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Using negative emotions to trace the experience of borderline personality pathology: Interconnected relationships revealed in an experience sampling study

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Abstract

While emotional difficulties are highly implicated in borderline personality disorder (BPD), the dynamic relationships between emotions and BPD symptoms that occur in everyday life are unknown. The current paper examined the function of negative emotions as they relate to BPD symptoms in real time. Experience sampling methodology with 281 participants measured negative emotions and borderline symptoms, expressed as a spectrum of experiences, five times daily for two weeks. Overall, having a BPD diagnosis was associated with experiencing more negative emotions. Multilevel modeling supported positive concurrent relationships between negative emotions and BPD symptoms. Lagged models showed that even after three hours negative emotions and several symptoms continued to influence each other. Therefore, results indicated that negative emotions and BPD symptoms are intricately related; some evidenced long-lasting relationships. This research supports emotion-symptom contingencies within BPD and provides insight regarding the reactivity and functionality of negative emotions in borderline pathology.

Disruptive emotional experiences are a defining feature of borderline personality disorder (BPD; Lewis, Caputi, & Grenyer, 2012; Sanislow et al., 2002; Taylor & Reeves, 2007; Zanarini et al., 2007). It is linked to the etiological development of BPD and may differentiate BPD from other personality disorders (Linehan, 1993; Scott et al., 2013; Zanarini et al., 1998). However, it is unknown how emotions relate to experiencing BPD symptoms in the moment. While cross-sectional and global measures of emotion

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dysregulation (e.g., Difficulties in Emotion Regulation Scale) relate to current and future experiences of BPD symptoms, research has not examined the dynamic relationships between in-the-moment emotions and the occurrence of BPD symptoms (Cheavens, Strunk, & Chriki, 2012; Glenn & Klonsky, 2009; Rosenthal, Cheavens, Lejuez, & Lynch, 2005; Salsman & Linehan, 2012; Tragesser, Solhan, Schwartz-Mette, & Trull, 2007). The current study used experience sampling methodology (ESM) to investigate the interconnected relationships between negative emotions and BPD symptoms in real time. It also tested whether there are lasting associations (i.e., three hours later). Both variables were measured using a Likert scale; therefore BPD symptoms represent a spectrum of experiences, including milder, non-clinical experiences that relate to the measured symptom (e.g., giving someone the silent treatment is a milder form of relationship intensity).

Borderline Personality Disorder and Emotions

Several studies have tracked in-the-moment emotion experiences for individuals with BPD (e.g., Ebner-Priemer et al., 2007; Jacob et al., 2008; Jahng, Wood, & Trull, 2008; Limberg, Barnow, Freyberger, & Hamm, 2011; Links et al., 2007; Reisch, Ebner-Priemer, Tschacher, Bohus, & Linehan, 2008; Sadikaj, Russell, Moskowitz, & Paris, 2010; Scheel et al., 2013; Trull, Solhan, Tragesser, Jahng, & Wood, 2008). This research has demonstrated greater frequency and intensity of negative emotions, more moment-to-moment abrupt changes in emotions, increased emotional reactivity to environmental triggers, and longer-lasting emotional responses for individuals with borderline pathology. These indicators characterize emotion dysregulation. While past research reveals the specific emotion problems experienced by individuals with BPD, past studies have not investigated how emotion-related problems influence the occurrence of BPD symptoms. If the specific interconnections between negative emotions and BPD symptom experiences were fully understood, such information may provide insight for individuals with BPD and increase the predictability of symptoms. It may also advance treatments by providing specific emotion-symptom contingencies to target within interventions.

Negative Emotions

One way emotional difficulties might relate to BPD symptoms is by instigating the occurrence of a symptom. The occurrence of a symptom in the moment does not mean the person experiences the symptom at a pervasive, clinical level, but rather experienced the nature of the symptom for a short period in his or her life. For instance, a person with BPD may become extremely angry and trigger interpersonal discord or engage in self-harm (Armey, Crowther, & Miller, 2011). Similarly, experiencing shame may lead to questions about identity. Many theories and treatments propose that BPD symptoms occur in reaction to negative emotions or inner pain (American Psychiatric Association, 2001; Bateman & Fonagy, 2004; Clarkin, Yeomans, & Kernberg, 2006; Furr, Fleenon, Anderson, & Arnold, 2013; Linehan, 1993; Young, Klosko, & Weishaar, 2003). The idea is that symptoms flare up at times in people's everyday lives, recede, and then flare up again, in patterns tied to instigating events. Linehan's (1993) original biosocial theory of BPD conceptualized symptoms as the result of emotion dysregulation. Viewed this way, individuals engage in destructive behavior in an attempt to escape intense and unpleasant emotional states. There

is also evidence that individuals with BPD engage in destructive behavior when they experience stressful environmental triggers (Miskewicz, Furr, Fleeson, & Law, 2013). The causal direction of negative emotions triggering BPD symptoms was implied in Gratz, Levy, and Tull's (2012) study, where they showed that improvement in emotion regulation mediated the relationship between Emotion Regulation Group Therapy (ERGT) and engaging in fewer deliberate self-harm behaviors.

