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The Rejection-Rage Contingency in Borderline Personality Disorder

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Abstract

Though longstanding clinical observation reflected in the DSM-IV suggests that the rage characteristic of borderline personality disorder (BPD) often appears in response to perceived rejection, the role of perceived rejection in triggering rage in BPD has never been empirically tested. Extending basic personality research on rejection sensitivity to a clinical sample, a priming-pronunciation experiment and a 21-day experience-sampling diary examined the contingent relationship between perceived rejection and rage in participants diagnosed with BPD compared to healthy controls. Despite the differences in these two assessment methods, the indices of rejection-contingent rage that they produced were both elevated in the BPD group, and were strongly interrelated. They provide corroborating evidence that reactions to perceived rejection significantly explain the rage seen in BPD.

Keywords

Borderline Personality Disorder; rejection sensitivity

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Anger that is inappropriate, intense or uncontrolled (APA, 2000) -- the quality of anger central to the definition of *rage* – is among the DSM-IV criteria for borderline personality disorder (BPD). Not all individuals with BPD experience rage, nor is rage the only intense, dysregulated emotional experience associated with the disorder. Yet, because relationships are deeply desired by individuals with BPD, and because high-quality relationships have been associated with improvements in the course of the disorder (e.g., Gunderson et al., 2006; Zanarini, Frankenburg, Hennen, Reich, & Silk, 2005), the destructive effects of rage on the stability of both personal and therapeutic relationships make it a particularly devastating symptom. For example, in a population survey of couples, BPD symptom severity was associated with the perpetration of marital violence and increased probability of marital dissolution (Whisman & Schonbrun, 2009). Moreover, levels of hostility predict BPD patients' early dropout from treatment (Rüsch et al., 2008; Smith, Koenigsberg, Yeomans, Clarkin, & Selzer, 1995; Kelly et al., 1992). In turn, the interpersonal stress to which rage often contributes is identified by people diagnosed with BPD as increasing their likelihood of self-harm (Welch & Linehan, 2002), and as the most important trigger for recent suicide attempts (Brodsky, Groves, Oquendo, Mann, & Stanley, 2006).

The clinical experience reflected in the DSM-IV-TR suggests that a key precipitant of rage (as well as other symptoms) in BPD is the perception that an important other is “neglectful, withholding, uncaring or abandoning” (APA, 2000, pp. 707-708). However, no previous research has evaluated the extent to which perceived rejection explains the rage that is a characteristic of the disorder. To help fill this gap, we examine the contingent relationship between perceived rejection and rage in participants with BPD relative to healthy control participants. We first investigate the contingency between automatic thoughts of rejection and rage in a laboratory experiment. Then, we use an electronic experience-sampling diary to examine the extent to which this automatic association translates into rejection-triggered rage feelings in participants' daily lives. Finally, we test whether the strength of rejection-rage contingency shown in the experiment is associated with the strength of rejection-rage contingency shown in the experience-sampling diary.

Rage in BPD

Research using several methods has shown that rage-related emotions and behavior in BPD fluctuate and occur with a relatively sudden onset. Studies assessing self-reported affective instability have found that the lability of anger differentiates BPD from other personality disorders and from comorbid mood disorders (e.g., Koenigsberg et al., 2002; Henry et al., 2001). Further evidence for labile anger in BPD has been obtained from diary studies in which individuals report their moods multiple times per day. For example, Trull et al. (2008) found that increases in hostility from one diary report to the next were more abrupt in BPD compared to depressive disorders. Using an event-contingent diary that was completed immediately after each interpersonal interaction, Russell, Moskowitz, Zuroff, Sookman, and Paris (2007) found participants with BPD to have heightened variability in quarrelsome, dominant, and agreeable behaviors, as well as a greater frequency of sudden switches between these interpersonal styles, compared to controls. Although the study did not address the extent to which quarrelsome behavior required an interpersonal trigger per se (nor any other triggering features of the interpersonal situations in which it emerged), the results

clearly demonstrated that the expressions of anger associated with BPD fluctuate from one interpersonal context to the next.

Mood fluctuations in BPD appear to be linked with stress and insecurity, consistent with the clinical depiction of BPD symptoms as reactive to interpersonal context (e.g., Gunderson & Phillips, 1991; Bradley & Westen, 2005; Levy, 2005; Yeomans & Levy, 2002). For example, Glaser, Van Os, Mengelers and Myin-Germeys (2008) conducted a diary study that assessed, at random intervals each day, depressed/anxious mood and stressfulness ratings for recent and current situations. These authors found subjective stress ratings were more associated with concurrently reported negative mood in BPD than in healthy and psychotic comparison groups. Similarly, in an electronic diary study assessing aversive inner tension on an hourly basis, Stiglmayr et al. (2005) asked participants to indicate retrospectively whether reported increases in tension had been preceded by specific events. Participants with BPD had more frequent, intense, and sudden experiences of aversive tension than did control participants; moreover, *rejection*, *being alone*, and *failure* were identified as triggering events for nearly 40% of the BPD group's increases in aversive tension.

These relatively independent strands of research are consistent with the clinical depiction of rage in BPD as reactive to interpersonal stressors such as perceived rejection, but none examine the rejection-rage contingency directly. A great deal of empirical work on individual differences in rejection-triggered rage does exist, however, in basic personality research conducted in nonclinical samples.

