The relationship between borderline personality features and prompt emotional recovery

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The relationship between prompt emotional recovery and borderline personality feature severity

The aim of the current study was to explore the relationship between borderline personality (BP) feature severity and prompt emotional recovery by assessing participants' modulation of affect in response to sudden changes in emotional context. A total of 86 analogue participants underwent a computerized experiment, in which they viewed morphed neutral facial expressions at baseline, negative facial expressions, and immediately following neutral facial expressions. Self-reported affect to negative facial expressions was employed to indicate participant's emotional reactivity. Difference between self-reported affect to neutral expressions at baseline and to neutral expressions following negative expressions was employed to indicate participant's emotional recovery. Results revealed that participants with higher BP feature severity showed poorer emotional recovery. This result remained notable even after depressive symptoms, anxiety and anger proneness as personality traits were controlled for. The current study adds to the previous findings that poorer emotional recovery may be an important constituent of emotion dysregulation related to BP features.

Keywords: Borderline personality features; emotional recovery; emotion dysregulation; prompt emotional recovery; emotional reactivity

Borderline personality disorder (BPD) is a perplexing and debilitating psychiatric disorder that affects 2.7 to 5.9% of the general population and approximately 15- 20% of the psychiatric inpatient population (Shen, Hu, & Hu, 2017). With Biosocial theory, Linehan (1993) proposed that BPD is a disorder of emotion dysregulation and that predominant constituents of emotion dysregulation associated with BPD include heightened emotional reactivity and slow return to emotional baseline. Linehan (1993) described "emotional reactivity" as extreme reactions towards emotional stimuli and "emotional recovery" as return to baseline levels of emotional arousal subsequent to an emotional trigger.

Extant research has included examinations of hyperreactivity in BPD samples. Studies on emotional reactivity in naturalistic settings with computerized ecological momentary assessment (EMA) revealed that BPD patients experienced heightened negativity to their daily stressors than did healthy controls (Stiglmayr et al., 2005) and psychosis controls (Glaser, Van Os, Mengelers, and Myin-Germeys, 2008). In contrast, in laboratory studies in which changes were measured in emotional responses to negative stimuli, researchers reported no difference in hyperreactivity between the BPD sample and the healthy control (e.g., Herpertz, 2000; Jovev et al., 2011).

Compared with the wealth of research on emotional reactivity, there has been scarce research on emotional recovery in BPD. Several researchers conducted laboratory-based examinations of emotional recovery by measuring emotional responses over time after a negative emotion induction. For example, Scheel et al. (2013) examined emotional recovery in BPD by inducing shame and measuring self-reported affect at several time points (before, immediately after, three minutes, six minutes, and eight minutes after the shame induction). They reported that BPD patients' anger lasted longer than that of patients with major depressive disorder and of the nonclinical group. Gratz, Rosenthal, Tull, Lejuez, and Gunderson (2010) also assessed time-based recovery in BPD by giving negative feedback on the task that participants completed and assessing their affect five times with varying intervals (before, during a stressor task, after a negative feedback, during a solvable anagram task, and five minutes after the anagram task). They reported that in the BPD group, shame lingered more and with higher intensity than it did in the control group. Although time-based recovery paradigm offers an advantage in depicting the course of return to baseline, its delayed time intervals in between affect measurements inevitably preclude the immediate aspect of recovery from examination.

Emotions generally happen in the context of interpersonal interactions, in which individuals' emotional responses are closely linked (Butler, 2015). Understanding interpersonal affect dynamics and reshaping one's emotions and behaviour to conform to immediate situational demand is critical in social outcomes (Butler, 2015). In this regard, modulating one's emotion to sudden changes in emotional context, especially quickly recovering from negative context, can be desirable. Gottman

and Levenson (1994) reported that individuals who failed to promptly recover from negative affect induced from conflict discussion, when the conflicting situation had terminated, were more prone to negative relationship outcomes. In this way, the essence of relationships often lies in the immediate emotional experience in interpersonal interactions (Häfner & IJzerman, 2011). Thus, examining the relation between borderline personality features and prompt aspect of emotional recovery may contribute to an advance knowledge in interpersonal difficulties related to BP features. However, from our knowledge, studies on BP feature have yet measured the relationship between BP feature severity and prompt emotional recovery.