Perhaps just as plausible as emotions causing symptoms is the possibility of symptoms causing emotional difficulties. For example, self-harm behaviors may lead to increased negative emotions (e.g., shame). From this perspective, the high level and volatility of emotions in borderline pathology may be a reaction to ongoing symptoms. In particular, self-conscious emotions (e.g., shame and guilt) may be the result of symptom-related behaviors that individuals later evaluate as mistakes (Crowe, 2004). Anger and irritability may result from the disruption caused by symptoms and may be attempts to avoid feared outcomes, such as abandonment (Critchfield, Levy, Clarkin, & Kernberg, 2008).

If both causal directions are in play, harmful cycles could result. If negative emotions trigger a specific symptom, which then results in increased negative emotions, and then triggers the symptom again, a self-sustaining cycle is created. Given the prominence of negative emotions in etiology and symptom expression, and their long-lasting nature in borderline pathology, it seems probable that sustaining relationships exist. At the same time, the cycle could be interrupted by decreasing negative emotions or resisting symptom engagement. If the absence of negative emotions could reduce symptoms, which in turn would further lessen negative emotions, and so on, then a corrective cycle could be initiated.

A complicating factor for this endeavor is separating negative emotions and BPD symptoms. This is especially true for the symptoms of intense anger, feeling empty, and unstable mood. The current study recognizes the construct overlap for these symptoms and acknowledges certain limitations. In order to address the validity of relationships, as effects may be due to shared variance rather than true relationships, patterns of results will be investigated using statistical controls where possible (e.g., when irritable, angry, and guilty are controlled, does ashamed relate to intense anger?). Although BPD symptoms, particularly those mentioned, overlap with negative emotions, we believe the current study provides useful insights into borderline pathology and its meaningful connections to negative emotions.

Searching for Dynamic Emotion-Symptom Relationships

The goal of the current study was to examine the relationship between negative emotions and in-the-moment BPD symptom experiences within borderline pathology. This required repeatedly measuring current negative emotions and current expressions of symptoms. Using an experience sampling methodology (ESM), participants were asked multiple times a day for two weeks to rate the degree that they were experiencing negative emotions and BPD symptoms at that moment. Using ESM to assess emotions has a long history (Conner, Tennen, Fleeson, & Barrett, 2009). Using ESM to assess momentary occurrences of trait-like characteristics has also been very successful (Fleeson, 2007). Given this success, plus the importance of daily dynamic processes to the treatment of BPD, there has been a recent

surge of interest in investigating momentary occurrences of symptoms. Researchers have used ESM to successfully investigate the occurrences of several BPD symptoms, such as affective lability (Jahng et al., 2008), rage, interpersonal devaluation, and impulsivity (Berenson, Downey, Rafaeli, Coifman, & Paquin, 2011; Coifman, Berenson, Rafaeli, & Downey, 2012), as well as other psychological symptoms including psychotic and dissociative symptoms (Glaser, Van Os, Thewissen, & Myin-Germeys, 2010; Stiglmayr et al., 2008), and quarrelsomeness (Sadikaj, Moskowitz, Russell, Zuroff, & Paris, 2012). Wright & Simms (2014) assessed a wide range of personality disorder symptoms using daily methodology. However, ours is the first study to test all nine DSM symptoms of BPD in an ESM framework.

Expected outcomes from our study included that individuals with a BPD diagnosis would experience more negative emotions across the study than individuals without a diagnosis. This finding would replicate the results of previous studies (e.g., Sadikaj et al., 2010). We also expected to find dynamic relationships between negative emotions and in-the-moment BPD symptoms, specifically that they would co-occur for individuals across reports. While we expected individuals with BPD to experience negative emotions and BPD symptoms more often, we did not expect the concurrent relationships between negative emotions and symptoms to be specific to borderline pathology. For example, if a person, regardless of his or her level of borderline pathology, becomes upset and experiences negative emotions, then it is likely that a level of BPD symptom experiences would also occur (e.g., feelings of emptiness, relationship intensity). Therefore, we believed the link between negative emotions and BPD symptoms would be common across individuals, representing a dimensional perspective of BPD symptomatology.

We also investigated the sustained relationship between negative emotions and symptoms by using three hour lagged analyses. The three hours reassessment timeframe was based solely on the design of the larger project's intention to capture unfolding, dynamic processes among many kinds of constructs relevant to BPD. Based on emotion research, a shorter timeframe, perhaps within minutes, would be more ideal for studying emotional experiences (Ebner-Priemer, Eid, Kleindienst, Stabenow, & Trull, 2009). Therefore, our study captured sustained, or perhaps delayed, effects. We predicted that negative emotions would have a sustained relationship to BPD symptoms for individuals with higher borderline pathology. We also predicted that some BPD symptoms would have a sustained relationship to negative emotions. Sustained relationships tap into emotion dysregulation, as individual are unable to recover from negative emotions as quickly and are more likely to experience negative emotions in reaction to a variety of events.

