From Negative to Positive and Back Again: Polarized Affective and Relational Experience in Borderline Personality Disorder

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A core feature of borderline personality disorder (BPD) is the tendency to evaluate one's experience with extreme polarity (i.e., feeling all good or all bad; Beck, Freeman, & Davis, 2004; Kernberg, 1975; Linehan, 1993). In this investigation, we examined the polarity of within-person reports of experience in individuals with BPD and healthy adults over the course of a 21-day, experience-sampling diary. We applied multilevel modeling techniques (Rafaeli, Rogers, & Ravelle, 2007) to capture the within-person covariance of momentary reports of negative and positive features of experience, either affective or relational. Our data indicated significantly greater polarity in reports of affective and relational experiences in BPD that increased during heightened interpersonal stress. We also examined the association of affective and relational polarity to reports of impulsive behaviors (e.g., self-injury, substance use, etc.) and found evidence that increased polarity in reports of affective (in low-stress contexts) and relational experiences (in high-stress contexts) predicted increased rate of reports of impulsive behaviors. Together, these data present strong evidence for the role of polarized experiences in BPD, and have implications for the treatment of individuals with this disorder.

Keywords: borderline personality disorder, splitting, affect, relationships, impulsive behavior

Borderline personality disorder (BPD) is a disorder characterized by significant instability and dysregulation of affect, relationships, and behavior. In addition, a hallmark feature of this disorder is the tendency to evaluate one's experience with extreme polarity (i.e., feeling all good or all bad), and with difficulty synthesizing disparate feelings into a complex, unified experience. Often termed *dichotomous thinking* (DT) or *splitting*, this phenomenon is considered to be a core feature of the disorder (Beck et al., 2004; Kernberg, 1975; Linehan, 1993). Despite the pervasive theoretical discussions of DT or splitting in BPD, as well as the considerable clinical data suggesting that this phenomenon can be an obstacle to treatment (e.g., Arntz, 1994; Bond, 2004; Greene, 1993; McHenry, 1994), there is markedly little empirical work exploring this feature of the disorder.

Highly polarized reports of experience may underlie several of the main features of BPD. Specifically, two of the current diagnostic criteria, Criterion 2 (unstable interpersonal relationships alternating in extremes of idealization and devaluation), and Criterion 6 (affective instability and reactivity of mood) involve fluctuations between extreme positive and negative states, which may result from split cognitive representations or affective experiences. Similarly, Criteria 4 and 5 (impulsive behaviors, suicidality and self-injury) may also be linked to highly polarized experiences as they are theorized to be, in part, consequences of heightened or extreme negative affect (APA, 2000; Stiglmayr et al., 2005).

The purpose of the present investigation is to explore the polarity of affective and relational experiences over the course of a 21-day experience-sampling diary in adult individuals with BPD and a comparison group of healthy adults. Specifically, we will explore the within-person association of negative and positive features of affectivity and of experiences in close relationships, by building on the recently developed concept of affective synchrony (Rafaeli et al., 2007). Affective synchrony has been defined as the within-person association between oppositely valenced (i.e., negative and positive) affects over time, an association marked by wide and stable individual differences. In this study, we go beyond the examination of the phenomenon of affective polarity to examine an additional domain: the polarity of experiences within close relationships. Moreover, we look at the polarity of reported experience under different levels of perceived interpersonal stress. Finally, we investigate how the polarity of affective and relational experience is associated with impulsive and often maladaptive behaviors commonly exhibited by individuals with BPD (e.g., binge eating, self injury, etc.).

Dichotomous Thinking and Splitting in BPD

Cognitive theorists have come to view DT as a general tendency to characterize one's experience in extremes (i.e., "all or nothing"

thinking; Beck, 1995, p. 119). Such a tendency is particularly visible among individuals with BPD who have considerable difficulty integrating highly polarized moments of experience (Beck et al., 2004). Psychoanalytic theorists describe the similar concept of splitting, and also note its prevalence (and centrality) in the phenomenology of individuals with borderline personality organization or disorder. However, splitting is thought to evolve from primitive defenses enacted during early aversive relationships, resulting in the inability to form complex representations of the self or others (Kernberg, 1975). Although cognitive and psychoanalytic theories differ in the proposed etiology for split/dichotomized phenomena, both theoretical frameworks capture a similar clinical manifestation: the tendency of individuals with BPD to report their experience with extreme polarity or to alternate between these extremes (i.e., feeling all good or all bad, or viewing others as all good or all bad, at any given moment). Thus, both frameworks note a marked difficulty with complexity and with the inherent shades of gray that characterize most experiences.

Research investigating splitting/DT in BPD has evolved through the use of progressively more sophisticated methods. An early body of work employed questionnaire measures to assess behaviors, including splitting, in BPD (e.g., Defense Styles Questionnaire: Bond, Paris, & Zweig-Frank, 1994). Generally, these instruments do provide evidence of splitting, but are limited (because of their reliance on explicit, one-time self-report) in their ability to explore the construct. A later body of work consists of laboratory studies designed to capture DT in the moment. For example, Veen and Arntz (2000) examined patients with BPD as they made attributions about individuals depicted in video clips, and found some evidence of DT in interpersonally relevant film clips. In contrast, Sieswerda, Arntz, and Wolfis (2005) tested patients with BPD after playing a frustrating (but not interpersonal) computer game and found no evidence of increased DT. Such work has helped to clarify what contexts might bring about DT in BPD patients and suggests that interpersonal stressors may be most relevant.

In contrast to the limited research examining splitting/DT in BPD, a considerable body of work conducted with nonclinical samples has investigated the polarization of affective experience in reaction to stress. For example, Zautra and colleagues have demonstrated repeatedly through laboratory and field work that increased stress results in increased polarization of reported experience (see Zautra, 2003 for review). Zautra and colleagues have explained this phenomenon from a resource perspective, positing that in times of stress, maintaining complexity in one's awareness of experience is costly; the way to eliminate this cost is to (over) simplify and to experience events as highly polarized: all good or all bad (Reich, Zautra, & Davis, 2003; Zautra, 2003).

