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Momentary symptoms of Borderline Personality Disorder as a product of trait personality and social context

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Abstract

Past studies identify Five Factor Model (FFM) domains that are characteristic of Borderline Personality Disorder (BPD), including those associated with specific BPD symptoms, at a between-person level. The present study replicated these between-person associations and extended past research by assessing whether the FFM explains within-person variance in the manifestation of *momentary* BPD symptoms in the presence or absence of close social contact (CSC). We measured CSC and the BPD core symptoms negative affectivity, impulsivity, and interpersonal problems in 74 BPD patients and in a clinical control group of 40 depressed patients over the course of 28 days, six times a day. The FFM domains showed specificity in predicting momentary BPD symptoms and interacted with CSC in doing so. In particular, for BPD individuals only, momentary impulsivity and interpersonal problems were associated with higher Neuroticism and Extraversion and lower Agreeableness, and these associations were especially strong in situations involving CSC. Negative affectivity was predicted by Neuroticism for both groups of individuals, and this association was generally unaffected by CSC. Overall, experiencing CSC was positively associated with momentary BPD symptoms. Thus, both the FFM and CSC were associated with BPD patients' experience of symptoms in everyday life. Furthermore, specific FFM trait domains were particularly impactful in contexts where BPD symptoms are more likely to be manifested, providing further evidence that person-by-situation interactions are important for understanding BPD symptoms in the moment.

Keywords

Big Five; Five Factor Model; Borderline Personality Disorder; Ecological Momentary Assessment; Ambulatory Assessment

Introduction

Borderline Personality Disorder (BPD) is a severe psychiatric disorder that is characterized by a pervasive pattern of unstable interpersonal relationships, unstable affect, and marked impulsivity (American Psychiatric Association, 2013). BPD affects around 2.7% of the United States adult population and exhibits high comorbidity with other personality, mood, anxiety, and substance use disorders (Tomko, Trull, Wood, & Sher, 2013). Past research has repeatedly linked BPD to basic personality dimensions, such as the Five Factor Model (FFM) of personality (e.g., Clarkin, Hull, Cantor, & Sanderson, 1993; Trull & Brown, 2012; Trull, Widiger, Lynam, & Costa, 2003; Widiger, 2005; Wright, Hopwood, & Zanarini, 2015). The FFM is one of the most frequently used models of personality and includes the dimensions Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness (e.g., Costa & McCrae, 1992). Two large-scale meta-analyses have summarized studies linking the FFM to personality disorders and have shown that BPD is characterized by higher than average levels of Neuroticism, lower than average levels of Agreeableness and Conscientiousness, and slightly lower than average levels of Extraversion (Samuel & Widiger, 2008; Saulsman & Page, 2004).

However, a question that has been largely overlooked is whether the FFM domains are associated with significant variance in the specific symptoms of BPD beyond the FFM's ability to account for the presence of the diagnosis. That is, can FFM trait profiles also be used to predict BPD symptoms that may be especially problematic for a given patient? This question is particularly relevant in the case of BPD due to the disorder's marked symptom heterogeneity (Hallquist & Pilkonis, 2012; Trull, Tomko, Brown, & Scheiderer, 2010). With 256 unique ways to fulfill the DSM-IV criteria for a BPD diagnosis, which requires the presence of any five or more of nine symptoms, two individuals with BPD need overlap on only one of nine symptoms. Thus, linking the FFM to BPD at the diagnostic level, without taking into account specific symptom endorsement or symptom severity, potentially overlooks important within-group variation. To date, only one previous study has directly linked the FFM to BPD symptom severity (Hopwood & Zanarini, 2010). In this study, symptom areas including affect, cognition, impulse action (e.g. sexual deviance, substance use, self-harm), and interpersonal problems, as assessed by the *Revised Diagnostic Interview for Borderlines* (DIB-R; Zanarini, Gunderson, Frankenburg, & Chauncey, 1989), all showed positive correlations with Neuroticism and Extraversion (except impulse action), negative correlations with Agreeableness, and no significant correlations with Openness or Conscientiousness. Thus, this study provides some initial evidence that the FFM is related to BPD symptom severity, though relatively little support for the idea of specificity (i.e., that FFM domains might relate to certain symptoms, but not others). However, while Hopwood and Zanarini (2010) found that FFM traits predicted global BPD symptoms, these assessments, as they were retrospective in nature, shared the recall biases inherent in such measures. Thus, the observed associations may, in part, have been due to shared method.