The Rejection Sensitivity (RS) Model

It is well-established that feeling rejected normatively elicits anger (for review see Leary, Twenge, & Quinlivan, 2006) but that people show considerable variability in the intensity of this response. The Rejection Sensitivity (RS) model (Downey & Feldman, 1996) was initially developed to explain in cognitive-affective terms why some individuals are especially vulnerable to respond to rejection cues with anger that is intense, uncontrolled, and often culminating in verbal or physical aggression. In brief, the model proposes that experiences of rejection (including all overt and covert acts perceived to communicate rejection), can lead individuals to develop a disposition to anxiously expect rejection in the future. When highly rejection-sensitive individuals encounter cues that they have learned to associate with rejection, their anxious expectations for rejection become activated, triggering both *processing biases* and *intense reactions* that strain their capacity for self-regulation. Accordingly, these individuals' behaviors in situations perceived as rejection-relevant are often reflexive reactions to affectively-driven interpretations of the immediate situation, which lose sight of broader perspectives or long-term goals. By increasing the readiness to perceive and respond intensely to potential rejection even in ambiguous or benign situations, anxious expectations for rejection guide maladaptive reactions including overly intense and uncontrolled expressions of anger, thereby contributing to a self-fulfilling prophecy for future relationship difficulties, feelings of rejection, and loneliness (Downey, Freitas, Michaelis, & Khouri, 1998; London, Downey, Bonica, & Paltin, 2007). Numerous studies conducted with students and community samples support the RS model (for reviews see Romero-Canyas, Downey, Berenson, Ayduk, & Kang, 2010; Downey, Lebolt, Rincon, &

Frietas, 1998). However, the utility of the model for understanding processes underlying symptoms of clinical disorders, such as BPD, has not yet been established.

Particularly relevant to the present research are studies documenting that rejection cues specifically trigger rage in people high in RS. A laboratory experiment (Ayduk, Downey, Testa, Yen, & Shoda, 1999; Study 1) demonstrated that RS is associated with a stronger automatic mental association through which thoughts of rejection more readily trigger thoughts of rage. Two further experiments manipulating the presence of rejection cues in simulated internet dating contexts have also shown that RS is associated with stronger causal links from rejection cues to hostile interpersonal perceptions (Ayduk et al., 1999, Study 2) and to retaliatory aggressive behavior (Ayduk, Gyurak, & Luerssen, 2008). In addition, in a daily diary study of couples, conflicts were more likely to occur following days on which highly rejection-sensitive women reported feeling more rejected (Ayduk et al., 1999 Study 3). Notably, all of these studies found RS to be associated with increased intensity of anger only in the presence of rejection-related cues. Hence, the inappropriately intense or uncontrolled anger that often characterizes highly rejection-sensitive individuals is a context-contingent, predictable reaction rather than a chronic condition.

The RS model and the prior research demonstrating exaggerated intensity of rejection-contingent anger in highly rejection-sensitive individuals is a relevant framework for understanding rage in BPD. Both the BPD diagnosis itself and the frequency of rage observed in people suffering from BPD have also been associated with insecure attachment (e.g., Critchfeld, Levy, Clarkin, & Kernberg, 2007; Levy, Meehan, Weber, Reynoso, & Clarkin, 2005; Meyer & Pilkonis, 2005), a construct both theoretically and empirically related to RS. Moreover, the processing biases found to increase the readiness of individuals with BPD to perceive negativity in social-emotional cues (e.g., Lynch et al, 2006; Domes, Schulze, & Herpertz, 2009) are conceptually consistent with the processing biases associated with RS in nonclinical samples. Finally, the RS model draws upon a major contemporary view of personality, Mischel and Shoda's (1995) Cognitive-Affective Processing System, which focuses on the predictable variability of individual behavior produced by the interaction between dispositional characteristics and triggering situations. Such a perspective is particularly likely to increase knowledge of BPD through research that directly tests the clinical understanding of BPD symptoms as reactive to social contexts.

The Current Research

We predicted that participants with BPD would be characterized by high sensitivity to rejection, which the literature suggests can contribute to rage in two ways. First, RS is associated with experiencing the self as more rejected (both through readiness to interpret interpersonal cues as conveying rejection, and behavior patterns that undermine the formation and maintenance of stable, satisfying relationships). Because rejection commonly increases rage, those who experience more rejection should experience more rage, overall. Second, beyond mean differences in perceiving rejection, RS is also associated with heightened reactivity to perceived rejection, including reactivity that involves intense anger and aggression. Rejection-sensitive individuals should therefore show a stronger rejection-rage contingency, reacting with more rejection-contingent rage than others exposed to the

same degree of rejection. To assess and compare the strength of the rejection-rage contingency in participants with BPD and healthy controls, we used two complementary methods – an experiment with high internal validity, and an experience-sampling diary with high external validity.

A sequential priming-pronunciation paradigm assessed the extent to which priming thoughts of rejection automatically facilitates rage-related thoughts. Developed in Ayduk et al.'s (1999) study of the rejection-rage contingency associated with RS in non-clinical subjects, this laboratory task is based on established findings that the strength of mental association between a prime word and a target word is reflected in the speed with which the target word can be pronounced after presentation of the prime (e.g., Balota & Lorch, 1986; Bargh, Raymond, Pryor, & Strack, 1995). We predicted that rage words would be more cognitively accessible in BPD than in control participants only when they followed rejection primes, and not when they followed neutral primes or negative primes unrelated to rejection. We also predicted that the facilitated response to rage words following rejection primes in BPD would be unidirectional (i.e., not also occur for rejection words following rage primes).

Experience-sampling diaries were also used to examine the rejection-rage contingency in participants' daily lives. Experience sampling has gained recognition for its utility in assessing affective instability in BPD, because it minimizes biases influencing single-report retrospective questionnaires (e.g., Ebner-Priemer et al., 2006; Solhan, Trull, Jahng, & Wood, 2009). The ability to examine differences in reactivity to context, above and beyond individual differences in exposure to that context (cf., Bolger & Zuckerman, 1995), is another strength of these methods. Participants in our study rated their levels of perceived rejection and rage feelings using an electronic diary five random times each day for 21 days. The rejection-rage contingency index was the within-person association (slope) between the two constructs. We hypothesized that this within-person association would be markedly stronger for participants with BPD than for controls.