Previous studies have mainly focused on BPD patients; however, scholars suggest the importance of studying personality features in analogue samples. Scholars view personality disorders as a magnification of personality style along a continuum that exists within everybody (e.g., Widiger, 1992; Oldham, 1995). In addition, analogue participants with high BP feature severity have showed notable difficulties in social functioning (e.g., Dixon-Gordon, Chapman, Lovasz, & Walters, 2011) and even showed more self-reported academic, emotional, and interpersonal difficulties compared to those without the features after two years (Trull, Useda, Conforti, & Doan, 1997). It can be inferred that as one's BP feature severity increases, he/she may be more prone to problems or difficulties associated with BPD.

Extant evidence suggests that difficulties regulating emotion is one of the most prominent features of BPD (e.g., Linehan, 1993). Despite extensive studies on emotion dysregulation associated with BP features, the association between BP features and poor functioning in prompt emotional recovery has yet been examined. We employed an analogue sample to understand more about the underlying constructs and latent features of emotion dysregulation in BP features. We also intend to study young adults who do not meet the diagnostic criteria to learn more about nonpathological features of borderline personality.

The Current Study

For the current study, we examined emotional recovery and its association with BP feature severity. For this purpose, we adapted the experimental paradigm of Cho and colleagues (2017). They assessed participants' emotional responses to immediately changing contexts of the presented stimuli from negative to neutral and investigated these responses' relationships with mindfulness. Results showed that individuals with higher mindfulness showed less negative emotional responses to neutral stimuli immediately following negative stimuli. Given that BP feature is inversely related to mindfulness (Wupperman, Neumann, Whitman, & Axelrod, 2009), we speculated that participants with higher BP feature severity might show increasing difficulties in emotional recovery or in

emotion modulation to changed emotional situation.

In our study, we first assessed participants' responses to neutral facial stimuli at baseline. Next, we assessed participants' responses to negative facial stimuli and responses to immediately following neutral stimuli. Emotional reactivity was operationalized as the responses to negative stimuli. Emotional recovery was operationalized as the responses to neutral facial stimuli at baseline subtracted from the responses to neutral stimuli following negative stimuli. We postulated that participants with higher BP feature severity would show poorer emotional recovery.

Method

Participants

A total of 86 participants (65 female) participated in this study. We determined the sample size using G*Power, which yielded a minimum sample size of $N = 51$ to detect a small to large effect ($f = .20$) based on Cho et al. (2017) at power (.80) and with $\alpha = .05$. Age ranged from 18 to 38 (M=22.07, SD=3.70). Of the participants, 77 participants (89.50%) were undergraduate students, three (3.50%) were graduates, and six (6.98%) were graduate students. After the participation, all participants were rewarded with a $10 gift voucher. The current study was approved by institutional review boards (IRB).

Picture Stimuli

The raw materials for this study were colour photographs of negative (anger and disgust) and neutral facial expressions. We selected these stimuli from a standardized database, the NimStim Face Stimulus Set (Tottenham et al., 2009). Affect ratings from 17 subjects in a pilot study confirmed that the stimuli clearly instigated negative emotions. None of the faces were familiar to any of the participants. To generate dynamic facial expressions, we morphed 40 images using a computer-morphing program from neutral (0%) to anger (100%) and to disgust (100%) in 3.13% increments. For neutral stimuli, we morphed closed- and open-mouth versions of neutral expression using the identical technique. NimStim Face Stimulus Set contains both versions of the neutral expression to allow the production of morphed neutral stimuli so that they are comparable with morphed emotional stimuli (Tottenham et al., 2009).

For negative facial expressions, 2000ms out of 4000ms was of dynamic faces, developing an emotional expression to full-blown, and the remaining 2000ms was of a static full-blown expression. For neutral images, 2000ms was of dynamic faces, developing from an open-mouth to

closed-mouth neutral expression, and the remaining 2000ms was of a static image of a closed-mouth neutral expression. This change in speed was able to embody natural changes in the dynamic facial expressions of anger and disgust (Sato, Fujimura, & Suzuki, 2008).