A question about the FFM's link to BPD that remains unanswered is whether the FFM domains are associated with BPD symptoms as they are expressed and experienced in the moment during daily life. This is a relevant question because, in addition to the heterogeneity of symptoms *between* BPD individuals, BPD is also characterized by marked

within-person symptom variation, which results from the pervasive instability of affect, cognition, and behavior that defines this disorder (APA, 2013). That is, while a BPD patient may, at the person level, endorse a specific symptom, they likely do not exhibit it in equal intensities over time or across different situations.

For example, Miskewicz et al. (2015) found that the occurrence of momentary BPD symptoms is contingent upon a range of situational triggers (e.g., being rejected, disappointed, being alone). Additionally, previous work has shown that the majority of variance in momentary behavior that is not explained by personality is attributable to either the situation or to person-situation interactions (Fleeson, 2004; Webster, 2009). In other words, the momentary experience of BPD symptoms is likely influenced by personality traits, situational triggers, or their combination. However, we know little about the relative importance of each. Therefore, the primary goal of the present study was to examine the effect of the FFM domains, a meaningful situational variable, and their interaction on momentary BPD symptoms.

The Present Study

In the present study we first assessed the association between FFM domain scores and three BPD symptom areas at the between-person level: negative affectivity, impulsivity, and interpersonal problems (cf. Hopwood & Zanarini, 2010). We chose negative affectivity, impulsivity, and interpersonal problems as they have been identified as the three core symptoms of BPD (e.g., Skodol et al., 2002) with particular relevance for the psychopathology and prognosis of the disorder (Carpenter & Trull, 2013; Gunderson, 2007; Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004; Links, Heslegrave, & van Reekum, 1999; Trull et al., 2010). We were particularly interested in whether there was specificity in the relationships between the individual FFM domains and the core symptoms.

Regarding *negative affectivity*, defined as the tendency to experience high levels of negative affect due to emotional sensitivity and the tendency to experience affective instability due to a marked reactivity of affect (APA, 2013), we hypothesized a positive correlation with Neuroticism and a negative correlation with Agreeableness. This prediction was derived from previous evidence linking negative affect and negative affect instability to Neuroticism and Agreeableness in BPD (Hopwood & Zanarini, 2010) and in non-clinical samples using EMA (Barrett, 1997; Johnson, Miller, Lynam, & South, 2012; Miller, Vachon, & Lynam, 2009).

We expected *impulsivity* to be positively correlated with Neuroticism and Extraversion, and negatively correlated with Conscientiousness and Agreeableness. In a recent meta-analysis, Neuroticism, Extraversion, and Conscientiousness correlated significantly with impulsivity (Sharma, Markon, & Clark, 2014) and all three have domain content that pertains to impulsivity. Specifically, Neuroticism encompasses a proneness to maladaptive, impulsive behaviors, Extraversion includes tendencies to crave excitement and stimulation, and Conscientiousness comprises the tendency for deliberate and controlled action that is opposite impulsivity (Costa & McCrae, 1992). Additionally, Agreeableness can be seen as representing impulsivity in the form of impulsive aggression, marking the lower end of the Agreeableness spectrum (DeYoung, 2010).

Finally, based on Hopwood and Zannarini (2010), as well as Côté and Moskowitz (1998), who examined FFM scores and interpersonal problems using EMA in a non-clinical sample, we expected *interpersonal problems* to show a positive correlation with Neuroticism and a negative correlation with Agreeableness. Agreeableness should be of particular importance in this case, as individuals high in Agreeableness tend to be altruistic, sympathetic, helpful, and trusting (likely having fewer interpersonal problems), whereas those with low trait scores tend to be egocentric, skeptical, and competitive (Costa & McCrae, 1992).

In a second step, we assessed the relations between the FFM domains and momentary BPD symptoms. In light of evidence that momentary BPD symptoms may be contingent on situational triggers (Miskewicz et al., 2015), we additionally included a situational variable and its interactions with the FFM domains. We measured BPD symptoms and the situational variable in the moment, during daily life, using ecological momentary assessment (EMA, Stone & Shiffman, 1994; Trull & Ebner-Priemer, 2013). EMA is an established method that involves collecting real-life data in a person's natural environment using a handheld computer or smartphone, and this method has successfully been used to assess BPD symptoms in numerous previous studies (Coifman, Berenson, Rafaeli, & Downey, 2012; Ebner-Priemer et al., 2007; Gadassi, Snir, Berenson, Downey, & Rafaeli, 2014; Santangelo et al., 2014; Trull et al., 2008).