In addition, there may be important individual differences in the association of stress and cognitive evaluative components that would determine the polarity of self-reported experience. These differences could explain how individuals with greater cognitive resources might be able to maintain complexity in their reports of experience under stress, as well as how populations more vulnerable to stress may maintain fairly persistent levels of polarity. Polarity of emotional experience has been shown to be stable across multiple contexts (Rafaeli et al., 2007), as well as over time (Coifman, Rafaeli, Ross, Kleinert, & Giardina, 2012). Moreover, there is evidence linking increased complexity of reported expe-

rience to resilience during stress and increased polarity to the development of psychopathology. In a study of bereaved adults, highly polarized reports of emotional experience several months after the loss were linked to the development of significant mood and anxiety symptoms, whereas complex reports of emotion were associated with psychological resilience (Coifman, Bonanno, & Rafaeli, 2007). Finally, developmental differences, including age and educational attainment, have been associated with levels of complexity in emotional experiences, such that age and level of education are positively associated with complexity (Carstensen, 2006; Mather et al., 2004).

Individuals with BPD have been hypothesized to be particularly vulnerable to the experience of stress because of underlying deficits in regulatory capacity. For example, BPD patients have reduced baseline parasympathetic activity (Kuo, & Linehan, 2009) as well as slower recovery from heightened negative affect in BPD (Reisch, Ebner-Priemer, Tschacher, Bohus, & Linehan, 2008; Sadikaj, Russell, Moskowitz, & Paris, 2010; Stiglmayr et al., 2005). Moreover, individuals with BPD have also been shown to be particularly sensitive to interpersonal rejection and the experience of interpersonal stress (e.g., Berenson, Downey, Rafaeli, Coifman, & Leventhal, 2011; Selby, Ward, & Joiner, 2010). This vulnerability to increased stress may also be compounded by deficits in higher-order cognitive resources. For example, neuroimaging and neuropsychological research has demonstrated that there is significantly decreased activity in areas related to the control of cognitive resources in BPD (e.g., prefrontal areas; Tebartz van Elst et al., 2001), and that there is evidence of deficits in higher order cognitive processing (e.g., Bourke et al., 2006; LeGris & van Reekum, 2006). Together these findings suggest that individuals with BPD may experience more frequent states of heightened stress, which in conjunction with deficits in cognitive resources, may contribute to the highly polarized reports of experience that are characteristic of the disorder.

Affective and Relational Polarity and Impulsive Behavior in BPD

As described above, highly polarized reports of experiences, including those characterized as splitting/DT, overlap considerably with other core components of BPD. For example, individuals who have a tendency to view their experiences as either all good or all bad are likely to experience high levels of affect lability as well as unstable relational experiences. Moreover, extreme swings in affective or relational experience can trigger risky/impulsive behaviors (e.g., self-injury, substance abuse) in an attempt to regulate moods associated with these experiences. Indeed, there is considerable evidence suggesting an important association between affect, relational experiences, and maladaptive behavior in BPD (e.g., Ebner-Priemer et al., 2007; Russell, Moskowitz, Zuroff, Sookman, & Paris, 2007; Selby, Anestis, Bender, & Joiner, 2009; Trull et al., 2008), alongside an ongoing debate as to whether these components should be thought of as independent factors (e.g., Glenn & Klonsky, 2009; Koenigsberg et al., 2001; Linehan, 1993). For example, Linehan (1993) and others have argued that the key underlying component of BPD is emotion dysregulation, and that other components, including relational instability and impulsive behavior, can be understood as concomitants of an underlying emotion-regulation disorder.

Recently, researchers have begun to unpack the association between the components of BPD. For example, Gratz, Rosenthal, Tull, Lejeuz, and Gunderson (2006) demonstrated that unwillingness to tolerate distress was associated with avoidance behavior in BPD. In addition, Selby et al. (2009) demonstrated that extreme increases in negative affect were moderated by self-injurious behavior in BPD. Both pieces of evidence are consistent with theories suggesting that the risky/impulsive behaviors characteristic of the disorder are enacted as maladaptive yet powerful attempts at mood regulation when individuals become overwhelmed with negative affect (e.g., Beck et al., 2004; Linehan, 1993). Such extreme shifts may be fueled, in part, by patterns of cognitive–evaluative processing that are limited in their complexity. Individuals with BPD may only understand their experiences in extremes (all good or all bad) and thus resort to risky/impulsive behaviors to compensate, avoid, or regulate their feelings. Prior work in other populations has found a significant association between highly polarized reports of experience and disordered eating behavior (e.g., Dove, Byrne, & Bruce, 2009) as well as heightened suicide risk (e.g., Litinsky & Haslam, 1998). However, to our knowledge, there is no prior research linking polarized reports of either affective or relational experience to impulsive behavior in BPD.

Current Investigation

In this study we explored the polarity of self-reported experiences in adult individuals with BPD and in healthy adult controls over the course of a 21-day experience-sampling diary. Participants reported their affective and relational experiences as well as risky/impulsive behaviors commonly associated with BPD. We were particularly interested in exploring what impact interpersonal stress has on the polarity of self-reported experiences, and how polarity and interpersonal stress might be associated with risky/impulsive behavior.

Although considerable research in BPD populations has examined levels of negative and/or positive affect (e.g., Ebner-Priemer et al., 2007) or levels of negative and/or positive interpersonal experiences (e.g., Russell et al., 2007), we focus instead on the *association between negative and positive experiences within one individual*. To assess the polarity of experience, we modeled the momentary *within-person association* of negative and positive features of experience, both affective and relational, using techniques developed by Rafaeli et al., (2007).

Three hypotheses guide our work. First, we expect individuals with BPD to evidence poor integration of negative and positive features of experience, and predict that across the entire diary, participants in the BPD group will exhibit significantly greater polarity in the within-person estimates of negative to positive affective or relational experience. Second, we expect that individuals with BPD will show heightened sensitivity to interpersonal stress. Therefore, we anticipate that affective and relational polarity will be heightened during diary entries in which participants report greater interpersonal stress, and that this elevation will be significantly greater for the BPD group. Finally, we anticipate that greater polarity in affective and relational experience will be associated with increased rates of reported risky/ impulsive behaviors, and that this association will be strongest during high interpersonal stress.

When formulating our hypotheses and data-analytic strategy, we took into consideration that the polarity of reports of affective and relational experiences may be strongly associated due to underlying patterns in cognitive–evaluative processing. However, there is considerable debate regarding the link between affect and relational responses in BPD, and relatively little evidence examining the association between these two experiential domains, particularly in relation to impulsive behavior. As such, we used a data-analytic strategy that would allow us to define affective and relational polarity independently and to explore unique effects while still recognizing their association in our data analysis (i.e., including both constructs in each analysis to account for their overlap).