Specific to borderline pathology, we hypothesized that one's level of borderline pathology would moderate the emotion-symptom links, such that individuals with more BPD pathology would have stronger relationships. This hypothesis reflects the unique sensitivity to negative emotions present in individuals with BPD and the difficulty they have regulating negative emotions. It also captures severity, as the response was expected to be more dysfunctional.

Past research has primarily investigated negative emotions as a combined, general variable. However, more recent investigations have looked at specific negative emotions (e.g., anger, shame) and suggest that there may be targeted emotion-BPD symptom effects (Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2010; Scheel et al., 2013). In an exploratory manner, the current study tested specific negative emotions to determine their perhaps unique influence on BPD symptoms. Both angry- and self-conscious-related emotions have strong implications in borderline pathology, and were measured separately in the current study (Berenson et al., 2011; Crowe, 2004).

Method

The current study was part of a larger five year longitudinal personality project and the method described highlights the pertinent measures and procedures. For more information about the study see Fleeson, Anderson, Arnold, Friedman, & Furr, 2013 and Hawkins, Furr, Arnold, Law, Mneimne, & Fleeson, in press.

Participants

Analyses included 255 adult male and female participants composed of two subsamples: *high borderline pathology* and *community*. The high borderline pathology subsample ($n = 166$) included participants who reported at least seven BPD symptoms over the last year ($M = 8.19$), as assessed by the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003). Participants in the community subsample ($n = 89$) did not have to meet any specific BPD symptom requirement on the MSI-BPD, high or low ($M = 2.09$). Inclusion criteria for both subsamples included being between the ages of 18 and 65, proficiency with the English language, and residing within 50 miles of the study site. Exclusion criteria included having a current alcohol or substance dependency disorder with use in the last 30 days, as assessed by the Mini International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1998); a current psychotic disorder assessed by the M.I.N.I.; actively suicidal; an arrest for a violent crime; a severe cognitive disability evidenced by a score of less than 24 on the Mini Mental State Examination (Folstein, Folstein, & McHugh, 1975); inability to complete ESM reports (e.g., poor reading ability, physical disability); and having a court-appointed guardian. While 281 participants took part in the ESM study, 26 had less than 20% valid reports, resulting in a sample of 255.¹

Demographically, slightly more than half of the 255 participants were female (67.8%) and White (60.0%). Approximately a third were Black (34.5%). Mean age was 44 years ($SD = 11.2$). Educationally, the majority of participants had at least 12 years (83.1%), 39.6% had at least 16 years. Annual household income ranged from below \$0 to \$149,000, median = \$25,000-\$29,999. Over half of participants reported attending individual psychotherapy in their lifetime (55.7%), 44.7% took psychiatric medication in their lifetime, and 21.6% had at least one psychiatric hospitalization. Current psychiatric diagnoses, as assessed by the

¹ESM reports were considered invalid for the following reasons: report was completed at the wrong time (more than 5 minutes before or more than 3 hours after a specified time), multiple reports were made for the same timeframe, or at least half of the responses were answered too quickly (i.e., 500 milliseconds or less; see McCabe, Mack, & Fleeson, 2011). Individual ESM responses were considered invalid if they were answered too quickly (i.e., 500 milliseconds or less).

M.I.N.I., were common, 47.1% evidenced a mood disorder, 43.5% had at least one anxiety disorder, and 10.6% qualified for an alcohol or substance disorder. Participants from the high borderline pathology subsample were statistically less likely to be married, received less education, had a lower annual household income, and experienced more psychological difficulties, as indicated by psychiatric medications, hospitalization, and psychotherapy. These differences correspond to samples characterized by BPD (Tomko, Trull, Wood, & Sher, 2013). Seventy-seven participants had a current diagnosis of BPD, as assessed by the Structured Interview for DSM-IV Personality (SIDP-IV; Pfol, Blum, & Zimmerman, 1997). All tests of BPD symptomatology and BPD diagnosis were based on this measure, regardless of sample origin.

Measures

In-the-moment negative emotions and BPD symptoms were measured five times daily for two weeks using personal digital assistants (PDAs). Participants were beeped at preset times, 10 a.m., 1 p.m., 4 p.m., 7 p.m., and 10 p.m., and asked to report on their experiences in the last 60 minutes. The extent to which participants experienced four emotions, specifically irritable, angry, ashamed, and guilty, were assessed on a 6-point Likert scale, 0 = very slightly or not at all and 5 = extremely. In addition to scores on each of the negative emotions, a *combined negative emotions* variable was created by averaging all four specific negative emotions. Reliability of the combined negative emotions variable to measure systematic change was .69 (see Cranford et al., 2006).