As a potential situational trigger variable for momentary BPD symptoms we identified close social contact (CSC), that is, contact with a romantic partner, friend, or family member. We focused on CSC for two reasons: First, because romantic partners, friends, and family members represent a group of individuals most likely to have meaningful, frequent, and impactful interactions with participants over the study period. Second, we focused on CSC because previous studies identified interpersonal *stress* as a trigger for BPD symptoms (Berenson, Downey, Rafaeli, Coifman, & Paquin, 2011; Coifman et al., 2012; Miskewicz et al., 2015; Zeigler-Hill & Abraham, 2006). However, it remains relatively unexplored whether social contact with a significant other, per se, has any effects on BPD symptoms. Social contact, of course, may or may not also involve interpersonal stress. This is a clinically relevant question, because if social contact, regardless of the presence of stress, was associated with increased expression of BPD symptoms, then this would highlight the importance of broad training in interpersonal skills (e.g., the DBT Interpersonal Effectiveness module) that can be applied to a wide range of interpersonal situations. An additional advantage of examining CSC, as opposed to interpersonal stress, is that it can be assessed more objectively (i.e., you are either with someone or you are not).

For the within-person analyses, we predicted main effects for the FFM domain identical to our predictions for the between-person analyses. Regarding CSC, we expected that all BPD features would be more likely to occur or be stronger in magnitude when CSC was present, as we predicted that CSC would have an “amplification effect” similar to that of interpersonal stress (Berenson et al., 2011; Coifman et al., 2012; Russell, Moskowitz, Zuroff, Sookman, & Paris, 2007; Zeigler-Hill & Abraham, 2006). We further expected CSC to interact with the FFM in predicting momentary BPD features in the following ways: First, we expected CSC to interact with Neuroticism and Agreeableness, such that CSC would be associated with negative affectivity particularly in individuals high in Neuroticism and low

in Agreeableness. Second, we predicted that CSC would be associated with impulsivity particularly in individuals high in Neuroticism and Extraversion and low in Conscientiousness. Third, we expected CSC would be associated with interpersonal problems particularly in individuals high in Neuroticism and low in Agreeableness.

Method

Participants

Participants were recruited from local psychiatric outpatient clinics serving the community in Columbia, Missouri, for a study examining affective instability in BPD (Jahng et al., 2011; Jahng, Wood, & Trull, 2008; Solhan, Trull, Jahng, & Wood, 2009; Tomko et al., 2015; Tomko et al., 2014; Trull et al., 2008). Inclusion criteria defined that participants had to be between the age of 18 and 65. General exclusion criteria were the presence of a psychotic disorder, history of severe head trauma or neurological dysfunction, intellectual disability, or severe substance dependence. The current study utilized all participants who completed the EMA component of the study. This initial sample included 131 participants. Participants in the BPD group ($n = 80$) were required to meet the DSM-IV-TR criteria for BPD and the specific BPD criterion of affective instability. To determine whether the postulated relations between the FFM and BPD symptoms were specific to BPD patients, we also assessed a clinical control group. The control group included participants ($n = 51$) meeting DSM-IV-TR criteria for current major depressive disorder and/or dysthymia (DD; American Psychiatric Association, 2000) and not BPD or the affective instability criterion. This control group was chosen because, like BPD patients, those with DD tend to be high in negative affect and suffer from interpersonal problems. Moreover, since comorbidity rates between BPD and mood disorders are high (e.g., Tomko et al., 2013), the DD control group allows us to interpret whether effects are specific to BPD.

To determine eligibility, we employed the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 1995) and the Structured Interview for DSM-IV Personality (SIDP-IV; Pfohl, Blum, & Zimmerman, 1994). For a subset of participants ($n = 20$), a second interviewer listened to an audio recording of the diagnostic interviews and made an independent rating. This provided us with a measure of diagnostic interrater reliability. Interviewers demonstrated high correspondence on the presence/absence of affective instability ($\kappa = 1.00$), diagnosis of BPD ($\kappa = .90$), and diagnosis of a current depressive disorder ($\kappa = 1.00$).

For the present study, due to the small number of male participants ($n = 6$ in BPD group; $n = 11$ in DD group), and known sex differences in emotion processing and interpersonal interaction (e.g., Barrett, Lane, Sechrest, & Schwartz, 2000), only female BPD participants were included in the analyses¹. Thus, the final sample included a total of 114 participants: 74 female BPD patients, aged 18 to 64 ($M = 32.4$, $SD = 11.9$) and 40 female DD patients,

¹Note that the inclusion of the male participants did not change the overall pattern of results for the bivariate correlations or multi-level models that we present. We prefer the restricted sample as a more conservative test of our hypotheses and a safeguard against overgeneralizing the results.

aged 19 to 65 ($M = 34.8$, $SD = 12.2$). Demographics and comorbid disorders are shown by group in Table 1.