Finally, because a unique feature of our study was measuring the strength of the rejection-rage contingency in two very different ways, we tested the hypothesis that the two indices would be associated with one another.

Method

Participants

The research was conducted with adult participants from the community who met all criteria (described below) for BPD or healthy control (HC) groups as determined by diagnostic interviews.

Inclusion/exclusion criteria—Because personality disorders rarely occur in the absence of comorbid diagnoses (e.g., Dolan-Sewell, Krueger, & Shea, 2001; Shea et al., 2004), we used relatively few exclusion criteria to recruit participants with BPD who would be representative of the population. Individuals with primary psychotic disorder, current substance intoxication or withdrawal, or organic cognitive impairment were excluded because these conditions were likely to interfere with providing valid data. All other

disorders and medication use were allowed to vary freely. To be eligible for the HC group, participants were required to have no current or partially remitted Axis-I disorder in the last year, to meet fewer than three criteria for any single personality disorder, and to meet fewer than 10 personality disorder criteria in total. In addition, we excluded from this group anyone taking medication for a psychiatric condition, and anyone with a Global Assessment of Functioning score below 80. For both groups, we excluded individuals observed to have reading/language or visual difficulties pronounced enough to influence study participation.

The present investigation includes eligible BPD and HC participants who provided sufficient data on the experimental task and/or diary. The sample sizes vary across different aspects of the research, because equipment failure or other problems sometimes interfered with some procedures. Sub-sample sizes are noted for each analysis.

Sample characteristics—The BPD group (n=45) met an average of 6.21 criteria for BPD (range 5-8), whereas the HC group (n=40) met an average of .15 (range 0-2). The total sample was 76.5% female, and had a mean age of 33.5 years (SD=10.2). Participants were 48.2% Caucasian, 23.5% African-American, 12.9% Hispanic, 8.2% Asian, 2.4% Native American, and 4.7% from multiple or unknown racial/ethnic backgrounds. The BPD and HC groups did not significantly differ on these characteristics, and similar proportions of both groups were involved in a committed romantic relationship (48.2% of the total sample). However, the BPD group had completed fewer years of education ($M=15.5$, $SD=2.7$), than had the HC group ($M=17.6$, $SD=2.5$), $F(1,83)=14.16$, $p<.0001$. Table 1 displays the frequencies with which BPD participants met diagnostic criteria for Axis-I disorders and specific BPD features. By definition the HC group had no Axis-I diagnoses and few BPD symptoms: 2.5% met BPD criterion 3 and 12.5% met criterion 4.

Procedures

Recruitment—Advertisements for the study were placed in newspapers and on both general and mental-health related websites and bulletin boards. Respondents were first pre-screened by telephone for selected personality disorder symptoms using questions based on the SCID-IIQ (First, Gibbon, Spitzer, Williams, & Benjamin 1997). Potential participants for the BPD group were required to endorse 5 or more BPD symptoms and to report that these symptoms had led to significant distress/impairment or treatment during the last 5 years. Potential HC participants were required to report no psychiatric difficulties or psychotropic medications within the last year (and to endorse no more than 2 symptoms of BPD).

Psychiatric diagnoses—During the initial lab session, the Structured Clinical Interview for DSM-IV-TR (SCID-I; First, Gibbon, Spitzer, & Williams, 1996) and the Structured Interview for DSM-IV Personality (SIDP-IV; Pfohl, Blum, & Zimmerman, 1997) were used to establish diagnoses and ensure the meeting of inclusion criteria. Both are widely used interviews with documented reliability in previous research (e.g., Zanarini et al., 2000; Oltmanns et al., 2004). Interviews were conducted or supervised by licensed clinical psychologists, and were videotaped for reliability analyses. Interviewers demonstrated reliability at the diagnostic level for Axis I disorders (mean kappa=.86), and at level of individual criteria for BPD (mean kappa=.83). All interviewed individuals were

compensated for their time. Those eligible for continued study participation were invited to do so for additional payment.

Assessments—Eligible participants attended a second lab session to obtain their electronic diary, and to complete questionnaires and experimental tasks. They returned again for a final session after the 3-week diary period.

Questionnaire measures

Trait anxiety: The trait anxiety scale from the State-Trait Anxiety Inventory is a 20-item measure with established reliability ($\alpha=.90$) and validity data (Spielberger, Gorsuch, & Lushene, 1970). Respondents rate the frequency of experiencing anxiety (e.g., “I feel nervous and restless”) on a 4-point scale (1=almost never, 2=sometimes, 3=often, 4=almost always). We used this measure to control for the effect of individual differences in anxiety level on performance during the priming-pronunciation task.

Rejection sensitivity: We assessed anxious expectations for rejection by important others, using the Adult Rejection Sensitivity Questionnaire (A-RSQ; available at: <http://socialrelations.psych.columbia.edu>). Similar in structure and scoring to the college student RSQ from which it was adapted (Downey & Feldman, 1996), the adult version presents 9 hypothetical interpersonal situations involving possible acceptance or rejection by important others. For each situation, respondents rate the anxiety they would feel about the outcome, as well as the likelihood that the important other would respond with rejection. Scores are calculated by first multiplying the expected likelihood of rejection for each situation by the degree of anxiety, and then averaging these weighted scores across the situations. (For information on development of the adult version as well as convergent and discriminant validity, see Berenson et al., 2009.)

Participants ($n=85$) completed this measure during their initial interview and again during their final lab session, an average of 6.9 weeks apart (range 3.9–15.9). Internal consistency was $\alpha =.89$ for each administration; the Spearman-Brown coefficient for test-retest reliability was .91.