Apparatus

Experimental process was controlled by a program written in PsychoPy v3.0 (Peirce et al., 2019) and implemented on a laptop (Ultrabook, LG) with a Microsoft Windows operating system.

Measures

Borderline Personality Features

The Personality Assessment Inventory-Borderline Subscale (PAI-BOR) developed by Morey (1991) and later validated in Korean (Hong et al., 1998) was used to assess borderline personality feature severity. The original questionnaire was of 24 items, but one item with low internal correlation between items was excluded in the Korean Version. Items were rated from 0 (not at all) to 3 (extremely true), with higher scores indicating higher BP feature severity. PAI-BOR scale has been employed in a number of studies to assess BPD symptoms among undergraduate samples (Trull, 1995, 2001; Chapman, Leung & Lynch, 2008). In a study by Hong et al. (1998), the internal consistency was .84, and the test - retest reliability was .75 over 6 weeks. In the current sample, internal consistency was satisfactory (.84). Sixteen percent of the participants reported PAI-BOR scores greater than or equal to 38 (T scores ≥70), which implies clinically significant BPD features (Morey, 1991; Trull, 2001). Proportion of participants who scored higher than 38 was slightly larger than Trull's 14.8% (1995).

Depression Symptomatology

The Center for Epidemiological Studies – Depression scale (CES-D) developed by Radloff (1977) and later validated in Korean (Chon, Choi & Yang, 2001) was used. It is a 20-item questionnaire with items ranging from 0 (extremely rare) to 3 (almost always) to assess depressive symptomatology in the general population. Higher score indicates greater depressive symptoms. In a study by Chun et al. (2001), the internal consistency was .91. In the current sample, internal consistency was .90.

Trait Anxiety

Trait Anxiety section from the State-Trait Anxiety Inventory (STAI) developed by Spielberger (1983) and later validated in Korean (Han, Lee, & Chon, 1996) was used. It is a 20-item questionnaire with items ranging from 1 (extremely rare) to 4 (almost always) to measure trait anxiety. Higher score

indicates higher trait anxiety. In a study by Kim (1978), the internal consistency was .86 and was .91 in the current sample.

Trait Anger

Trait Anger section of the State-Trait Anger Expression Inventory (STAXI) originally developed by Spielberger (1988) and later validated in Korean (Han, Lee, & Chon, 1997) was used to assess trait anger. This section of the scale consists 10-items, with higher scores indicating higher trait anger. The items are rated from 1 (almost never) to 4 (almost always). In a study by Chon et al., (1997), the internal consistency was .86. In the current sample, the internal consistency was .80.

Participants' affect ratings of facial stimuli.

A single question the Affect Scale adapted from Cho et al. (2017) was employed to examine participants' emotional responses to presented stimuli. Participants read the following instruction: "Please rate your current emotional state on a scale from 1 (very unpleasant) to 9 (very pleasant)." For this study, we adjusted the original scale to a scale of one to nine. For the data analysis, we used the mean response for each emotional category (baseline neutral stimuli, negative stimuli, neutral stimuli following each negative stimuli).

Procedure

As participants arrived, they were informed about the task they were to perform and signed a consent form. They were seated in front of a laptop screen (15.6-inch), they listened to a relaxing music for five minutes to allow general adaptation to the room. Then, they had three practice trials to familiarize themselves with the rating system with the experimenter's assistance.

The experimental paradigm was intended to assess participants' responses to stimuli across three different contexts: neutral stimuli in baseline, negative stimuli, and neutral stimuli immediately following negative stimuli. In total, the paradigm included 12 negative stimuli, which were dynamic facial expressions of anger and disgust, and 18 neutral expression stimuli.

First, in the baseline block, participants viewed neutral facial expressions of six models (three females) and rated their affect after each stimulus. Participants were given an infinite amount of tie to rate their affect but were encouraged to rate intuitively and as quickly as possible. Models used in the baseline were excluded from the later blocks to rule out the possibility of habituation.