Procedure and Measures

Participants carried an electronic diary (Palm Zire 31® handheld computer) for 28 days. Participants were instructed on the use of the electronic diary at an initial orientation session, at which time they also completed the personality assessment as well as other self-report measures not pertinent to the current investigation. The electronic diary prompted participants, via audible alarm, six times per day, at which time participants responded to questions about their current mood, behavior, and environment. The electronic diary's software spaced these prompts evenly across the day, dividing participants' typical waking hours into six equal intervals and then randomly selecting a time within each interval (see Trull et al., 2008 for more detail). Participants showed high compliance, answering on average 86.3% of prompts. A total of 16,225 prompts over 3,152 person-days were included in analyses. On average, individuals completed 149 total prompts ($SD = 19.7$).

Personality assessment—Participants' personality was assessed using the NEO personality inventory revised (NEO PI-R; Costa & McCrae, 1992). The NEO PI-R consists of 240 items measuring the five personality domains Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. Each domain contains six facets measured with eight items each. Items are answered on a five point scale ranging from “strongly disagree” to “strongly agree” and then summed for each domain. The NEO domains showed good internal consistencies with $\alpha = .90$ for Neuroticism, $\alpha = .92$ for Extraversion, $\alpha = .88$ for Openness, $\alpha = .88$ for Agreeableness, and $\alpha = .89$ for Conscientiousness.

Momentary affect assessment—Affect was assessed using items from the Positive and Negative Affect Schedule-Extended version (PANAS-X; Watson & Clark, 1999). Participants responded to affect items on the electronic diary at each occasion. They were instructed to rate the extent to which they had experienced a particular affective state since the last prompt on a five point Likert scale (1 = very slightly or not at all, to 5 = extremely). In total, 21 negative affect trait descriptors were given at each prompt and these items were averaged to create a general negative affect indicator. To quantify negative affect instability, squared successive differences (SSDs) were computed by subtracting the lagged negative affect score (of one prompt earlier) from the negative affect score of a given prompt and squaring this value. Note that SSDs were not calculated across days, meaning that the last prompt of day 1 could not serve as the lagged value for the first prompt of day 2. Additionally, SSDs were weighted to adjust for the fact that measurements were unequally spaced in time, due to the random prompting (see Jahng et al., 2008 for further details).

Momentary impulsivity—Participants' momentary impulsivity scores were assessed at each occasion using the *Momentary Impulsivity Scale* (MIS; Tomko et al., 2014). The MIS consists of 4 items on which participants rate their impulsivity since the last prompt, using a 5-point Likert scale (1 = very slightly or not at all; 2 = a little; 3 = moderately; 4 = quite a bit; 5 = extremely). The individual items included in the MIS are, “I made a ‘spur of the

moment' decision," "I said things without thinking," "I spent more money than I meant to," and "I have felt impatient." MIS scores were available for a subsample of 66 BPD and 37 DD participants.

Interpersonal problems—At each occasion, participants answered whether, since the last prompt, they had had a *disagreement* with their romantic partner, boss, co-worker, roommate, friend, parent, sibling, child, or any other family member. The number of disagreement instances per occasion was added up into a sum score.

Close social contact (CSC)—At each occasion, participants answered whether, since the last prompt, they had "spent time with a romantic partner," "spent time with friends," or whether they had "talked with their family". These variables were combined into one dummy variable that indicated whether CSC (i.e. contact with romantic partner, friends, or family) had occurred since the last prompt or not. The absence of CSC could indicate either that participants were alone or that they were only in contact with individuals other than those listed above (e.g., coworkers, acquaintances, or strangers).

Data analysis

Data were filtered such that only days with at least 3 occasions were included. If a day included more than the pre-specified 6 occasions, only the first 6 occasions were selected². Data were analyzed using two levels of analysis, a person level and a momentary level.

Person level—Person level aggregates of the BPD symptoms were obtained by averaging all momentary scores per day and then averaging all days per person. Table 2 shows the means and standard deviations for the 28 day feature aggregates and the FFM scores by group. The feature aggregate scores were each correlated with the FFM domain scores, separately for the BPD and DD group.