Moreover, because we examined both constructs within the context of high and low interpersonal stress, we were able to explore whether contextual features would help define their association to behavior. For example, if emotion dysregulation underlies other components of BPD, then the polarity of affective experience may have the strongest association with impulsive behavior (above the polarity of relational experience) even within the context of high interpersonal stress. However, if instead we understand the polarity of affective or relational experiences as a relatively stable cognitive–evaluative style, then contextual features (i.e., high/low interpersonal stress) could instead determine which domain of experience, affective or relational, is more relevant to understanding impulsive behavior. In this case, we would predict that during high interpersonal stress, relational polarity would have the strongest association to impulsive behavior and that during low interpersonal stress, affective polarity would have the strongest association.

Method

Procedure

Adult individuals from the New York City area were recruited through newspaper ads, online forums, and flyers for a study on "personality and mood in daily life." Materials specifically targeting individuals for the BPD sample also described symptoms of the disorder and used the diagnostic label. Additional postings and materials were distributed through treatment clinics, disorder-specific support groups, and related research projects in area hospitals. Approximately 1200 interested individuals were administered a brief telephone screening consisting of questions from the Structured Clinical Interview for *DSM–IV* (*Diagnostic and Statistical Manual of Mental Disorders,* 4th ed., text rev.; APA, 2000) Personality (First, Gibbon, Spitzer, Williams, & Benjamin, 1997). Individuals likely to meet criteria for one of the study groups (i.e., endorsing six or greater symptoms of BPD for the BPD group *or* endorsing no symptoms for the healthy control group; HC) were invited to the lab for a thorough diagnostic interview (approximately 46% of those screened). Written informed consent was obtained prior to the interview session, and all participants were paid $30 for the interview regardless of eligibility. Data were collected between 2007 and 2011.

Following the diagnostic interview, participants deemed eligible returned for a second session in which they were trained to use a personal digital assistant (PDA) in order to complete the experience-sampling diary. Participants were able to practice using

the PDA in the laboratory and were provided a written manual and instructions to take home. In addition, participants received weekly reminders during the 21-day diary period. During this period, participants were audibly signaled five times a day (at random intervals), and at each signal were asked to answer questions about their moods, behaviors, and relational experiences. At the end of the 21-day period, participants returned to the lab, were debriefed, and paid up to $100 (depending on the number of entries completed). During both the second and third lab visits, participants also completed a battery of social–cognitive tasks that are beyond the scope of this paper and reported elsewhere (e.g., Berenson et al., 2011).

Diagnostic Evaluations

Potential participants completed an extensive diagnostic interview to determine the presence of BPD or to exclude psychopathology from the control group. Interviewers were 11 doctoral-level clinical psychologists and master's-level doctoral candidates in clinical psychology who received extensive training and supervision in the administration of the Structured Interview for the Diagnosis of Personality Disorders (SID-P-IV; Pfohl, Blum, & Zimmerman, 1997) and the Structured Clinical Interview for DSM–IV (APA, 2000) Axis I Disorders (SCID-I; First, Gibbon, Spitzer, & Williams, 1996). All potential HC participants were assessed for all 10 personality disorders using the SID-P-IV. However, BPD participants were evaluated via the SID-P-IV for those personality-disorder diagnoses most often comorbid with BPD, and those most relevant to the research questions. Disorders excluded from the SID-P-IV interview for BPD participants included obsessive-compulsive, schizoid-, and paranoid-personality disorders. Symptoms of these three disorders were evaluated using the Structured Clinical Interview for DSM–IV (APA, 2000) Axis II Disorders (SCID-II; First, Gibbon, Spitzer, Williams, & Benjamin, 1997) screener self-report questionnaire administered to all eligible participants. Symptom levels reported by eligible BPD participants indicated low to moderate representation of symptoms of these disorders.

All interviews were videotaped to ensure reliability. Reliability was assessed by having each interviewer code the same set of five randomly selected interview videos; overall reliability for the assessment at the symptom and diagnostic level for Axis-II personality disorders was good (SID-P-IV average $\kappa = 0.83$), as was the reliability at the diagnostic level for Axis-I disorders (SCID-I average $\kappa = 0.86$).

Exclusion criteria for both groups were evidence of a primary psychotic disorder, current substance intoxication or withdrawal, cognitive impairment, or illiteracy. In addition, the HC group met no more than two criteria for any personality disorder, had no Axis-I diagnoses for at least one year prior to the date of the interview, were not currently taking any psychotropic medications, and had a Global Assessment of Functioning (APA, 2000) score that was high (GAF > 79). Given the high comorbidity of BPD with other disorders in actual patient populations (e.g., Skodol et al., 2002), relatively few exclusion criteria were used for the borderline group. Similarly, we did not exclude BPD participants for use of psychotropic medication.

Approximately 14% of individuals who were evaluated in the laboratory were deemed eligible for the BPD group. However, because of drop-out, equipment malfunction, and insufficient data,

16 BPD and 9 HC participants were not included in this investigation. The final study sample consisted of 65 individuals (53 female) with a current DSM–IV–TR (APA, 2000) diagnosis of BPD, and 61 HC individuals (45 female)[1]. Demographic variables for both groups are displayed in Table 1. Table 2 presents comorbid Axis-I and Axis-II diagnoses for the BPD group.

Experience-Sampling Diary

Daily variations in affect and experiences in close relationships were assessed using a 21-day computerized experience-sampling diary. The Intel adaptation of Barrett and Barrett's (2000) Experience Sampling Program software was used and configured to run on handheld Zire 21 PDAs (Palm Inc., Milpitas, CA). Audible prompts were emitted by the PDA five times daily at random intervals for a period of 21 days. The prompt was set to beep every 15 seconds for up to 10 minutes, or until the participant responded to the device. Each entry took approximately 5–10 minutes and all responses were automatically dated and time stamped. Participants could complete up to 105 diary entries over the 21-day period. The mean number of completed entries for the entire sample was $M = 74.00$, $SD = 20.66$ (71% compliance; range 27–105 entries) and there were no significant group differences in the number of entries completed. We also examined the association between diary compliance and demographic or diagnostic differences and found none.

In each diary entry, participants were asked to report on their current affective experiences, as well as to each think of one important person in his or her life (e.g., partner/spouse, parent, friend, therapist etc.). They then completed a series of items assessing their feelings about those persons, and their experiences in those relationships. This choice of important person could vary from entry to entry. In addition, participants rated a series of items capturing their overall experiences of interpersonal stress at each diary entry. Finally, participants were also asked to report if they had acted in five possible domains of risky/impulsive behaviors.