BPD symptoms were based on the nine BPD diagnostic criteria; and each symptom was assessed by two items (except self-harm, which was assessed by a single item; see Appendix for all items). Symptom items (e.g., “My emotions were on a roller coaster,” “I was extremely moody”) were averaged to indicate the extent to which participants experienced each BPD symptom in the last 60 minutes. Items were rated on a 6-point Likert scale, where 0 = does not describe me at all and 5 = describes me very well. The reliability for each symptom to measure systematic change was as follows: effort to avoid abandonment = .59, relationship intensity = .48, uncertain sense of self = .62, impulsive behavior = .65, unstable mood = .78, feeling empty = .88, intense anger = .83, unreal experience = .37 (see Cranford et al., 2006). The logic of creating these items is similar to the logic behind the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003), in that items were based closely on the wording of the symptoms in the DSM. Indeed, participants who endorsed a symptom on the MSI-BPD reported significantly higher average levels of the same symptom in the ESM assessment (all t 's > 3.46, all p 's < .01). Furthermore, the factor structure and factor scores of the ESM symptoms were related to the factor structure and factor scores of the SIDP symptoms (Hawkins et al., in press).

Additionally, participants completed a variety of self-report questionnaires (e.g., personality traits, retrospective reports) and completed two clinical interviews. One of the interviews, the SIDP-IV (Pfol et al., 1997), was used to represent participants' borderline pathology. The SIDP-IV is a semi-structured interview that examines personality psychopathology over the past five years. It is a highly recommended assessment with excellent construct validity and inter-rater reliability (see Widiger, 2008). Responses are rated on a scale from 0 to 3,

where a rating of 0 or 1 means the criterion for the symptom is not met and a rating of 2 or 3 means the criterion is met. For the current study, the nine BPD symptom items that met criterion were summed to represent borderline pathology for each participant, ranging from zero to nine. The SIDP-IV was administered in its entirety to all participants by a research staff member with a master's or doctoral degree. Both interviewers were trained by a clinical psychologist familiar with the instrument. For the current study, intraclass correlation coefficient = .90 for BPD symptom items. As expected, the subsamples significantly differed on the average number of BPD symptoms, $M_{\text{high borderline pathology}} = 4.01$, $M_{\text{community}} = 1.08$.

Despite some non-normality, multilevel analyses included all study variables using their original scales (see Fleeson et al., 2013). Self-harm was the most non-normal variable, skew = 4.72, kurtosis = 24.38. The subsamples statistically differed on all study variables, with the high borderline pathology subsample scoring higher; however, the two groups did not differ based on the number of valid ESM reports, $M_{\text{high borderline pathology}} = 42.39$, $M_{\text{community}} = 46.03$, $t(1) = 1.89$, *ns*.

Procedure

Participants were recruited through referrals from an outpatient psychiatry clinic, postal mailings, community fliers, and snowball sampling; this was not a treatment study. Participants took part in a screening procedure to ensure that inclusion and exclusion criteria for the study were satisfied. Participants then completed a packet of self-report questionnaires and met with a master or doctoral-level research staff member for an initial assessment. During the initial assessment, participants completed two clinical interviews (i.e., M.I.N.I. and SIDP-IV) and received instruction on how to use the PDA for ESM reports. Following the clinical interview, participants completed two-weeks of ESM reports; they also completed other measures that are not relevant to the current study. At the end of the two-week period, participants again met with a research staff member. Total compensation that participants received was up to \$170. The study was approved by the associated institutional review board.

Results

Does Borderline Personality Disorder Predict Greater Negative Emotions?

Participants with a BPD diagnosis experienced significantly more negative emotions in daily life than did those without a diagnosis, $t(116) = 6.43$, $p < .05$, equal variances not assumed (see Figure 1). This result aligns with previous findings (e.g., Trull et al., 2008). Additionally, increased negative emotions among individuals diagnosed with BPD was evident for each of the specific negative emotions, $t_{\text{irritable}}(253) = 7.13$, $t_{\text{angry}}(117) = 5.09$, $t_{\text{ashamed}}(108) = 4.29$, $t_{\text{guilty}}(115) = 5.03$, $p < .05$, equal variances not assumed.

Do Symptoms Have Concurrent Dynamic Relationships With Negative Emotions?

In order to test in-the-moment dynamic relationships between negative emotions and BPD symptoms and to account for the hierarchical nature of the data, multilevel modeling (MLM) was used. Each BPD symptom was regressed onto person-centered negative emotions at

level 1. The effects of negative emotions were modeled as both fixed and random effects with unstructured covariance.

Concurrent dynamic relationships between symptoms and combined negative emotions

The combined negative emotions variable had a positive linear relationship to each BPD symptom for the average participant. Table 1 shows that unstandardized betas ranged from 0.12 when predicting effort to avoid abandonment to 0.72 when predicting unstable mood. This means that individuals experienced higher levels of BPD symptoms when they had elevated levels of negative emotions. Additionally, participants differed from each other significantly in the strength of these relationships (as shown by the significant random effects). The fact that the standard deviations of these random effects were often as large or larger than the average effects suggests that some participants actually had zero or negative relationships between negative emotions and specific BPD symptom experiences. Therefore, there were individual-specific processes involved in the relationship between negative emotions and BPD symptoms.