Momentary level—To assess effects of the FFM domains and CSC on momentary BPD symptoms we employed a linear multi-level model (MLM). We modelled a random intercept for each person and a random intercept of days nested within persons (i.e., certain days may be associated with higher overall levels of the outcome that are specific to an individual as opposed to shared across individuals). Predictors included the grand mean centered FFM domain scores, the group membership dummy-variable and the CSC dummy-variable. Additionally, the model included main effects for the control variables weekday, weekend, study day, time elapsed since the person awoke, and a person's average amount of social contact experienced throughout the study period (grand mean centered). Beyond the main effects, the model included all two-way interactions between the FFM and group, between the FFM and CSC, and between group and CSC. All three-way interactions between the FFM, group, and CSC were also modeled.

Due to the large number of interactions, we do not present the test statistics for all the different main and interaction effects. Instead, we present in Table 4 the main effects of the

²Note that the general pattern of results remained unchanged when running analyses with the unfiltered dataset.

FFM on the outcomes of interest by the two dummy-variables group and CSC. In the text, we report the main effects of CSC and the significant CSC by FFM interaction effects. Multilevel analyses were performed in R (R Core Team, 2014) using the **lmer** function from the package **lme4** (Bates, Maechler, Bolker, & Walker, 2014). Significance tests were conducted using the package **lmerTest** (Kuznetsova, Brockhoff, & Christensen, 2014).

Results

Person Level

Bivariate person-level correlations between the FFM domains and aggregates of momentary BPD symptoms are presented in Table 3 separately for the BPD and DD group. In both groups, negative affect and negative affect instability were positively correlated with Neuroticism. In the BPD group, negative affect was also negatively correlated with Conscientiousness and there was a marginally significant negative correlation for negative affect instability with Agreeableness. Impulsivity scores were negatively correlated with Agreeableness in the BPD group and with Conscientiousness in the DD group. Disagreements were negatively correlated with Agreeableness in the BPD group and with Openness in the DD group.

Momentary level

Negative affectivity—Close social contact (CSC) predicted momentary negative affect in the BPD group (*Estimate* = 0.025, *SE* = 0.010, *p* = .016), but not in the DD group (*Estimate* = -0.014, *SE* = 0.016, *p* = .384). For the FFM dimensions, Neuroticism predicted negative affect in both groups (see Table 4). Finally, none of the FFM dimensions interacted with CSC to predict negative affect. Regarding affective instability, there was no significant main effect for CSC, either in the BPD group (*Estimate* = 0.016, *SE* = 0.019, *p* = .392) or in the DD group (*Estimate* = 0.014, *SE* = 0.029, *p* = .631). For the FFM dimensions, Neuroticism predicted negative affective instability in both groups (see Table 4). Finally, in the BPD group, CSC interacted with Neuroticism (*Estimate* = 0.002, *SE* = 0.001, *p* = .043), such that Neuroticism predicted greater affective instability when CSC was not endorsed. Additionally, Extraversion had a significant positive effect on affective instability in the BPD group, but only when CSC was not endorsed (the interaction term, however, was not significant, *Estimate* = 0.001, *SE* = 0.001, *p* = .104).

Impulsivity—CSC significantly predicted momentary impulsivity in both groups (BPD group: *Estimate* = 0.432, *SE* = 0.052, *p* < .001; DD group: *Estimate* = 0.356, *SE* = 0.082, *p* < .001). For the FFM dimensions, in the BPD group, Extraversion had a significant positive effect on momentary impulsivity and Agreeableness had a significant negative effect (Table 4). In the BPD group, CSC interacted with Extraversion (*Estimate* = 0.009, *SE* = 0.002, *p* < .001), Agreeableness (*Estimate* = 0.012, *SE* = 0.003, *p* < .001) and Neuroticism (*Estimate* = 0.013, *SE* = 0.003, *p* < .001) in predicting impulsivity. Conscientiousness had a significant negative effect on impulsivity when CSC was not endorsed (the interaction term was, however, only marginally significant, *Estimate* = 0.004, *SE* = 0.002, *p* = .062). In the DD group, Conscientiousness had a significant negative effect on impulsivity when CSC was endorsed and a marginally significant negative effect when CSC was not endorsed.

Interpersonal problems—CSC significantly predicted momentary disagreements in both groups (BPD group: *Estimate* = 0.065, *SE* = 0.010, $p < .001$; DD group: *Estimate* = 0.071, *SE* = 0.016, $p < .001$). There were no significant main effects for the FFM dimensions. In the BPD group, CSC interacted with Extraversion (*Estimate* = 0.001, *SE* = 0.001, $p = .013$) and Agreeableness (*Estimate* = -0.001 , *SE* = 0.001, $p = .009$) in predicting disagreements. Both domains significantly predicted momentary disagreements in the BPD group only when CSC was endorsed.