From the relevant items, we created scales assessing negative and positive affect, negative and positive relational experiences, and perceived interpersonal stress. Reliability coefficients for each diary scale were computed at both the between-subjects level (i.e., reflecting the ability to reliably differentiate between participant scores during a single, fixed, diary entry) and the within-subject level (i.e., reflecting the ability to reliably detect change in a participant's scores across assessments). These followed the procedure described by Cranford et al., (2006).

Negative and positive affect were assessed by asking participants to rate on a 5-point Likert scale ($0 = $ not at all, $4 = $ extremely) the extent to which they were currently experiencing different moods or emotions. They rated the following negative affect terms: disappointed, tense, afraid, sad, angry, and irritated; and the following positive affect terms: satisfied, energetic, happy, enthusiastic, calm, and relaxed to create scales for negative and positive affective experience. These particular terms were selected to account for varying levels of activation across two levels of valence, as suggested by affective circumplex models (e.g., Rafaeli

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[1] There were no significant demographic or diagnostic differences between those individuals who were excluded from the final sample because of drop-out, equipment malfunction, or insufficient data.

Table 1
Participant Demographics

	BPD N = 65		Healthy control N = 61		
	M	SD	M	SD	
Age	32.35	11.64	33.69	12.64	$t(124) = .62$, n.s.
Gender					$\chi^2(2, N = 126) = 1.01$, n.s.
Female	53 (82%)		45 (74%)		
Male	12 (18%)		16 (26%)		
Race/Ethnicity					$\chi^2(5, N = 126) = 6.35$, n.s.
Asian	5 (8%)		7(12%)		
Black/African	11 (17%)		18 (30%)		
Caucasian	35 (54%)		29 (49%)		
Hispanic	8 (12%)		5 (8%)		
Other	10 (15%)		7 (12%)		
Relationship status					$\chi^2(5, N = 126) = 3.10$, n.s.
None	18 (28%)		21 (34%)		
Casual dating	16 (25%)		10 (16%)		
Significant relationship	15 (23%)		13 (21%)		
Living with partner	15 (23%)		17 (28%)		
Other	1 (2%)		0		
Education level					$\chi^2(5, N = 126) = 20.45$, $p < .01$
Less than high school	4 (6%)		0		
High school diploma	3 (5%)		2 (3%)		
Part undergraduate	26 (40%)		12 (20%)		
Bachelor's degree	16 (25%)		15 (25%)		
Some graduate	16 (25%)		32 (53%)		
Psychiatric treatment history					
Current psychotherapy	36 (55%)		0		
Current medication	26 (40%)		0		

et al., 2007; Russell, 1980). Between- and within-subject reliability coefficients for negative affect were .90 and .82. Between- and within-subject reliability coefficients for positive affect were .89 and .78.

Negative and positive relational experiences. Participants were each asked to think of an important person in their lives, and to identify this person from a list of 10 categories (e.g., partner, therapist, parent, friend, etc.) and then indicated if this was the same individual they had selected in the previous diary.[2] After identifying the important person, each participant was asked to respond to a series of items assessing his or her relational experiences with this person across 6 items on a 5-point Likert scale (0 = *not at all*, 4 = *extremely*). The positive experiences scale consisted of three items: how content they were with this person, and how cared for they felt by this person, and how worthwhile they considered this person. The negative experiences scale also consisted of three items: how irritated and angry they were with this person, and how bad they considered this person. Between- and within-subject reliability coefficients for positive relational experiences were .86 and .84, respectively. Between and within subject reliability coefficients for negative relational experiences were .78 and .83.

Perceived interpersonal stress. Perceived interpersonal stress was assessed by asking participants to report, on a 5-point Likert scale (0 = *not at all*, 4 = *extremely*), the extent to which the following statements felt true at the moment: (a) "I am abandoned;" (b) "I am accepted by others" (reverse scored); (c) "I am rejected by others;" and (d) "My needs are being met" (reverse scored). This scale has been previously used in related research

and captures feelings of rejection and abandonment (see Berenson et al., 2011). Between- and within-subject reliability coefficients were .92 and .55, respectively.

Impulsive behavior. Impulsive behavior was assessed by asking participants to report if they had performed behaviors in five possible domains since the last diary entry. Participants indicated whether they had enacted each of the following behaviors: (a) Excessive spending (defined as making expensive or unplanned purchases); b) binge eating (defined as eating an amount of food larger than most people would consider in the same amount of time *and* feeling a lack of control); c) risky sexual behavior (defined as having sex impulsively with someone one wouldn't normally expect to have sex with, or having unsafe sex); d) substance use (defined as use of illegal and/or intoxicating substances or drugs, including alcohol); and (d) self-injury (defined as behavior causing direct tissue damage, such as cutting, burning, scratching, or banging; did not include suicide attempts). Reports of acts were

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[2] We examined the data to see if there were meaningful differences between the BPD and HC groups in both the choice of important person as well as the rate at which that choice varied from entry to entry. We found some significant differences in the choices made, including that BPD participants selected their therapist more often than HC participants. However none of these differences affected any relevant study variables or analysis. We did not find that the rate at which the choice varied from entry to entry ($M = 46.23\%$; $SD = 33.26\%$) differed across the groups and, although this variable had a modest but significant association with relational polarity in the low stress context, $r = .22, p < .05$, we did not find that it entered meaningfully into any analysis.

Table 2

Comorbid Axis-I and Axis-II Disorders Assessed by Diagnostic Interview

Axis I	BPD N = 65 (%)	Axis II[a]	BPD N = 65 (%)
Major depressive disorder	26 (40)	Avoidant PD	16 (25)
Bipolar disorder	7 (11)	Dependent PD	3 (5)
Dysthymic disorder	16 (25)	Narcissistic PD	5 (8)
Social phobia	27 (42)	Histrionic PD	2 (3)
Posttraumatic stress disorder	21 (32)	Anti-social PD	5 (8)
Panic disorder	6 (9)	Schizotypal PD	1 (2)
Agoraphobia without history of panic	3 (5)		
Obsessive–compulsive disorder	7 (11)		
Generalized anxiety disorder	27 (42)		
Psychosis	0 (0)		
Bulimia	1 (2)		
Binge-eating disorder	4 (6)		
Substance dependence	13 (20)		
Substance use	6 (9)		

Note. PD = personality disorder.
[a] Obsessive–compulsive, schizoid, and paranoid personality disorders were not assessed by diagnostic interview in the BPD group.

summed across diary entries by participant. Each sum was divided by the number of entries completed by that participant to create a rate of reports of impulsive behavior within the diary period.