Concurrent dynamic relationships between symptoms and specific negative emotions

Table 1 also shows results of MLMs that predicted symptom experiences from one specific negative emotion at a time. Each negative emotion significantly predicted each BPD symptom (except self-harm occurrences were not predicted by feeling angry or ashamed). When all of the specific negative emotions were included in the same model, nearly all of these effects remained statistically significant (as indicated by ^a in Table 1). Therefore, each specific negative emotion evidenced unique associations to in-the-moment BPD symptoms, over and above the effects of the other negative emotions.

Do Symptoms and Negative Emotions Have Sustained Lagged Relationships?

Results of the concurrent MLMs provide evidence that negative emotions and BPD symptoms are intricately linked in the flow of daily life. In order to determine whether there are sustained effects, that is, whether symptoms persist following negative emotions and or whether negative emotions persist following symptoms, three hour lagged MLMs similar to the concurrent MLMs were run. Note that these analyses are conservative. They can only reveal effects that are still present after three hours; so any effects that happened immediately or that faded by three hours will not be identified. A significant lagged result reveals an effect – a non-significant effect may mean that the lag time was incorrect. Note that fewer ESM reports were included in the lagged analyses, because more than three hours elapsed between some reports (e.g., 10 p.m. to 10 a.m.), $M = 27.5$ reports, $SD = 11.4$. Participants in the community subsample had significantly more lagged reports, $M_{\text{community}} = 24.0$, $M_{\text{high borderline pathology}} = 20.3$, $t(250) = 2.4$, $p < .05$.

Predicting future symptoms from current negative emotions

We first tested whether negative emotions precede later symptoms. Importantly, starting symptoms' levels in the present were controlled for (i.e., were a predictor in the MLMs), so that the level of a symptom in the future represented changes in a symptom subsequent to the negative emotions.

The first column of Table 2 shows that the *combined* negative emotions significantly predicted several future BPD symptoms, specifically relationship intensity, uncertain sense of self, unstable mood, and feeling empty. There was also statistically significant variation among individuals in the strength of these relationships (as shown by the random effect's standard deviations). For some individuals, the relationships were negative in direction, while positive for other individuals.

Table 2 also shows the lagged effects of *specific* negative emotions on future BPD symptom experiences, tested in separate models. Specific negative emotions' models had several lagged predictions of symptoms. Most notably, angry and ashamed predicted symptoms three hours later, controlling for starting levels of symptoms. For unstable mood, all of the specific negative emotions statistically predicted future symptoms of unstable mood for the average participant in the sample.

Predicting future negative emotions from current symptoms

We then tested for evidence in the reverse direction – symptoms predicting sustained negative emotions. Only one BPD symptom predicted an increase in future *combined* negative emotions for the average person in the sample: uncertain sense of self (see Table 3). However, between-person variance in all relationships was significant, such that the direction and strength of the relationship differed significantly across participants. This means that the lagged relationship from symptoms to later combined negative emotions were present for at least some participants (Whitsett & Shoda, 2014).

Lagged *specific* negative emotions were also regressed onto BPD symptoms (see Table 4). Only a few emotions followed a few symptoms across three hours.

Is BPD Related to the Strength of the Emotion-Symptom Process?

In our approach, the emotion to symptom experience process is a general process, not specific to BPD. That is, many people may experience symptoms at times of heightened negative emotions. However, this process may be especially strong among those with BPD. We repeated the above analyses, this time including uncentered BPD pathology (the number of symptoms a person met criteria for on the SIDP-IV) as a level 2 variable.

In concurrent dynamic relationships, combined negative emotions significantly interacted with BPD pathology in predicting almost all BPD symptoms; the one exception was for intense anger (see Table 4). All interaction effects were such that as BPD pathology increased, so did the strength of the positive linear relationships between negative emotions and in-the-moment BPD symptoms. However, the simple effect for negative emotions in this model was also a significant predictor for all BPD symptom experiences, except self-harm. This means that negative emotions and BPD symptom experiences co-occurred for participants who did not have any borderline symptoms at all on the SIDP-IV. Note that this does not imply that individuals experienced clinically significant BPD symptoms. Most of the specific negative emotions also interacted with BPD pathology (see Table 4). The greater a person's borderline pathology, the stronger the connections between each negative emotion and in-the-moment BPD symptoms.

In the lagged relationships, there was only one significant interaction with BPD pathology. Those with greater BPD pathology had a strengthened association between combined negative emotions and future feelings of emptiness, $b = 0.03$, $p < .01$. There were not any significant interactions between BPD pathology and symptoms for future combined negative emotions or future specific negative emotions. Lack of an interaction suggests that these emotion-symptom processes are general across the spectrum.

Discussion

The current study empirically examined how a central feature of BPD, difficulty with negative emotions, contributes to borderline symptoms by investigating the dynamic relationships between negative emotions and in-the-moment BPD symptoms. While previous studies have linked emotion dysregulation to BPD and have described disruptions in emotional experiences (e.g., Glenn & Klonsky, 2009; Trull et al., 2008), prior research has not tested whether negative emotions and symptoms influence each other in unfolding processes. By tracking negative emotions and BPD symptoms in real time, the current study demonstrated that negative emotions and symptoms co-occur, even for individuals without borderline pathology, and that they co-occur more often in individuals with higher borderline pathology. Further, results indicated that negative emotions and BPD symptoms have sustained relationships. Additionally, these relationships were evidenced for most of the specific negative emotions: irritable, angry, ashamed, and guilty. Therefore, the sensitivity that individuals with BPD have toward negative emotions is linked to experiencing BPD symptoms.