Discussion

The goal of the present study was to assess whether the FFM domains were able to explain variance in average and momentary BPD symptoms that were measured using EMA, within a sample of BPD and DD patients. Regarding momentary BPD symptoms, we additionally assessed whether the FFM domains interacted with the situational variable CSC to predict momentary BPD symptoms.

Negative Affectivity

As hypothesized, Neuroticism correlated positively with negative affect and affective instability at the between-person level, and also was associated with both constructs at the momentary level. These findings replicate previous work with a BPD (Hopwood & Zanarini, 2010) and healthy samples (Barrett, 1997; Jacobs et al., 2011; Johnson et al., 2012; Miller et al., 2009). The effects of Neuroticism on (momentary) negative affect and affective instability were not specific to the BPD group, as they were found in the DD group as well. This, however, is not surprising, given that Neuroticism has repeatedly been identified as being associated with psychopathology in general (e.g., Ormel, Rosmalen, & Farmer, 2004).

Specific to the BPD group was the effect of CSC as a situational correlate of momentary negative affect, indicating that negative affect in BPD patients was higher when they were with someone close to them. In contrast, negative affective instability was not associated with CSC in either group. Interestingly, this association, while failing to reach significance in either group separately, depended upon Neuroticism in the BPD group. Specifically, high levels of Neuroticism predicted greater affective instability when BPD patients did *not* endorse CSC. In general, social contact has been theorized to stabilize emotional lability (Beckes & Coan, 2011 [Social Baseline Theory]), though in healthy individuals it serves to stabilize them at low levels of negative affect. In dysregulated individuals, like those with BPD, who have higher levels of negative affect overall, social contact might be expected to stabilize negative affect to consistently high levels in a state of evaluative tension, while the absence of social contact might lead to chaotic shifts in affect that are not otherwise kept in check by social evaluation concerns. Thus, the results suggest that more neurotic individuals can keep their generally higher affective instability relatively more in check when around those important to them.

Apart from the hypotheses pertaining to Neuroticism, we expected Agreeableness to be negatively correlated with momentary negative affect and affect instability. Agreeableness, however, did not predict either criterion, perhaps due to Neuroticism capturing a major proportion of the variance in this BPD feature.

Impulsivity

We expected negative associations of impulsivity with Agreeableness and Conscientiousness scores and positive associations with Neuroticism and Extraversion scores. In the BPD group, Agreeableness had a negative effect on impulsivity at the between-person level, in line with our hypothesis and corroborating previous findings (Aslan & Cheung-Blunden, 2012; Hopwood & Zanarini, 2010; Seibert, Miller, Pryor, Reidy, & Zeichner, 2010). Parallel to the between-person level, Agreeableness also had a negative main effect on momentary impulsivity and significantly interacted with CSC. Specifically, while impulsivity was greater on occasions with CSC for all participants, this effect was especially strong in individuals with low levels of Agreeableness. This interaction could reflect the fact that two of the included impulsivity items pertained to disagreeable behavior, such as saying something *to someone* without thinking about their feelings or making spur of the moment decisions. Both of these, on the surface, appear related to aspects of low Agreeableness, such as making egoistic decisions. Note that Agreeableness was linked to impulsivity only in the BPD group, which suggests specificity of this effect for BPD.

We also expected Conscientiousness to be negatively correlated with impulsivity as this domain captures the tendency for controlled, deliberate behavior. While this association was not present at the person level, Conscientiousness significantly predicted momentary impulsivity on occasions when CSC was not endorsed. This could imply that, in the absence of CSC, BPD patients' disposition to act conscientiously comes into play more strongly, allowing them to regulate impulsive behavior, while this process is more difficult when close others are present. Similar to the stabilizing effect of CSC for affective instability hypothesized above, it is possible that CSC stabilizes BPD individuals at high levels of impulsivity (cf. Beckes & Coan, 2011). In turn, the absence of CSC (and its stabilizing effect) may leave impulsivity more susceptible to regulating efforts motivated by Conscientiousness.

Originally, we also postulated a positive effect of Neuroticism on impulsivity, as this domain, at least partially, taps impulsive urges (cf. Costa & McCrae, 1992). We did not observe this correlation at the person level, but did at the momentary level. Specifically, Neuroticism was a positive predictor for momentary impulsivity when BPD patients reported CSC, but not when they reported no CSC. This, too, supports the idea that CSC stabilizes BPD individuals at high levels of negative affect and impulsivity (cf. Beckes & Coan, 2011). One possibility is that it was easier for BPD patients to "overcome" their neurotic predisposition and to inhibit the tendency to act impulsively outside of CSC, where patients need not devote regulatory resources to maintaining relationships.