Data Preparation

Identifying low/high interpersonal-stress diary entries. In order to identify high- versus low-stress diary entries, we person-centered ratings of perceived interpersonal stress. High-stress diary entries were those above each participant's own mean, and low-stress diary entries were those below the participant's mean. With this classification of diary entries, we were able to estimate the polarity of affective and relational experience under high-stress and low-stress contexts separately, as well as to assess the rate of impulsive behaviors reported in each context. There were significant group differences in the number of diary entries in each context. The BPD group had significantly fewer low-stress diary entries, BPD: $M = 37.28$, $SD = 14.75$; HC: $M = 46.31$, $SD = 23.95$; $t(124) = 2.57$, $p < .05$, as well as a significantly greater number of high-stress diary entries, BPD: $M = 36.58$, $SD = 15.97$; HC: $M = 26.39$, $SD = 21.05$; $t(124) = -3.07$, $p < .01$. As such, when doing any analysis involving context-specific data, we routinely controlled for the number of diary entries.

Polarity of affective and relational experience. The procedure for estimating the moment-level association between two features of experience within one individual, in this case, negative and positive affect or negative and positive relational experiences, was developed by Rafaeli et al. (2007). The polarity of momentary experience can be understood as distinct from levels of negative or positive features of experience. Indeed, this procedure attempts to minimize differences in levels of negative or positive affective or relational experience in order to examine the relationship between two valenced dimensions. Until recently, research examining the within-person covariation of dimensions of experience has been limited to the use of Ordinary Least Squares (OLS) correlations between two scales (e.g., Coifman et al., 2007; Zautra et al., 2001). However, multilevel regression strategies have been found to more

effectively account for the within-person dependence of the data and to address differential missing data (Raudenbusch & Bryk, 2002). Using the Rafaeli et al. (2007) procedure, we first person-centered each relevant variable (i.e., negative and positive affect, as well as negative and positive relational experience). The purpose of this step is to equate the mean level of ratings both within and between groups so that the association between negative and positive experiences is not confounded by more enduring mood-related influences, but is instead dependent on moment-level deviations from one individual's own mean. Then, using a multilevel regression model (PROC MIXED, SAS, 2008), we entered person-centered positive affect as a fixed effect predicting moment-level negative affect. We employed an autoregressive error structure to control for serial auto-correlation, and retained the random effects for the slope coefficient as individual estimates of polarity in affective experience.[3] The same procedure was repeated to estimate polarity in relational experience, using person-centered positive relational experiences as the fixed effect predicting moment-level negative relational experiences. These individual slopes reflect the polarity in the association between negative and positive features of experience: The steeper the slope, the stronger the association. As such, more negative scores reflect more highly polarized experiences. We repeated this procedure three times to capture the polarity of either affective or relational experience across the whole diary, as well as for diary entries identified as low or high in interpersonal stress. Thus, each participant had a total of six scores reflecting estimates of the polarity of affective and relational experiences across the entire diary, under high interpersonal stress, and under low interpersonal stress.

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[3] We did systematically check that no assumptions of regression were violated, either in the multilevel analyses used to derive polarity scores, or in the OLS regressions described in the analyses for Hypothesis 3. This included visually inspecting residuals (marginal and conditional for the mixed models) and confirming linearity and normality of the distribution.

Results

Preliminary Data Analysis

Comparison of the two study groups indicated that, although there were no differences in age, gender, or racial/ethnic ratios between the groups, there were significant differences in educational attainment, $\chi^2(7, N = 126) = 20.45, p < .01$ (see Table 1). We also examined the association between diary compliance (i.e., number of completed entries) and differences in demographic and diagnostic status and found none.

Table 3 presents the means of the affects, experiences in relationships, perceived interpersonal stress, and impulsive behaviors for the two groups, along with t tests of group differences. As expected, the BPD group reported significantly greater negative affect, more negative experiences in relationships, greater interpersonal stress, and significantly less positive affect and fewer positive experiences in relationships. Similarly, the BPD group reported a significantly higher rate of impulsive behavior.

Table 4 presents the group mean estimates of polarity, as well as zero-order correlations between estimates. As expected there were consistently strong associations between estimates of affective and relational polarity between and within each context.

Hypothesis 1: Group Differences in the Polarity of Affective and Relational Experiences

To Test Hypothesis 1, that individuals with BPD would have more polarized affective and relational experiences, we examined differences between groups in estimates of affective and relational polarity across the 21-day diary using a two-way ANCOVA (Group × Experience type). Because there is considerable evidence regarding the role of age and educational attainment in the complexity of reports of experience (Carstensen, 2006), we controlled for both in the between-groups analyses. As predicted, we found a significant between-groups effect, $F(1, 122) = 63.83, p < .001, \eta^2 = .34$, suggesting that the BPD group had significantly greater polarity in reports of affective and relational experience (i.e., significantly lower estimates) across the entire diary period.[4] We reran the analysis controlling for the number of completed diary entries and the results were unchanged.

Hypothesis 2: The Role of Stressful Contexts

To test the hypothesis that heightened interpersonal stress would significantly increase polarity of both affective and relational experiences, and that this would be moderated by group (BPD or HC), we conducted a three-way mixed-model ANCOVA (Group × Experience type × Stress level), with educational attainment and age as covariates. We did also include number of context-specific diary entries (i.e., low stress, high stress) and relationship status as covariates, but because they did not meaningfully impact the results, these variables were dropped. Consistent with the results above, there was a significant between-groups difference in polarity across all data points, $F(1, 122) = 58.29, p < .001, \eta^2 = .32$. More important, this analysis revealed a significant Group × stress level interaction, $F(1, 122) = 4.01, p < .05, \eta^2 = .03$, suggesting a distinct pattern of responses for each group, under high and low stress (Figures 2a and 2b; Table 5). As

predicted, the polarity of affective and relational experiences was greater (i.e., scores became more negative) in the BPD group when interpersonal stress was high. In contrast, the polarity of reports in the HC group decreased (i.e., scores became less negative) when interpersonal stress was high, although the simple effect of stress level was not significant. There was also a significant three-way interaction of Stress level × Experience type × Age, $F(1, 122) = 5.14, p < .05, \eta^2 = .04$. An inspection of means suggested that the older the participant, the more complex his or her emotional experiences were under heightened stress.