Priming-pronunciation assessment of automatic association between rejection and rage: To examine the extent to which thoughts of rejection automatically elicit thoughts of rage, participants completed a priming-pronunciation task based on Ayduk et al. (1999). Participants sat in front of a computer equipped with a portable microphone. The experimenter instructed participants to read each word appearing in the center of the computer screen aloud into the microphone as quickly as possible, and to try to ignore words that briefly flashed above or below the center of the screen. To ensure that participants understood the instructions, they completed practice trials using a separate set of neutral words before the main task.

Each trial began with three asterisks at the center of the computer screen. After four seconds, a prime word appeared either slightly above or below the asterisks for 90 msec, and was then masked by a string of letters for 10 msec. The target word then appeared in the center of the screen (in place of the asterisks) and remained there for 3 sec or until the participant

pronounced it. The next trial began after a 3-sec pause. The time from the onset of the target word's presentation to the start of its pronunciation was recorded by voice-activated computer software (Direct RT from Empirisoft).

There were 108 trials presented in a completely random order: 36 trials involved prime words drawn from the rage, rejection, or negative word lists, paired with a target word drawn from another of these lists; 72 trials substituted a neutral word as either the prime or the target word. The words in each category were: rejection (*abandon, betray, exclude, ignore, leave, reject*); rage (*anger, hit, hurt, rage, revenge, slap*); neutral (*board, build, chalk, dress, form, map*); negative (*disgust, infect, itch, pity, pollute, vomit*). The word stimuli were selected for their ability to uniquely capture one of the four word types, (see validation studies in Ayduk et al., 1999).

Experience-sampling assessment of rejection-contingent rage in daily life: After completing various experimental tasks including the procedure described above, participants were instructed in how to use the experience-sampling diary. The training session included practicing operating the stylus, reviewing each diary item using a detailed instruction sheet that participants took home with them, and completing their first diary while the experimenter was present and available to answer questions. During training participants were also asked to indicate the times at which they typically awaken and go to sleep on weekdays and on weekends. This information was used to program the diary to operate only during the hours in which the participant reported being typically awake.

The diary was programmed on a handheld electronic PDAs outfitted with the Intel Experience Sampling Program, an adaptation of Barrett and Barrett's (2001) Experience Sampling Program (<http://www.experience-sampling.org/>). The software program divided the waking hours that the participant had identified into five equal intervals and scheduled a prompt to occur at randomly selected points within each interval. The prompt consisted of an audible beep followed by a reminder beep every 15 seconds until the participant began to complete his/her diary entry or had missed the opportunity to complete it by not responding for 10 minutes.

The diary presented a series of questions about current cognitions and emotions as well as about behaviors and events that had occurred since the previous diary, in a fixed order. Each question was displayed individually on the PDA screen (along with its possible response options). Participants selected their answers by tapping the stylus. All responses were time stamped.

Participants were asked to take the diary home and carry it wherever they went for 21 days. They were encouraged to complete as many of the prompted diary entries as possible, and told that their payment for participating in the diary portion of the study would be based on the percentage of the 105 prompts for which they completed entries. Participants were contacted weekly by study personnel checking if the diary procedures were running smoothly. They returned the PDA in the final lab visit.

Perceived rejection: In each diary entry, participants were asked to “Please rate the extent to which the following statements are true for you RIGHT NOW.” The statements to be rated included 4 items assessing current perceptions of rejection: *I am accepted by others* (reversed); *I am abandoned*; *I am rejected by others*; *My needs are being met* (reversed). Ratings were made on a 5-point scale (0=not at all, 1=a little, 2=moderately, 3=quite a bit, 4=extremely). We calculated the reliability estimates for the rejection scale using procedures outlined in Cranford et al. (2006). The between-subjects reliability coefficient, reflecting the ability to reliably differentiate between individuals’ scores during a single fixed diary assessment, was .92. The within-subjects reliability coefficient, reflecting the ability to reliably detect change in an individual’s scores across assessments, was .55.

Rage feelings: In each diary entry, participants were asked to rate a series of emotion words, with the prompt “Right now to what extent do you feel _____”. Four items assessed current feelings of anger and rage: *Irritated*; *Angry*; *Like lashing out*; *Enraged at someone*. Ratings were made on a 5-point scale (0=not at all, 1=a little, 2=moderately, 3=quite a bit, 4=extremely). Although the items “irritated” and “angry” lack the inherent intensity of the two more extreme rage items, extreme rage feelings are infrequently experienced by HC participants and may not occur at all during a typical three-week period. Hence, capturing within-person fluctuation in emotional reactions to perceived rejection among representative samples from both groups required asking about the intensity of rage feelings on a continuum including both mild and extreme items. Reliability coefficients were .87 (between-subjects) and .86 (within subjects).

Results

Rejection Sensitivity

As predicted, A-RSQ scores were significantly higher among the 45 participants with BPD, $M=14.86$ ($SD=6.09$), than among the 40 HC participants, $M=6.19$ ($SD=2.80$), $t(63.4)=8.58$, $p<.0001$. Indeed, the mean score in the BPD group was above the 90th percentile for a general sample of 681 adults, $M=8.61$ ($SD=3.61$), who had completed the A-RSQ over the internet during the development of the measure (see Berenson et al., 2009). These results support our characterization of individuals with BPD as highly sensitive to rejection.

