and interpersonal behavior during the everyday social interactions of individuals with BPD and offered a more detailed understanding of the processes through which these individuals might engage their social worlds. On a broader level, this research illustrated the utility of event-contingent recording as a tool for the naturalistic investigation of interpersonal and intrapersonal processes within clinical populations, offered methodological improvements over the existing research on affective instability, and applied novel measures of instability to the historically unexamined association between BPD and variability in interpersonal behaviors. The results of the present investigation suggest that the continued application of innovative conceptual and psychometric techniques from individual-differences research to the study of individuals with BPD and populations with other personality disorders may be of significant value to the evolving understanding of both core personality disorder features and their intrapersonal and interpersonal manifestations.

References


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