Following the baseline block was the main block. The main block consisted of two types of

negative stimuli: anger and disgust stimuli. These yielded similar results, so we collapsed them into negative stimuli.[1] There were six anger stimuli, six disgust stimuli, and a neutral stimulus following every negative stimulus. We randomized the order of the presented emotion type across participants. Participants first viewed a negative stimulus (either anger or disgust) and rated their affect and then viewed a neutral stimulus of the same person and rated their affect again. This process of "negative stimuli-rate-neutral stimuli-rate" was repeated six times for each emotion type with different models. The order of the stimuli was also randomised across participants. Upon the completion of computerized task, participants completed the questionnaires.

We replicated Sato and Yoshikawa's (2007) procedure in displaying the stimuli. Before the presentation of each stimulus, a warning tone (100s) was presented with a fixation point (an illustration of a small "+" in white on a black background for 520s) at the centre of the screen. Then, the stimulus was presented for 4000ms. After the stimulus presentation, black screen appeared to allow inter-trial interval, which varied randomly from 3000 to 7000ms. Our duration of stimulus presentation (4000ms) was modified based on Hofman, Bos, Schutter, and van Honk's (2012) study, because results of a pilot study with 17 participants suggested that Sato & Yoshikawa's (2007) duration of presentation (1520ms) would be too short to recover from pre-induced emotion.

Statistical Analysis

For preliminary analysis, correlation analysis among the independent variables has been conducted. All continuous independent variables were grand-mean centered for clearer interpretation of the results. Before the main analyses, we conducted paired t-tests to ensure that negative stimuli successfully instigated negativity and that participants experienced lingering negativity when they rated the neutral stimuli following the negative ones.

For main analyses, repeated measures analysis of variance (ANOVA) with context of the presented stimuli (*neutral at baseline, negative, neutral following negative*) as a within-subject variable and BP feature severity as a standardized continuous variable was conducted. Significant interaction effect was followed up with Bonferroni-corrected linear regressions of BP features on baseline affect, emotional reactivity, emotional recovery. Also, repeated measures analyses of covariance (ANCOVA) was conducted to control for depressive symptoms, anxiety traits, and anger traits. Greenhouse-Geisser adjustments were used when the assumption of sphericity was violated. All data analyses were conducted by using R program (R Core Team, 2017).

Result

Preliminary Analysis

Table 1 presents the correlations, means, and standard deviations for the self-reported variables. BP feature severity measured by PAI-BOR was significantly associated with depressive symptomology, trait anxiety, and trait anger. Thus, we controlled for these three variables in the relevant analyses.

Table 1. Correlations and descriptives for self-reported measures

Variables	*1*	*2*	*3*	*4*
1. PAI-BOR	-			
2. STAI_trait	.69***	-		
3. CES-D	.68***	.82***	-	
4. STAXI_trait	.52***	.29**	.29**	-
M	27.17	46.85	17.36	18.53
SD	8.56	10.95	9.66	4.66

Note. *N* = 86. PAI-BOR = Personality Assessment Inventory-Borderline Subscale; STAI_trait = Trait Anxiety from State Trait Inventory; CES-D= Center for Epidemiological Studies – Depression scale; STAXI_trait = Trait Anger from State-Trait Anger Expression Inventory.

*p < .05, **p < .01, ***p < .001.

To assess whether negative stimuli successfully instigated negative emotion, we conducted a paired t-test, and we found that participants' responses to negative stimuli (M = 3.22, SD = 0.92)

were significantly more negative than were their responses to neutral stimuli in the baseline block (M = 5.00, SD = 0.47), $t(85) = -17.05$, $p < .001$.

Also, we had to ensure that participants experienced lingering negativity when they rated the neutral stimuli following the negative stimuli. A paired t-test revealed that participants' responses to neutral stimuli following negative stimuli (M = 4.77, SD = 0.74) were significantly more negative than their responses to neutral stimuli in the baseline block (M = 5.00, SD = 0.47), $t(85) = -2.99$, $p = .004$.