Automatic Association between Rejection and Rage

Data preparation—The data were cleaned by removing responses with latencies less than 300 ms or greater than 1200 ms. We then excluded 15 participants (6 BPD, 9 HC) for whom more than 10% of responses were invalid in this way, because such a significant proportion of unusable data suggests equipment failure, excessive background noise, or difficulty complying with task instructions. Two additional participants (1 BPD and 1 HC) were excluded for having latencies more than 3 SDs above the sample mean for one or more variables of interest, and 1 BPD participant was excluded due to apparent distress during the experiment. Hence, the subsample used for analyses of the experiment included 37 BPD and 30 HC.1 Among these participants, the number of responses removed for invalid latencies ranged from 0 to 10 ($M=2.18$, $SD=2.74$, median=1, mode=0). The median latency for starting to pronounce the target word was computed for each participant for each type of

prime-target pair. We also computed the median latency across all trials to index overall psychomotor speed.

Analytic strategy—We expected that latencies for rage words primed by rejection would be significantly faster in BPD than in controls, whereas no diagnostic group difference would be found for rage words following neutral or negative primes, nor rejection words following rage primes. Because the words in each category were not selected to be of equal length and usage frequency, the design is not optimal for comparing the pronunciation latencies of different types of prime-target pairs. Our analyses therefore consist of focused univariate comparisons of diagnostic group differences in pronunciation latency for the same prime-target pairs. All analyses included age, sex, education, trait anxiety (to control for generic effects of anxiety on performance), and median latency across all trials (to control for psychomotor speed).

Facilitation of rage words by rejection primes in BPD vs. HC—An ANCOVA on the pronunciation latency for rage words showed that the BPD group responded significantly faster to rejection-primed rage words ($M=547.83$, $SE=8.87$) than did the HC group ($M=583.96$, $SE=10.51$); $F(1,60)=4.29$, $p<.05$. These data support predictions of a stronger automatic association between rejection and rage in BPD vs. HC.

Ruling out alternative explanations for the rejection-rage facilitation effect: Similar ANCOVAs on the pronunciation latency for rage words following neutral primes and negative primes unrelated to rejection yielded nonsignificant diagnostic group differences (Neutral: BPD: $M=555.24$, $SE=7.42$; HC: $M=562.91$, $SE=8.79$; $F<1$, ns ; Negative: BPD: $M=573.90$, $SE=8.42$; HC: $M=556.33$, $SE=9.98$; $F(1,60)=1.13$, ns). These findings suggest that the facilitation of rage words following rejection primes in BPD is specifically due to priming with rejection content rather than to greater chronic accessibility of rage words (nonsignificant effect of neutral primes) or priming with content of a general negative valence (nonsignificant effect of negative primes).

Directionality of the rejection-rage facilitation effect: Supporting predictions that the rejection-rage facilitation effect in BPD is unidirectional, ANCOVAs showed no significant diagnostic differences in pronunciation latencies for rejection words that followed rage primes (BPD: $M=580.68$, $SE=11.73$; HC: $M=585.96$, $SE=13.90$; $F<1$, ns).

A replication of our original ANCOVA on latency for rejection-rage pairs with latency for neutral-rage, negative-rage, and rage-rejection pairs added to the set of covariates again showed a significant effect of diagnosis (BPD: $M=546.12$, $SE=9.02$; HC: $M=586.00$, $SE=10.70$; $F(1,57)=5.05$, $p<.05$). Neither chronic accessibility of rage words, general priming by negative words, nor a bidirectional cognitive link between rage and rejection accounts for the shorter latencies for rejection-primed rage thoughts in BPD.

¹The BPD and HC subgroups included in the experiment did not differ from those in the total sample on demographics, diagnostic variables, trait anxiety, RS, or mean levels of perceived rejection or rage in the diary. However, HC participants included in the experiment completed significantly more diary entries than those who were excluded, suggesting that a high proportion of invalid or unusual response latencies may have been related to difficulties complying with the research procedures (due to low motivation or other reasons).

Rejection-Contingent Rage in Daily Life

Compliance with diary procedures—Diary analyses exclude two participants with BPD who did not return their diaries, and 4 participants (2 BPD, 2 HC) who completed very few diary entries (more than 2 SDs below the mean number of entries completed by the sample). The remaining 79 participants (41 BPD, 38 HC) completed $M=76.69$ ($SD=19.34$) of the possible 105 diary entries (range 32–105). Perfect compliance was not expected because the random nature of the prompt meant that participants were sometimes prompted while engaging in activities that prohibited responding (e.g., during a meeting at work, while driving a car). The number of entries completed was unrelated to diagnosis (BPD: $M=76.07$, $SD=20.07$; HC: $M=77.71$, $SD=18.60$), $t < 1$, ns , or to the mean levels of perceived rejection and rage that participants reported across the diary period ($r = -.04$ and $r = -.06$, respectively). In addition, restricting the sample to participants with at least 60% compliance did not change the results of our analyses. Hence, noncompliance does not appear to be systematically related to the rejection-rage contingency or to influence our results.

Mean levels of perceived rejection and rage feelings—Over the entire diary period, the BPD group reported higher mean levels of perceived rejection ($M=2.04$, $SD=.86$), than the HC group ($M=.70$, $SD=.30$), $t(50.9) = 9.38$, $p < .0001$. The BPD group also reported higher mean levels of rage feelings ($M=.86$, $SD=.71$), relative to controls ($M=.12$, $SD=.14$), $t(43.2) = 6.60$, $p < .0001$. Means of rage feelings are low overall because experiences of intense rage are infrequent. Ratings of rage reached an intensity greater than 2 (higher than ‘moderately’) in 14.4% of diary entries by participants in the BPD group but in less than 0.3% of entries by participants in the HC group.

Within-person rejection-rage contingency in BPD vs. HC—We predicted stronger rejection-contingent rage reactions in BPD than in HCs. Thus, we expected participants with BPD to report significantly more intense rage than HC participants, when experiencing an equivalent increase in perceived rejection relative to their individual mean level. To test this hypothesis with a multilevel or hierarchical linear modeling approach, we used PROC MIXED in SAS, which allowed for person-specific random effects of rejection, included an autoregressive error structure that accounts for dependencies due to repeated measurements (i.e., auto-correlation) and handled missing data appropriately (see Bryk & Raudenbush, 2002; Bolger, Davis, & Rafaeli, 2003).