Lastly, in line with our hypothesis, Extraversion had a positive effect on impulsivity at the momentary level (though not at the person level), which adds to previous evidence on the role of Extraversion in trait impulsivity (Aslan & Cheung-Blunden, 2012; Seibert et al., 2010). In addition to highly extraverted individuals being more likely to show momentary impulsivity, Extraversion also interacted with CSC in predicting impulsivity. That is, while highly extraverted participants were generally more likely to show impulsivity, this was especially the case in the presence of others.

Interpersonal problems

We hypothesized that interpersonal problems in BPD would be associated with high Neuroticism and low Agreeableness (Costa & McCrae, 1992; Côté & Moskowitz, 1998), and the CSC-interpersonal problems relationship would interact with these domains. In line with our hypothesis, Agreeableness correlated with interpersonal problems in the BPD group at the between-person level and predicted them at the momentary level. Specifically, Agreeableness interacted with CSC, such that individuals low in Agreeableness were particularly likely to experience problems when endorsing CSC. This is not surprising given that interpersonal problems with romantic partners or friends (i.e., close others) are a core symptom of BPD (APA, 2013). Unexpectedly, Extraversion showed very similar effects at the momentary level, also showing a significant main effect and interacting with CSC in predicting momentary interpersonal problems. We did not predict the positive effect at the momentary level, but reasoned post hoc that it could have been driven by the Extraversion facet *assertiveness*, which includes tendencies to be dominant and forceful that could cause conflict with others. We tested this by replacing the Extraversion domain by its facets in the MLM, and found that only the assertiveness facet had a significant positive effect on momentary disagreements, whereas none of the other facets did.

Limitations

The present study had a number of strengths, including being the first to relate BPD symptoms that were measured in the moment to the FFM and being the first to look at CSC and its interaction with personality. An additional strength was the comparison of the BPD sample to a clinical control group of DD patients. However, there are also a number of limitations. First, the given sample size of 74 BPD outpatients, while not small, restricts making strong generalizations about the BPD population as a whole, especially regarding the person level associations. Further, the unequal group sizes (specifically the lower N for the DD group) make it difficult to directly compare the magnitude of effects between the groups due to a difference in statistical power.

Another potential limitation is the focus on CSC. Because we only asked about social contact with a romantic partner, family, and friends, we excluded interactions with non-friend acquaintances, coworkers, and strangers. It is possible that results would be different if these were included, and that the patterns found for close others do not extend to other social contact. Additionally, the current study conflated non-CSC interaction with being alone and important differences may exist between these two states. Future studies are needed to address the differential effects that contact with close and distant interaction partners have on the occurrence of BPD symptoms (and their interaction with personality).

A further methodological limitation is that we asked participants to indicate whether they had interacted with someone and to rate BPD symptoms “since the last prompt.” Thus, while reported CSC and BPD symptoms occurred in the same time window, we cannot know whether they actually occurred at the exact same moment. Event-based sampling, prompting participants to answer the emotion and behavior items right after a social interaction, may be best suited to answer this question. Finally, additional information about the nature of the

CSC (including length, activity, and overall evaluation of quality) would be helpful in interpreting some of the effects that were found.

Implications

The present study demonstrates the utility of the FFM in predicting core symptoms of BPD that were measured in the moment using EMA at an aggregated person level (28 days), as well as at a momentary level. The findings imply that basic personality domains are not only useful in characterizing the BPD population as a whole, as demonstrated repeatedly in previous studies (see Samuel & Widiger, 2008; Saulsman & Page, 2004), but that they can also serve to predict specific symptoms of BPD as they occur in patients' everyday lives. This is critical because between-person comparisons are often (incorrectly) used to infer parallel within-person processes, but corresponding between- and within-person processes can be notably different (Curran & Bauer, 2011). In the context of BPD and personality we show that a number of between-person findings extend to the within-person level, including the positive association of Neuroticism with negative affect and affective instability and the negative association of Agreeableness with impulsivity and with interpersonal problems. However, we also identified a number of other findings not previously identified by the literature.

Specifically, Conscientiousness, Neuroticism, and Extraversion each had significant effects on momentary impulsivity (some in conjunction with CSC) but were not correlated with between-person impulsivity. Additionally, Extraversion had a positive effect on momentary interpersonal problems when CSC was endorsed. Thus, while these domains were not significant predictors at an aggregate level, they had meaningful effects at the momentary level.