Main Analysis

Repeated measures ANOVA results revealed a significant main effect of context, $F(2, 168) = 204.27$, $\eta^2 = .56$, $p < .001$, qualified by an interaction with BP feature severity, $F(2, 168) = 7.91$, $\eta^2 = .05$, $p = .001$. (Figure 1); Greenhouse-Geisser adjustment was used. With increasing BP feature severity, the coefficient of stimuli context (neutral stimuli at baseline v. neutral stimuli following negative stimuli) on the participant's response becomes significantly negative. (Figure 2). This indicates participants with higher BP feature responded significantly more negatively as the stimuli context changed from *baseline* to *subsequent to negative stimuli*. For post-hoc analyses, we applied Bonferroni correction ($\alpha/3 = .017$). Post-hoc linear regression was conducted to examine if the interaction effect was associated with emotional recovery, which was calculated by subtracting responses to neutral stimuli at baseline from responses to neutral stimuli following negative stimuli. Results revealed that this interaction effect was due to a significant negative association between BP feature severity and emotional recovery, $R^2 = .06$, $F(1, 84) = 5.97$, $p < .017$. There was no notable association between BP feature severity and participants' responses to negative stimuli, $R^2 = .01$, $F(1, 84) = 2.10$, $p = ns$, and no association between BP feature severity and responses to neutral stimuli in the baseline, $R^2 = .01$, $F(1, 84) = 1.55$, $p = ns$.

To control for depressive symptomology, anxiety traits, and anger traits, we conducted repeated-measures analysis of covariance. Among other variables, BP feature severity was the only variable that showed significant interaction with context, $F(2,162) = 7.79$, $\eta^2 = .05$, $p = .001$. Greenhouse-Geisser correction was used.

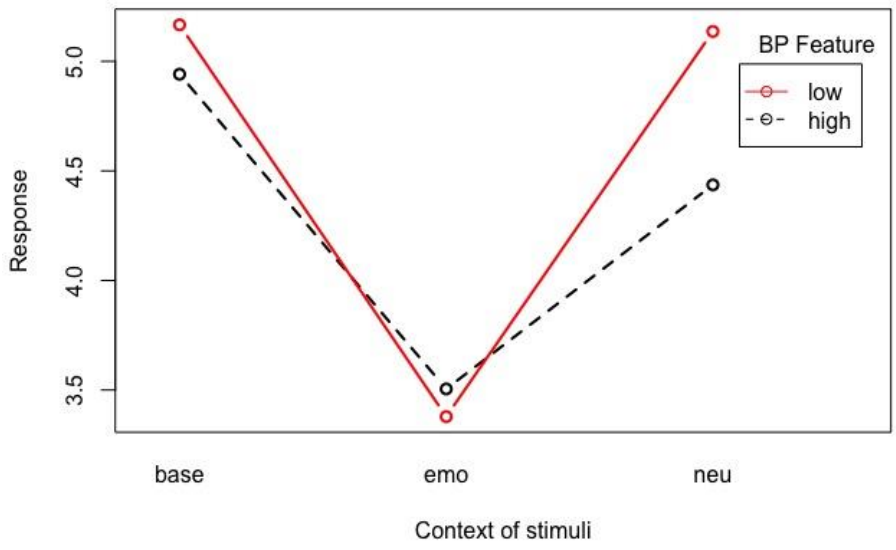

Figure 1. N = 86. Self-rated response by stimuli context as a function of Borderline Personality (BP) feature. BP feature was categorized into high (+1 SD above the mean) and low (-1 SD below the mean). Base = responses to neutral stimuli in the baseline block; Emo = responses to negative stimuli; Neu = responses to neutral stimuli following negative stimuli.