The dependent variable was intensity of momentary rage feelings. The central predictor of interest was the interaction between diagnosis (a categorical variable with HC as the reference group) and the extent to which the individual’s momentary perceived rejection deviated from his/her mean level. Because momentary perceived rejection showed significant diagnostic group differences in both mean and variance, we standardized it within each individual to enable equating within-person momentary fluctuations in this variable across the entire sample (*Std rejection*). This time-varying predictor and the intercept were treated as random effects. We controlled for the individual’s mean level of perceived rejection over the diary period standardized across the entire sample, (*Avg rejection*), as well as age, sex, and education (all centered at the sample mean).² Controlling for the

individual's mean level of perceived rejection ensures that the coefficient for perceived rejection exclusively reflects a within-subject effect (Allison, 2005; Curran & Bauer, 2011).

The equations modeled in our analysis are as follows:

Level 1 equation:

$$Rage_{ij} = \beta_{0j} + \beta_{1j} Stdrejection_{ij} + r_{ij}$$

Level 2 equations:

$$\begin{aligned} \beta_{0j} &= \gamma_{00} + \gamma_{01} Diagnosis_j + \gamma_{02} Avg(rejection)_j + \gamma_{03} Age_j + \gamma_{04} Sex_j + \gamma_{05} Education_j + u_{0j} \\ \beta_{1j} &= \gamma_{10} + \gamma_{11} Diagnosis_j + u_{1j} \end{aligned}$$

The solution for the fixed effects is shown in Table 2, with $df=73$ for all tests of significance. The predicted diagnosis x perceived rejection interaction was significant, $F(1,73)=38.59$, $p<.0001$. Each 1 SD increase in perceived rejection was associated with a nearly significant increase in momentary rage feelings among HCs, consistent with prior evidence for rejection-contingent anger and aggression in nonclinical samples, $B=.05$ ($SE=.03$), $t(73)=1.87$, $p<.06$. But the same increase in perceived rejection was associated with a significantly greater increase in the momentary rage feelings among the BPD group, $B=.29$ ($SE=.03$), $t(73)=10.85$, $p<.0001$.

Figure 1 shows the predicted intensity of momentary rage feelings associated with momentary perceived rejection in each group, controlling for the individual's mean level of perceived rejection. The intensity of rage associated with experiencing perceived rejection that was 1 SD lower than the individual's mean level did not differ with diagnosis, $F(1,73)=.05$, ns ; BPD: $B=.31$ ($SE=.08$); HC: $B=.34$ ($SE=.09$). By contrast, there was a significant effect of diagnosis on the intensity of rage associated with experiencing perceived rejection that was 1 SD higher than the individual's mean, $F(1,73)=8.48$, $p<.01$, with the BPD group reporting significantly larger momentary increases in rage feelings ($B=.90$, $SE=.09$) than the HC group ($B=.46$, $SE=.10$).

Effect of mean perceived rejection on mean rage feelings—In the above analysis, our focus was on individual differences in rejection-contingent rage reactions when perceived rejection was equated across the entire sample. But the mean level of perceived rejection that an individual experiences may also contribute to explaining his/her mean level of rage. Examining the mean level of rage in a linear regression with diagnosis (1=BPD, 0=HC), sex, age, sex, and education (all centered at the mean) as predictors, the effect of diagnosis was $B=.75$ ($SE=.13$), $t(74)=5.90$, $p<.0001$. When the mean level of perceived rejection (standardized) was added to the model, it was a significant predictor $B=.43$ ($SE=.13$), $t(74)=3.33$, $p<.001$.

²We chose to examine raw deviations from the mean rather than residualized change for simplicity of interpretation. However the results showed the same significant interaction between diagnosis and momentary perceived rejection when the lagged momentary values of perceived rejection and rage (both person-standardized time-varying variables) were included as additional predictors and random effects. The interaction effect also remained significant when we controlled for trait anxiety, and when we controlled for depressed or anxious mood.

07), $t(73)=6.07$, $p<.0001$, and the effect of diagnosis was not, $B=-.15$ ($SE=.15$), $t(73)=1.04$, *ns*.

Association between Experimental and Diary measures of Rejection-Rage Contingency

To examine the association between our two measures of rejection-rage contingency for participants with both experiment and diary data ($n=61$), we first used PROC MIXED to estimate, for each participant, the random effect of perceived rejection on rage. Momentary rage feelings were the dependent variable, and momentary perceived rejection was the predictor (standardized within the individual), controlling for the individual's mean level of perceived rejection (standardized across the sample).

Because the resulting random effect estimates were not normally distributed, we used Spearman rank order partial correlations to examine their association with pronunciation onset latencies from the experiment, controlling for all the covariates included in the experiment (age, sex, education, trait anxiety, and pronunciation latency across all trials). As expected, a significant negative correlation, $r_s=-.30$, $p<.05$, indicated that stronger rejection-contingent increases in rage feelings in the diary were associated with shorter latencies for rejection-primed rage words. By contrast, the same rejection-contingent increases in rage feelings were associated with longer latencies for neutral-primed rage words $r_s=.28$, $p<.05$, and showed no association with response latencies for either negative-primed rage words $r_s=.13$, *ns*, or rage-primed rejection words $r_s=.06$, *ns*.

Discussion

Consistent with our predictions, both a priming-pronunciation experiment and an experience-sampling diary provided corroborating evidence that the triggering effect of rejection substantially contributes to the association of rage with the BPD diagnosis. This triggering was seen both in cognitive accessibility, spanning fractions of a second, and in subjectively reported rejection and rage feelings, multiple times per day over a three-week period. Moreover, the strength of the rejection-rage contingency in participants' daily lives showed a specific, significant association with the automatic cognitive facilitation of rage words by rejection words during the experiment.