Hypothesis 3: Affective and Relational Polarity and Impulsive Behavior

To test Hypothesis 3, we examined the role of polarized relational and affective experience in predicting the rate of reports of risky/impulsive behaviors during low and high stress. First, we extracted the rate of reports, separately for diary entries designated as high or low interpersonal stress, of any of the following behaviors: excessive spending, binge eating, risky sexual behavior, substance use, or self-injury. Because these data were skewed, we performed a square-root transformation so that the data approximated a normal distribution (i.e., rate of impulsive behavior during high stress, skewness = 0.41; rate of impulsive behavior during low stress, skewness = 0.78). Then we ran two hierarchical regression analyses to examine the association between affective and relational polarity and rate of impulsive behavior under low- and high-stress conditions, separately.

In the first analysis, our dependent variable was the rate of impulsive behaviors during high stress. We first entered estimates of the polarity of affective and relational experiences during high stress as predictors. We then entered diagnostic group in a second step. Each step of the model was significant. Moreover, the polarity of relational experience was significantly associated with the rate of reports of impulsive behavior during high stress in the final model, such that the more polarized the relational experience, the greater the rate of reports, $\beta = -.26 \ p < .05, sr^2 = .04, F(3, 122) = 13.90, p < .001$. The polarity of affective experience did not approach significance (see Table 6). Post hoc t tests revealed that the regression coefficients for affective polarity and relational polarity were significantly different, $t(122) = -4.41, p < .01$.

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[4] Given the typically high rates of Axis-I and Axis-II comorbidities in samples with BPD and in our sample, we reran each analysis in order to explore whether the results were not better accounted for by other psychopathology. First, because Axis-I disorders generally are associated with mood or affect-related differences, we excluded all BPD participants without any comorbid Axis-I pathology ($n = 4$), reran all analyses, and the results were unchanged. Next, because mood disorders in particular can exert influences on affect-related phenomena, we reran all analyses excluding all BPD participants without comorbid mood pathology ($n = 13$; bipolar, major depression, dysthymia), and the results were unchanged. Then, because the presence of other Axis-II disorders could also influence our findings, particularly in the domain of relational experiences, we reran all analyses using a stratified approach for the BPD sample, those diagnosed with another Axis-II disorder ($n = 26$), versus those without another Axis-II disorder ($n = 39$), and again the results were unchanged. Finally, we controlled for the presence of avoidant-personality disorder ($n = 16$), the most common comorbid Axis-II condition in our BPD sample, and again the results were unchanged.

Table 3

Comparison of Mean Affective and Relational Experience, Interpersonal Stress, and Rate of Impulsive Behavior Across the Entire Diary

	Borderline PD N = 65		Healthy control N = 61			
Variable	M	SD	M	SD		d
Positive affect	1.33	0.58	2.15	0.53	t(124) = 8.32***	1.49
Negative affect	1.19	0.65	0.21	0.23	t(124) = −10.99***	1.97
Positive relational experience	2.25	0.83	3.11	0.62	t(124) = 6.53***	1.17
Negative relational experience	0.97	0.67	0.20	0.23	t(124) = −8.48***	1.52
Perceived interpersonal stress & rejection	2.00	0.80	0.73	0.34	t(124) = −11.56***	2.08
Impulsive behavior (low stress)	0.17	0.21	0.06	0.09	t(124) = −3.92***	0.70
Impulsive behavior (high stress)	0.20	0.19	0.07	0.10	t(124) = −4.78***	0.86
Impulsive behavior (overall)	0.18	0.16	0.06	0.09	t(124) = −4.84***	0.87

*** $p < .001$.

In the second regression analysis, our dependent variable was the rate of report of impulsive behaviors during low stress. We followed the same steps as in the previous analysis and each step was significant. In this case, results indicated that the polarity of affective experience was significantly associated with the rate of reports of impulsive behaviors during low stress in the final model, $\beta = -.20$, $p = .06$, $sr^2 = .02$, $F(3, 122) = 12.51$, $p < .001$. The polarity of relational experience did not approach significance (see Table 6). Post hoc t tests revealed that the regression coefficients for affective polarity and relational polarity were significantly different, $t(122) = 2.22$, $p < .05$.

We initially included age, educational attainment, relationship status, and number of diary entries in each model as controls, but dropped them because they did not have any meaningful impact on the results. Moreover, we repeated each regression controlling for Axis-I and -II disorders, treatment with medication and/or psychotherapy, and the results were unchanged [4].

Discussion

Most theories of BPD place polarized experience at the heart of the disorder (Beck et al., 2004; Kernberg, 1975; Linehan, 1993), and this phenomenon is recognized as central to the clinical presentation of patients (APA, 2000). However, the understanding

of this feature of BPD has been based mostly on clinical and theoretical descriptions with relatively little empirical explication. The results of the current study present the first attempt to capture the polarity of affective and relational experience in BPD using experience-sampling methodology, and advance our understanding of this phenomenon in several key ways.

Consistent with hypotheses, heightened polarity of both affective and relational experiences were markedly evident in the BPD group when compared with the healthy control group. Moreover, during interpersonal stress, polarity increased for the BPD group in contrast with controls. Finally, heightened polarity in affective and relational experiences was significantly associated with risky/impulsive behaviors. Although, affective and relational polarity were strongly associated, our analysis revealed the importance of context in explicating the link between polarity and impulsive behavior. For example, during heightened interpersonal stress, relational polarity was the sole predictor (beyond group) of impulsive behavior, whereas during low interpersonal stress, affective polarity was the sole predictor (beyond group). Together these findings are consistent with dominant theories of DT and splitting in BPD (e.g., Beck et al., 2004; Kernberg, 1975; Linehan, 1993) and advance our understanding of the complex association between affect, relationships, and behavior in this disorder.