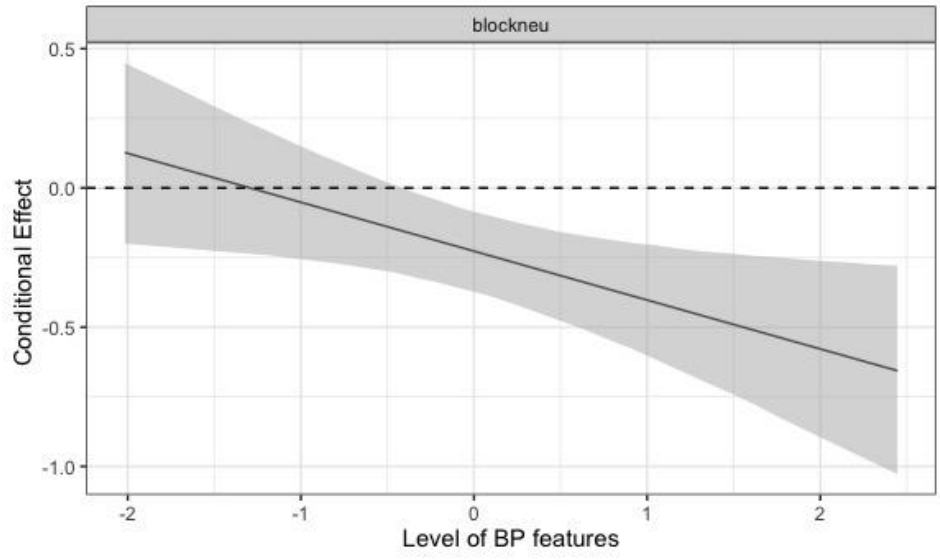

Figure 2. N = 86. Conditional effect of Stimuli Context (neutral stimuli at baseline v. neutral stimuli following negative stimuli) on participant's response as a function of BP feature severity.

Discussion

In support of our hypotheses, the current findings revealed that higher the BP feature severity, the poorer the emotional recovery participants displayed. Our results demonstrated an interaction effect between BP features severity and differences in emotional responses across stimuli of varying contexts. More specifically, participants with higher BP feature showed poorer emotional recovery. Our findings imply that emotion dysregulation associated with BP features may be closely related to poorer functioning in prompt emotional recovery.

One of the strengths of our study was that we measured how BP feature was associated with the capacity to immediately change one's responses to altered emotional events. As Häfner and IJzerman (2011) suggested that immediate emotional experience in interpersonal interactions is important in relationships, individuals who are able to momentarily modulate their affect to conform to sudden situational changes can be more adept at interpersonal interactions. Thus, our findings can imply that the vulnerability in this ability may contribute to marked problems in interpersonal relationships in individuals with high BP features.

Our results revealed that BP feature severity was not associated with emotional reactivity to negative facial stimuli; this is consistent with previously mentioned laboratory studies (e.g., Jovev et al., 2011). This could be because negative stimuli given in the laboratories might be rather weak compared to daily life stressors and was not able to differentially provoke negative emotion depending on the BP feature severity. Results showed that negative stimuli clearly instigated negative emotion in participants, but those with higher BP feature did not experience more negativity. If participants with higher BP feature severity experienced more negativity to the presented stimuli, this might suggest that they were influenced by a greater extent when they responded to subsequent neutral stimuli. Thus, our results imply that individuals with higher BP features showed less complete recovery not because they had more to recover from.

The current study has several limitations. First, we only measured emotional responses using subjective ratings. Although self-reported measures are widely used to assess emotional responses to stimuli, they may be biased by self-deception and subjectivity issues. Thus, future studies can replicate the current study, using different assessments such as physiological measurements and neuroimaging. This would provide important information about whether differences in emotional recovery are the result of physiological or biological differences or simply differences in how individuals subjectively respond to negative stimuli. Second, we did not employ a clinical sample, and thus our findings cannot be generalized to the clinical population. Lastly, we did not measure subjective responding to negative stimuli across specific emotions. Future studies can replicate our study with emotion-specific ratings such as anxiety, shame, or anger to examine the precise nature

of emotional recovery.

Notes

To ensure that anger and disgust stimuli did not render differing results depending on the BP feature severity, we conducted a 2 (context: negative vs. neutral) × 2 (emotion type: anger vs. disgust) repeated-measures ANOVA with BP feature severity as a standardized continuous between variable on affect ratings. A three-way interaction between BP feature severity, context, and emotion type was not significant, $F(1,84) = 2.37$, $p = ns$. This indicates that the interaction between BP feature severity and context did not vary in relation to type of emotion. Thus, we collapsed across the variable of emotion type (anger vs. disgust) into negative stimuli as a whole.

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