This work extends research demonstrating extreme, sudden increases in angry emotion in BPD (Trull et al., 2008), as well as dramatic fluctuations in angry behavior across different interpersonal encounters (Russell et al., 2007), by focusing on the context in which anger emerges. It also builds upon research that examined the triggers for BPD symptoms in general terms (e.g., Glaser et al., 2008), or in retrospective designs (e.g., Stiglmayer et al., 2005; Welch & Linehan, 2002; Brodsky et al., 2006). Finally, this work contributes to research linking BPD and rage to styles of insecure attachment (e.g., Critchfield et al., 2007; Levy et al., 2008). Sharing attachment theory's emphasis on insecurity in close relationships, research on RS approaches this issue from a Cognitive-Affective Processing System (CAPS; Mischel & Shoda, 1995) perspective, focusing on the specific cognitive, affective, and behavioral sub-processes implied by working models of attachment.

Conceptualizing symptom patterns in terms of stable, contextualized “if...then...” contingencies or personality signatures, the CAPS perspective has broad potential for research on psychiatric disorders, assessment, and treatment -- and is especially consistent with cognitive-behavioral and interpersonal approaches. The present work extends the existing literature by adopting the CAPS focus on the interaction between dispositional characteristics and situational context in both its theoretical underpinnings and methodology. It is the first, we believe, to conduct a direct empirical test of the influence of a specific context, perceived rejection, on rage in BPD.

The between-group differences in cognitive accessibility of rejection-primed rage words were small. Yet response-latency studies are designed to detect differences in the magnitude of fractions of a second, and the size of the difference that we found was consistent with previous studies using this method (e.g., Bargh et al., 1996). The ability of the response latency measure to predict rejection-contingent increases in rage in the diary study further supports our conclusion that small differences in the extent to which the accessibility of rage is facilitated by rejection primes has practical significance for responses to perceived rejection in participants' daily lives.

Because intense rage feelings occurred infrequently during the diary study for both groups, mean levels of rage feelings were low overall. Moreover, our diary study focused on the within-person fluctuation in momentary rage feelings associated with fluctuation in perceived rejection -- after the between-group differences in mean levels of perceived rejection had already been taken into account. In interpreting the small changes in rage detected using this approach, it is important to keep in mind their cumulative effects over time (Abelson, 1985).

Future research directions

The diary methods that we used offer many advantages over questionnaires completed in a single session, but still have limitations common to self-report measures. Particularly unclear in our data is whether the perceived rejection and rage that participants subjectively reported were manifested in any observable interpersonal events (rather than cognitive/affective experiences alone). Future research should aim to assess the presence of rejection cues and rage objectively (as well as subjectively) by employing more than one reporter. Given that almost half of our BPD sample was involved in a committed relationship, it may be feasible to examine rejection-contingent rage from multiple perspectives in the context of a diary-based couples' study. For example, measures of rejection cues could be derived from partner reports of feelings toward the participants, the partner's mood, and/or the amount of time spent together. In addition, if both members of the couple were to report on the rage feelings and enraged behaviors of one's self and one's partner, we could track the effect of rage on the relationship over time.

Participants with BPD reported feeling more than moderately intense rage in 14.4% of their diary entries. By contrast, few participants in the HC group reported any intense rage at all in the three-week assessment period. Given the very low frequency with which HC participants experience intense rage in their ordinary lives, capturing these moments may require a modified assessment strategy. For example, assessing participants who are known

to be facing rejection-relevant stressors (e.g., relationship conflicts or breakups) may help increase the likelihood that moments of intense rage will be experienced. Event-contingent or daily retrospective diaries may also be useful for assessing the relatively infrequent occurrence of intense rage feelings and/or their behavioral manifestations over a longer period of time.

Experience-sampling diaries allowed us to capture subtle momentary fluctuations in perceived rejection that are not likely to be captured in retrospective assessments. Yet, we cannot rule out the possibility that a similar pattern of results may have occurred in reaction to external non-interpersonal stressors and/or thoughts/memories of such stressors. Future research on rejection-contingent rage would benefit from also assessing perceived stressors in a non-interpersonal domain.

Our priming experiment had been designed specifically for examining individual differences in the rejection-rage contingency. It was not designed for within-person comparisons of responses to different word types because the words in each category were not of equal length or usage frequency. Moreover, it did not assess other emotional reactions that increase with rejection, such as depressed or anxious mood. Future studies adapting this method could make further use of the experimental data by developing new stimuli without these particular limitations.

Rage is not the only aspect of BPD clinically understood as reactive to interpersonal stress and rejection. The rejection-contingent rage reported by participants in the BPD group could not be more simply explained by a more general increase in negative mood, because momentary perceived rejection remained a statistically significant predictor of momentary rage feelings in this group after depressed and anxious moods had been controlled. Yet depressed and anxious moods are also important aspects of BPD and future research should aim to shed light on contextual triggers for change in these moods as well as other BPD symptoms (e.g., perceptions of self and others, dissociation, impulsive behavior, self-injury). Including additional comparison groups in these analyses would also be helpful for determining which responses to rejection are similar or different from high RS individuals without BPD, or in other forms of psychopathology that do not involve high RS.