Temporally, BPD symptoms followed negative emotions more often after three hours. While the influences of negative emotions are likely short-term (Ebner-Priemer et al., 2009), the current study revealed that within borderline pathology negative emotions have a small, longer-lasting side. This was true for both angry-related and self-conscious-related emotions.

One possible explanation for both the concurrent and the sustained relationships of negative emotions to symptoms is poor emotion regulation. Individuals may become stuck in the emotion, which in turn may cause maladaptive functioning. This effect may be strongest immediately and then decay over time. Focusing on emotions is common across the six empirically-supported treatments for BPD: dialectical behavior therapy (DBT), schema-focused psychotherapy (SFT), transference-focused therapy (TFT), general psychiatric management (GPM), mentalization-based psychotherapy (MBT), and systems training for emotional predictability and problem solving (STEPP; Weinberg, Ronningstam, Goldblatt, Schechter, & Maltzberger, 2011). All of the interventions, except STEPP, assume that emotions trigger maladaptive behaviors. Therefore, it is important to help individuals become more aware of these relationships and work to change them. The current study's results support these treatments' assumptions, as negative emotions related to problematic responses, even after three hours. To the authors' knowledge, this is the first empirical data to support such relationships.

The significant individual differences in negative emotions-symptom relationships also have implications for treatment. If individuals track their own specific emotion-symptom contingencies, then they will increase the predictability of their symptoms, and interventions can target their person-specific difficulties (see Ram et al., 2013). Targeting person-specific contingencies within treatment may reduce the number of sessions needed to obtain meaningful treatment gains. This would decrease treatment costs during psychotherapy and perhaps extend to widespread savings by reducing additional care (e.g., psychiatric hospitalization). Targeting person-specific difficulties may also enhance a person's engagement in psychotherapy, as the intervention would be individually-tailored and relevant.

There was also evidence, although limited, suggesting the reverse sustained direction. BPD symptoms continued to predict some negative emotions three hours later in higher borderline pathology individuals. While only a few significant instances of symptoms predicting later negative emotions emerged, the lack of more relationships does not preclude the existence of more immediate triggered relationships. Further examination of symptoms triggering negative emotions is needed using different lag periods. Nonetheless, relationships in this temporal direction may relate to lower quality of life and the high comorbidity of mood disorders associated with borderline pathology.

The current study does not directly address these questions and further investigation is necessary to fully understand the relationships between BPD symptoms triggering negative emotions. The current study is not without limitations, including the incompleteness of lagged relationships. As ESM reports occurred every three hours, we were only able to test sustained or delayed relationships. More immediate triggered relationships may exist between negative emotions and BPD symptoms, and may be more numerous and stronger in magnitude. Future studies may want to measure negative emotions and BPD symptoms more frequently over a shorter period of time (e.g., 10 times daily for five days).

Another limitation concerns the construct overlap between negative emotions and some BPD symptoms; perhaps the most severe overlap is between negative emotions and unstable mood, anger and intense anger, and self-conscious emotions and feeling empty. Predictor-criterion redundancy calls into questions the validity of effects, as effects may be due to shared variance. Although the strength of relationships may be artificially inflated due to redundancy, it seems likely that real effects exist. For example, while anger evidenced the strongest relationship to intense anger, the other specific negative emotions measured (e.g., shame) evidenced relationships, even when controlling for each other. Similarly for feelings of emptiness, shame and guilt evidenced stronger relationships; however, the other specific negative emotions also evidenced unique relationships. Caution is recommended in interpreting the magnitude of concurrent relationships between overlapping criterion-predictor relationships and further research regarding the uniqueness of these constructs is needed.

Inherent to studying any extreme, infrequently occurring phenomena are measurement concerns, particularly when studied across individuals with varying levels of symptomatology. At the most basic level, reliability is weakened. For example, the most

common BPD symptoms had excellent reliability (e.g., unstable mood, intense anger, feeling empty), while the uncommon experiences had low reliability. While we believe frequency affected our reliabilities, it nonetheless also affected our ability to capture systematic covariance with other variables. One could argue that our significant moderated effects between negative emotions and BPD symptom experiences were simply due to higher base rates among individuals with higher BPD symptomatology. We do not disagree; and in addition, we believe that these higher base rates are systematically related to BPD. Further studies may be needed to strengthen this assertion.

Unexplained in our study is the large amount of between-person variance in our MLMs. Identification of other between-person variables, besides borderline pathology, that explain the differences between people in the magnitude and direction of the relationships between negative emotions and BPD symptom experiences may clarify the functionality of these relationships.