Table 4

Estimates of the Polarity of Affective and Relational Experiences Over the Entire Diary (and During High and Low Interpersonal Stress): Group Means and Zero-Order Correlations

	Borderline PD N = 65		Healthy control N = 61						
Estimated variable	M	SD	M	SD	1	2	3	4	5
1. Affective polarity	−0.17	0.36	0.19	0.15	—				
2. Relational polarity	−0.17	0.30	0.16	0.21	.74**	—			
3. Affective polarity (under low stress)[†]	−0.10	0.29	0.14	0.11	.80**	.62**	—		
4. Affective polarity (under high stress)[†]	−0.16	0.43	0.17	0.17	.86**	.57**	.51**	—	
5. Relational polarity (under low stress)[†]	−0.12	0.31	0.13	0.19	.58**	.83**	.59**	.39**	—
6. Relational polarity (High Stress)[†]	−0.18	0.33	0.15	0.20	.71**	.92**	.55**	.62**	.66**

** $p < .001$. [†] Low stress = low-perceived interpersonal stress; high stress = high-perceived interpersonal stress.
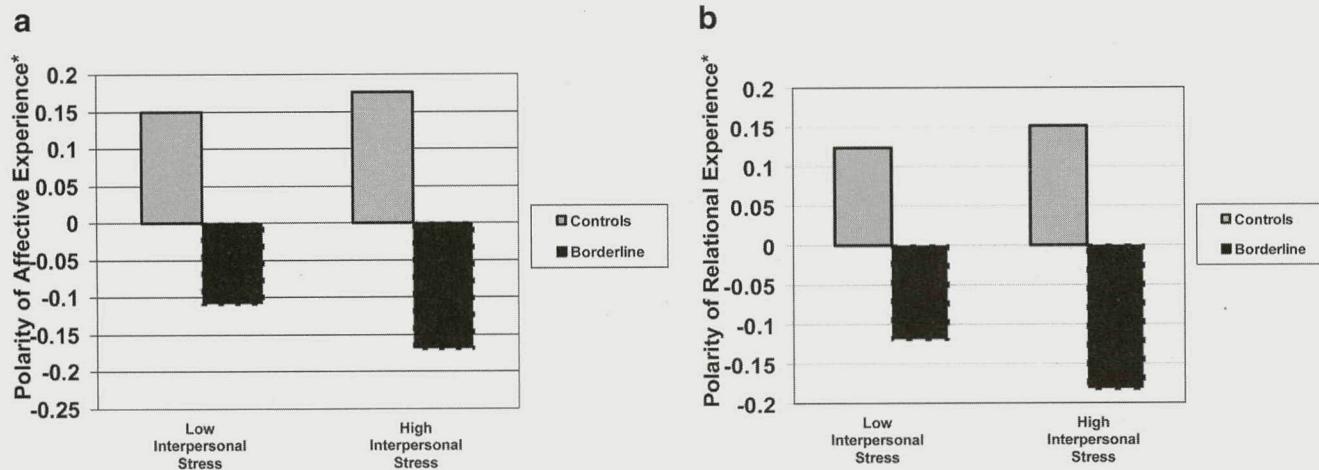
a

b

Figure 1. a. The polarity of affective experience by group and interpersonal stress level. Lower scores reflect greater polarity in reports of affective experience. b. The polarity of relational experience by group and interpersonal stress level. Lower scores reflect greater polarity in reports of relational experience.

Although prior research has suggested that most people can show polarized reports of experience during heightened stress (Zautra, 2003), our work indicates that individuals with BPD show greater polarization, even in the absence of a stressful context. This finding is consistent with the view (e.g., Rafaeli et al., 2007) that presumes important differencesthat limit the ability of some individuals with BPD to experience events in a complex way. Indeed, these data suggest that individuals with BPD may have key differences in their patterns of cognitive–evaluative processing, making them more vulnerable to highly polarized appraisals of their experience.

The results of this investigation are also highly consistent with new evidence suggesting overly simplistic processing of emotion in BPD.

Table 5
Three-Way Mixed-Model Analysis of Covariance: Group × Experience Type × Stress Level

	df (1, 122)		
	F	η^2	p
Within-subject effects			
Source			
Stress level	.07	.00	n.s.
Stress level × age	2.05	.02	n.s.
Stress level × Education	1.03	.01	n.s.
Stress level × Group	4.01	.03	$p < .05$
Experience type	.33	.00	n.s.
Experience type × Age	1.25	.01	n.s.
Experience type × Education	1.72	.01	n.s.
Experience type × Group	.11	.00	n.s.
Stress level × Experience type	1.21	.01	n.s.
Stress level × Experience type × age	5.14	.04	$p < .05$
Stress level × Experience type × Education	.14	.00	n.s.
Stress level × Experience type × Group	.00	.00	n.s.
Between-subjects effects			
Source			
Group (BPD vs. HC)	58.29	.32	$p < .001$
Age	2.08	.01	n.s.
Education	.18	.00	n.s.

For example, recent evidence suggests that individuals with BPD have a decreased capacity to describe and distinguish like-valenced emotional experiences (i.e., differentiate anger from sadness from guilt; Zaki, Coifman, Rafaeli, Berenson, & Downey, 2011; Suvak et al., 2011). This dimension of emotion processing has been termed "emotion differentiation" or "granularity" and is thought to be a component of emotion regulation and inherent to complexity in emotional experience (Lindquist & Barret, 2008). This evidence, in conjunction with accumulating research suggesting deficits in higher order cognitive processing in BPD (e.g., Bourke et al., 2006), supports our interpretation that individuals with this disorder are prone to patterns of cognitive–evaluative processing that facilitate highly polarized, and perhaps overly simplistic, interpretations of experience.

Although we found an increase in the polarity of affective and relational experience under high (vs. low) stress in the BPD group, the control group did not exhibit the same pattern. Indeed, their reports of both affective and relational experiences became less polarized (i.e., increased in complexity) under high interpersonal stress. We can understand this in a number of different ways. First, individuals in the control sample were relatively high functioning (we used an inclusion criterion of the GAF, i.e., scores at 80 or above; APA, 2000), suggesting that these individuals were less likely to report truly elevated interpersonal stress over the course of the diary. In addition, consistent with the findings of Coifman et al. (2007), highly resilient individuals can maintain levels of complexity in affect even during the most aversive events. This may be an adaptive mechanism that allows the individual to maintain high levels of functioning even during times of need. Moreover, attachment theorists would argue that under threat (i.e., heightened interpersonal stress), the attachment system is activated; because of it, healthy (i.e., mostly securely attached) individuals are likely to enhance the positive features of those close to them as a way of reengaging feelings of security (e.g., Murray & Holmes, 1997). The consequence of this would be increased complexity in reports of experience in relationships, particularly during heightened stress.