Previous research in nonclinical samples suggests that the rage associated with perceived rejection in BPD is likely to reflect a combination of RS and self-regulatory vulnerabilities. Longitudinal studies of participants whose ability to delay gratification had been assessed in childhood showed that the combination of high RS and poor delay ability predicted self-reported BPD features (Ayduk et al., 2008), teacher ratings of aggression toward peers, and cocaine use (Ayduk et al., 2000). Hence, it is likely that the ability to delay immediate gratification for future goals, and to observe thoughts/feelings from a non-immersed perspective, may moderate the maladaptive patterns associated with RS by enabling better modulation of negative emotions and control of the ways that these emotions are behaviorally expressed. Our ongoing work examines the moderating effect of self-regulation on reactions to rejection, aiming to identify specific self-regulatory skills that help people with BPD respond more effectively to perceived rejection cues.

Although there are differences in the explicitness and particular techniques with which they do so, current treatment approaches for BPD arguably share the therapeutic goals of decreasing the proportion of rejection to acceptance experiences and of improving the ability to observe and regulate the network of cognitions and affects activated by rejection situations. Examining the maladaptive patterns characterizing BPD from the process approach utilized here can facilitate research that will directly test the mechanisms underlying interventions designed to interrupt these patterns.

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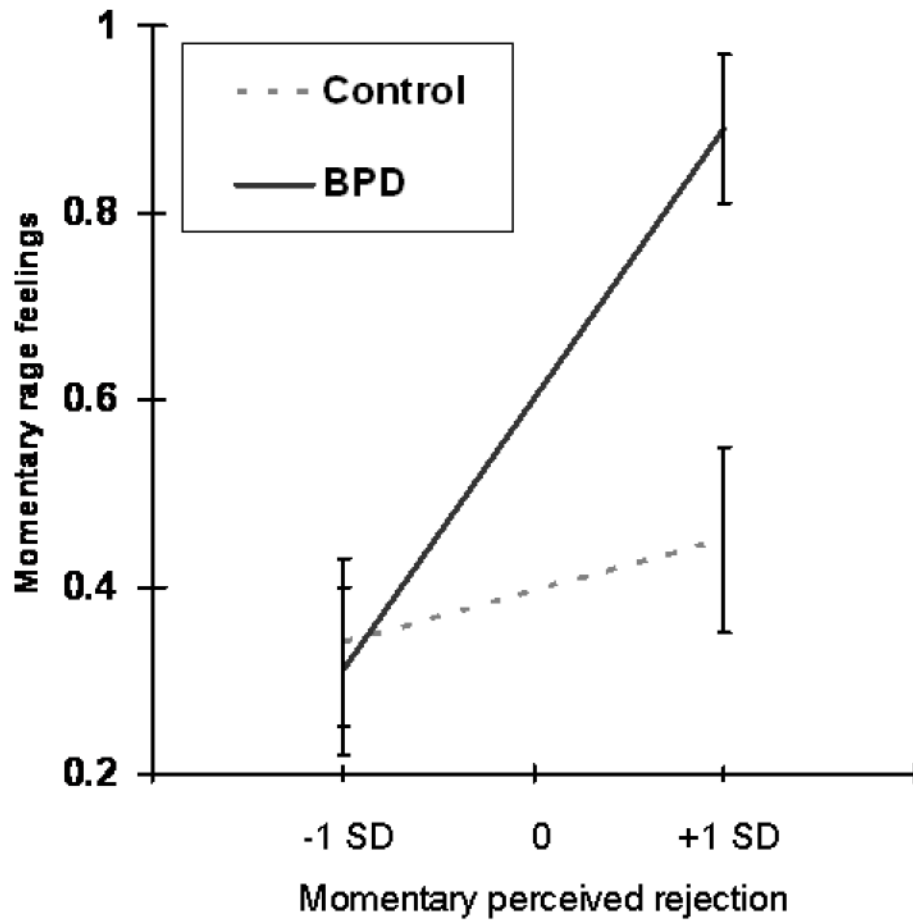


Figure 1. Predicted momentary rage feelings associated with within-person fluctuation in momentary perceived rejection (in SDs from the individual's mean). Age, sex, education, and mean level of perceived rejection are controlled. Standard errors are represented by the bars attached to predicted values.

Table 1

Frequency of specific criteria and current axis I disorders in BPD sample

	<u>n=45</u>	<u>(%)</u>
BPD criterion 1 – abandonment reactions	22	(48.9)
BPD criterion 2 – interpersonal instability	41	(91.1)
BPD criterion 3 – identity disturbance	24	(53.3)
BPD criterion 4 – impulsivity	35	(77.8)
BPD criterion 5 – suicidality or self-injury	32	(71.1)
BPD criterion 6 – affective instability	38	(84.4)
BPD criterion 7 – emptiness	32	(71.1)
BPD criterion 8 – rage	32	(71.1)
BPD criterion 9 – dissociation or paranoia	24	(50.5)
Major depressive disorder	19	(42.2)
Dysthymic disorder	10	(22.2)
Bipolar I	1	(2.2)
Generalized anxiety disorder	21	(46.7)
Social phobia	20	(44.4)
Posttraumatic stress disorder	12	(26.7)
Panic disorder	4	(8.9)
Obsessive-compulsive disorder	3	(6.7)
Bulimia nervosa or binge eating disorder	3	(6.7)
Substance abuse	5	(11.1)
Substance dependence	6	(13.4)

Table 2
Fixed effect estimates for predictors of momentary rage feelings (DF=73)

Effect	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Intercept	0.39	.09	4.51	<.0001
Diagnosis (1=BPD, 0=HC)	0.21	.14	1.47	<i>ns</i>
Momentary perceived rejection (standardized within person)	0.05	.03	1.87	<.06
Diagnosis x momentary perceived rejection	0.24	.04	6.21	<.0001
Mean perceived rejection (standardized across sample)	0.39	.07	5.73	<.0001
Age (in years, centered)	0.00	.00	0.75	<i>ns</i>
Sex (centered, male=.78)	0.13	.11	1.04	<i>ns</i>
Education (in years, centered)	0.00	.02	0.21	<i>ns</i>

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