Additionally future research may want to examine the particular relationships between specific negative emotions and BPD symptoms. The current study tested four specific negative emotions and found that each had unique relationships to concurrent BPD symptoms. Self-conscious-related emotions demonstrated particular importance for borderline pathology, as it interacted with pathology in triggered emotion-symptom relationships. Self-conscious-related emotions have been suggested as a mechanism involved in BPD (Crowe, 2004; Gratz et al., 2010). The current study supports the importance of self-conscious emotions in borderline pathology. As negative emotions are better understood in symptom expression, it may be helpful to differentiate the specific influences that emotions have for individuals and expand negative emotions to include anxious and sad. Future research may also fruitfully unpack the BPD diagnosis variable to see which components of BPD or associates are responsible for the heightened sensitivity among those with BPD to negative emotions.

In summary, the current study found that sensitivity, both in frequency and strength of reaction, to negative emotions and difficulty recovering from negative emotions relate to in-the-moment symptoms of BPD. By deconstructing emotional difficulties and examining how negative emotions relate to symptom experiences in real time, mechanisms driving the disorder can be understood, which can increase predictability of symptoms and advance person-specific interventions.

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Appendix

Experience Sampling Items for Borderline Personality Disorder Symptoms

1. In the last 60 minutes, I called someone to reassure myself that he or she still cared about me.
2. In the last 60 minutes, I did things to avoid feeling abandoned or being abandoned, like trying to stop someone from leaving or keeping tabs on someone.

3. An interpersonal relationship of mine was unstable or intense in the last 60 minutes.
4. I thought that people close to me were worthless in the last 60 minutes, although recently I have thought they were wonderful.
5. My sense of self was unstable in the last 60 minutes.
6. In the last 60 minutes, I felt like I didn't know who I am or like I had no identity.
7. I couldn't stop myself from overdoing something bad in the last 60 minutes.
8. I had a problem with impulsivity (e.g. an eating binge, spending spree, drinking too much or a verbal outburst) in the last 60 minutes.
9. I hurt myself on purpose (e.g. punched myself, cut myself, or burned myself) in the last 60 minutes.
10. My emotions were on a roller coaster in the last 60 minutes.
11. I was extremely moody in the last 60 minutes.
12. I felt hollow inside in the last 60 minutes.
13. I had feelings of emptiness in the last 60 minutes.
14. In the last 60 minutes, I had difficulty controlling my anger.
15. I lost my temper with someone in the last 60 minutes.
16. I was thinking suspicious or paranoid thoughts in the last 60 minutes.
17. In the last 60 minutes, I felt unreal or things around me felt unreal.

Figure 1.

Average level of combined negative emotions and each specific negative emotion across the two weeks of experience sampling reports, sample divided by borderline personality disorder diagnosis. Differences between groups tested by independent *t* tests.

Note. Scale range = 0–5. * $p < .01$.

Table 1
Concurrent MLM Estimates for Momentary BPD Symptoms Regressed Onto Negative Emotions

DV: BPD Symptom	Negative Emotions			Irritable			Angry			Ashamed			Guilty		
	Average Participant Effect (SD)	Average Participant Effect	SD	Average Participant Effect	SD	SD	Average Participant Effect	SD	SD	Average Participant Effect	SD	SD	Average Participant Effect	SD	SD
Avoid Aband	0.12 ** (0.21) †			0.06 ^a **			0.06 **			0.09 ^a **			0.09 ^a **		
Rel Intensity	0.35 ** (0.29) †			0.19 ^a **			0.22 ^a **			0.13 **			0.16 ^a **		
Uncertain Self	0.26 ** (0.28) †			0.13 ^a **			0.13 ^a **			0.16 ^a **			0.18 ^a **		
Impulsive Beh	0.20 ** (0.26) †			0.10 ^a **			0.10 ^a **			0.11 ^a **			0.13 ^a **		
Self-harm	0.02 ** (0.07) †			0.01 *			0.01			0.01			0.02 *		
Unstable Mood	0.72 ** (0.38) †			0.37 ^a **			0.40 ^a **			0.27 ^a **			0.30 ^a **		
Feeling Empty	0.34 ** (0.35) †			0.17 ^a **			0.17 ^a **			0.23 ^a *			0.21 ^a **		
Intense Anger	0.57 ** (0.45) †			0.28 ^a **			0.40 ^a **			0.13 **			0.16 **		
Unreal Exp	0.20 ** (0.23) †			0.10 ^a **			0.11 ^a **			0.12 ^a **			0.12 ^a **		

Note.

* $p < .05$,

** $p < .01$.

† standard deviation $p < .01$.

^a Main effect statistically significant when controlling for the other specific negative emotions. DV = dependent variable; SD = standard deviation of random effect across individuals; BPD = borderline personality pathology; Avoid Aband = effort to avoid abandonment; Rel Intensity = relationship intensity; Uncertain Self = uncertain sense of self; Impulsive Beh = impulsive behavior; Unreal Exp = unreal experience.