Finally, our analysis for Hypothesis 2 revealed a significant three-way interaction relating stress level, experience type, and age. Upon

Table 6

The Association Between the Polarity of Affective or Relational Experience and Rate of Reports of Impulsive Behaviors During the 21-Day Experience-Sampling Diary

	B	SE	β	sr^2	R^2	ΔR^2
	DV: Rate of reported impulsive behavior during high-stress diary entries					
Step 1						
Affective polarity (high stress)	−.02	.07	.03	.00	.17	—
Relational polarity (high stress)	−.28***	.08	−.39	.09		
$F(2, 123) = 12.20, p < .001$						
Step 2						
Affective polarity (high stress)	.03	.06	.05	.00	.26	.09***
Relational polarity (high stress)	−.19*	.08	−.26	.04		
Group (BPD vs. control)	.16**	.04	.35	.09		
$F(3, 122) = 13.90, p <.001$						
	DV: Rate of reported impulsive behavior during low-stress diary entries					
Step 1						
Affective polarity (low stress)	−.29**	.09	−.32	.07	.15	—
Relational polarity (low stress)	−.09	.08	−.11	.01		
$F(2, 123) = 11.22, p < .001$						
Step 2						
Affective polarity (low stress)	−.18†	.09	−.20	.00	.24	.09***
Relational polarity (low stress)	−.03	.08	−.04	.02		
Group (BPD vs. control)	.15**	.04	.33	.08		
$F(3, 122) = 12.51, p < .001$						

† $p = .06$. Δ $p = .07$. * $p < .05$. ** $p < .01$. *** $p < .001$.

closer examination, this finding appeared to be consistent with theoretical and empirical work (see Carstensen, 2006), suggesting that the older the participant, the more complex his or her emotional experiences, particularly under high stress. Although a large body of work has examined developmental influences on both affective and relational experiences, rarely has this work included clinical populations, such as individuals with BPD. This finding in particular is consistent with recent shifts in the understanding of features of this disorder once presumed to be "chronic" (see Clark, 2009), suggesting that there may be important life-span developmental influences to consider.

Clinical Implications

The results of this investigation are relevant to the clinical understanding and treatment of patients with BPD. First, we demonstrated that the increased polarity in the experiences of individuals with BPD limits their ability to appraise both their intrapersonal and their interpersonal worlds in complex and multihued ways. Thus, we provide a much-needed empirical validation of clinical reports about the limited capacity of individuals with BPD for complexity in understanding and reporting various kinds of experiences.

Second, as behavioral and psychoanalytic theorists (e.g., Beck et al., 2004; Kernberg, 1975; Linehan, 1993) have noted, this polarity results in great distress to persons with BPD or to those who come into contact with them. Our findings link extreme polarity in reported affective and relational experience to increased frequency of risky/impulsive behaviors. Decreasing polarization might prove to be a fruitful point of intervention for reducing risky behaviors in patients.

Finally, there is considerable clinical evidence documenting the negative impact of DT or splitting on the therapeutic relationship itself (e.g., Arntz, 1994), the cumulative toll it can take on practitioners and treatment settings (e.g., Bland & Rossen, 2005; Greene, 1993), as well as the negative impact on effectiveness of interventions for BPD (e.g., Bond, 2004; Linehan, 1993). Indeed, several current treatment modalities, including Dialectical Behavior Therapy (DBT; Linehan, 1993), Mentalization-Based Therapy (Bateman & Fonagy, 2004), and Schema Therapy (Young, Klosko, & Weishaar, 2003), were designed in part to address these phenomena. For example, Linehan (1993) explicitly focused DBT on the difficulties that patients experience maintaining a dialectic or complex view of themselves, of their experiences, and of therapeutic progress.

Limitations

There are several limitations to this investigation. First, the BPD sample, recruited as it was from the community and not exclusively from clinical settings, may not represent more severely impaired individuals with this disorder. We did not find differences between the BPD and healthy groups in the number of diary entries completed, and the overall study protocol was demanding. This raises the possibility that the study may have "selected out" individuals with BPD who were too impaired to be sufficiently compliant, or "selected in" individuals whose underlying motivations may have been driven, in part, by financial needs. Nonetheless, despite this possible selection bias, which should have weakened our power to detect differences, we found striking differences between the BPD and the HC groups.

The second issue pertained to our operationalization of high stress in the diary. We specifically focused on high interpersonal stress and not other stressful contexts. This seemed prudent given the compelling evidence suggesting that individuals with BPD experience more interpersonal difficulty than other groups (e.g., Russell et al., 2007). However, this choice limits the ability to generalize to other stressful contexts, which would be a worthwhile line of inquiry in future research. Moreover, because we defined interpersonal stress through self-reported means only, we were likely to find an association with self-reported ratings of relational experience. Future research endeavors would benefit from using more objective markers of interpersonal stress, including those provided by individuals close to the participant.

The third issue pertained to the high rate of comorbidity in the BPD sample. Although individuals with BPD typically present with high rates of other Axis-I and Axis-II disorders (Skodol et al., 2003) and our sample was no different, we were not able to rule out the possibility that other psychopathology may have influenced our findings. We were able to exclude or stratify the BPD sample to account statistically for these comorbidities [4] and found our results intact, but there is still the possibility that other psychopathology (in particular, mood pathology), may, in part, be driving these effects. An important step in future research will be to compare these phenomena in BPD with individuals with significant Axis-I pathology (e.g., major depressive disorder) without any significant Axis-II pathology.

Finally, although we used experience sampling and advanced statistical methods to isolate the within-person polarity of experience, we did not examine how these results might be related to established measures of DT or splitting. However, our findings are highly consistent with prior work examining these constructs through both self-report and experimental methods (e.g., Bond et al., 1994; Veen & Arntz, 2000), and suggest that we are measuring overlapping constructs.

Conclusion

In this investigation we explored the polarity of within-person reports of affective and relational experiences over the course of a 21-day experience-sampling diary in a sample of adult individuals with BPD and a comparison group of healthy adults. Specifically, we applied multilevel modeling techniques (Rafaeli et al., 2007) to capture the within-person covariance of momentary reports of negative and positive features of experience, either affective or relational. Our data demonstrated significantly increased polarity in reports of affective and relational experiences in the BPD sample, consistent with cognitive and psychoanalytic theories of DT or splitting. Moreover, when we examined this phenomenon across high- and low-stress contexts, the BPD group exhibited significant increases in the polarity of their reported experience, whereas the healthy control group showed the opposite tendency. Finally, we examined the association of affective and relational polarity to reports of impulsive behavior and found evidence that increased polarity in reports of either affective (in low-stress contexts) or relational experiences (in high-stress contexts) predicted rates of reported binging, excessive spending, risky sex, substance use, and/or self-injurious behaviors. Together, these data present strong evidence for the role of dichotomized, split, or polarized experiences in BPD, and for the importance of considering these experiences in the treatment of individuals with this disorder.

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