3 Hours Lagged MLMs: Sustained Influence of Negative Emotions on BPD Symptoms

Table 2

DV: BPD Symptom	Negative Emotions		Irritable		Angry		Ashamed		Guilty	
	Average Participant Effect (SD)	Average Participant Effect	Average Participant Effect	Average Participant Effect	Average Participant Effect	Average Participant Effect	Average Participant Effect	Average Participant Effect	Average Participant Effect	Average Participant Effect
Avoid Aband	0.02 (0.14) †	0.002	0.002	0.01	0.01	0.03	0.02	0.02	0.02	0.02
Rel Intensity	0.07 ** (0.22) †	0.03 **	0.03 **	0.04 **	0.04 **	0.04 *	0.04	0.04	0.04	0.04
Uncertain Self	0.06 ** (0.18) †	0.01	0.01	0.03 *	0.03 *	0.06 **	0.06 **	0.06 **	0.06 **	0.06 **
Impulsive Beh	0.02 (0.15) †	0.003	0.003	-0.0001	-0.0001	0.03	0.02	0.02	0.02	0.02
Self-harm	0.0005 (0.05) †	-0.00009	-0.00009	-0.006	-0.006	0.003	0.008	0.008	0.008	0.008
Unstable Mood	0.12 ** (0.30) †	0.04 *	0.04 *	0.05 *	0.05 *	0.08 *	0.06 *	0.06 *	0.06 *	0.06 *
Feeling Empty	0.08 ** (0.22) †	0.01	0.01	0.04 *	0.04 *	0.07 *	0.05 *	0.05 *	0.05 *	0.05 *
Intense Anger	0.01 (0.24) †	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Unreal Exp	0.004 (0.15) †	-0.01	-0.01	-0.01	-0.01	0.03	0.02	0.02	0.02	0.02

Note. When effects were tested only in the community subsample, there were not any statistically significant effects.

* $p < .05$,

** $p < .01$.

† standard deviation $p < .01$. DV = dependent variable; SD = standard deviation of effect across individuals; BPD = borderline personality pathology; Avoid Aband = effort to avoid abandonment; Rel Intensity = relationship intensity; Uncertain Self = uncertain sense of self; Impulsive Beh = impulsive behavior; Unreal Exp = unreal experience.

Table 3
3 Hours Lagged MLMs: Sustained Influence of BPD Symptoms on Negative Emotions

IV: BPD Symptom	Negative Emotions				
	Average Participant Effect (SD)	Irritable	Angry	Ashamed	Guilt
Avoid Aband	0.02 (0.18) †	0.02	0.002	0.03	0.04
Rel Intensity	-0.01 (0.15) †	-0.001	0.02	0.04	0.02
Uncertain Self	0.06 * (0.17) †	0.11 **	0.06	0.06	0.07 *
Impulsive Beh	0.01 (0.16) †	0.01	-0.004	0.04	0.03
Self-harm	0.15 (0.37)	0.21	0.14	0.03	-0.05
Unstable Mood	0.02 (0.13) †	0.06 *	0.05	0.04 *	0.03
Feeling Empty	0.03 (0.14) †	0.06 *	0.03	0.04	0.03
Intense Anger	-0.03 (0.16) †	0.03	0.02	0.01	0.03
Unreal Exp	0.05 (0.26) †	0.06	0.04	0.05	0.06

Note. When effects were tested only in the community subsample, there were not any statistically significant effects.

* $p < .05$,

** $p < .01$.

† standard deviation $p < .01$. IV = independent variable; SD = standard deviation of random effect across individuals; BPD = borderline personality pathology; Avoid Aband = effort to avoid abandonment;

Rel Intensity = relationship intensity; Uncertain Self = uncertain sense of self; Impulsive Beh = impulsive behavior; Unreal Exp = unreal experience.

Table 4

Concurrent MLM Estimates for Momentary BPD Symptoms: Interaction Between Negative Emotions and Borderline Personality Pathology

DV: BPD Symptom	Negative Emotions			Irritable			Angry			Ashamed			Guilty		
	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction	Interaction
Avoid Aband	0.02 *			0.01 **			0.01 *			0.02 **			0.01		
Rel Intensity	0.03 **			0.02 **			0.03 **			0.02 *			0.02 *		
Uncertain Self	0.05 **			0.03 **			0.03 **			0.03 **			0.02 **		
Impulsive Beh	0.03 **			0.01 **			0.02 **			0.03 **			0.02 *		
Self-harm	0.01 **			0.003 **			0.01 **			0.01 **			0.01 *		
Unstable Mood	0.03 **			0.03 **			0.03 **			0.02 *			0.02		
Feeling Empty	0.05 **			0.03 **			0.03 **			0.03 **			0.02 **		
Intense Anger	0.01			0.02 **			0.02 **			0.02 *			0.01		
Unreal Exp	0.03 **			0.02 **			0.02 **			0.02 **			0.02 **		

Note.

* $p < .05$,

**

$p < .01$. DV = dependent variable; BPD = borderline personality pathology; Avoid Aband = effort to avoid abandonment; Rel Intensity = relationship intensity; Uncertain Self = uncertain sense of self; Impulsive Beh = impulsive behavior; Unreal Exp = unreal experience.