Additionally, our study revealed a number of interactions between the FFM and CSC, which would be overlooked when only using between-person aggregates. In the BPD group, CSC amplified the associations of Neuroticism, Extraversion, and Agreeableness with momentary impulsivity and the associations of Extraversion and Agreeableness with momentary disagreements. In contrast, the presence of CSC weakened the association between Neuroticism and momentary affective instability, and the negative association between Conscientiousness and momentary impulsivity. We proposed that these contrary effects could be explained by a stabilizing function of CSC (see Beckes & Coan, 2011). The stabilizing effects of CSC were twofold: they were negative in the sense of stabilizing BPD patients at high levels of negative affect and impulsivity, thus promoting these symptoms, while they were positive in the sense of reducing affective instability, thus making patients less emotionally labile. The momentary perspective adopted in the present study thus underlined the importance of a number of previously observed between-person level results and additionally uncovered several associations not previously observed at the between-person level.

The present results further provide a number of clinical implications. First, dispositional traits are associated with how BPD patients experience symptoms in everyday life. A patients' FFM profile, thus, might not only have important implications for the syndromes they are suffering from (see Samuel & Widiger, 2008; Saulsman & Page, 2004) but also for

the specific symptoms they are experiencing at that particular moment (though one must still take into account the situation). If, for instance, a BPD patient has only slightly elevated levels of Neuroticism but very low levels of Agreeableness, then, in light of the present findings, this patient might be more likely to be affected by impulsivity and interpersonal problems than by negative affect experience. Clearly, further studies are needed to test this relationship more extensively, but this may hold possibilities for learning more about the relationship of patients' everyday symptom experience with trait profiles. A second takeaway from the current study is that BPD patients' experience of symptoms in everyday life seems to be strongly influenced by CSC. In this study, momentary negative affect, impulsivity and disagreements were all significantly greater when BPD patients reported CSC. The fact that CSC promotes symptom experience highlights the importance of interventions such as social competence training or the interpersonal module that is embedded in DBT (Linehan, 2014).

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Table 1

Demographics and Comorbid Conditions by Group (N = 114).

	<i>BPD (n = 74)</i>		<i>DD (n = 40)</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
<i>Ethnicity</i>				
African-American	3	4.1	2	5.0
Hispanic	2	2.7	2	5.0
Caucasian	64	86.5	36	90.0
Native American	1	1.4	0	0
Asian-American	2	2.7	0	0
Other	2	2.7	0	0
<i>Marital Status</i>				
Single, Never Married	36	48.6	17	42.5
Married	13	17.6	11	27.5
Cohabiting	9	12.1	4	10.0
Divorced or Separated	16	21.7	8	20.0
<i>Annual Income</i>				
\$0 to \$25,000	52	70.3	27	67.5
\$25,001 to \$50,000	11	14.9	10	25.0
\$50,001 to \$75,000	5	6.8	1	2.5
\$75,001 to \$100,000	4	5.4	1	2.5
Above \$100,000	2	2.7	1	2.5
Currently Employed ^a	38	51.4	21	55.3
<i>Current Axis I Diagnoses^b</i>				
Any anxiety disorder	58	80.6	25	62.5
Any mood disorder	45	63.9	40	100.0
Any eating disorder	18	25.0	2	5.0
Any substance use disorder	11	15.3	1	2.5
<i>Current Axis II Diagnoses^b</i>				
Narcissistic PD	6	8.3	0	0.0
Histrionic PD	7	9.7	0	0.0
Antisocial PD ^c	14	19.4	0	0.0
Schizotypal PD	1	1.4	0	0.0
Schizoid PD	0	0.0	0	0.0
Paranoid PD	9	12.5	0	0.0
Avoidant PD	27	37.5	14	35.0
Dependent PD	8	11.1	2	5.0
Obsessive Compulsive PD	19	26.4	5	12.5

Note. PD = Personality Disorder.

^aEmployment information was unavailable for 2 individuals in the DD group and 1 individual in the BPD group.

^bThere were 3 BPD individuals with una-vailable Axis I and II diagnostic data, with the exception, for 2 of these individuals, of the mood disorder category.

^cFor Antisocial PD, only Criterion A was assessed.

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Table 2

Means and standard deviations for all independent and dependent variables presented separately by group and t-values from two sample t-tests for group differences with respective p-values.

	<i>BPD</i>		<i>DD</i>		<i>t</i> (112) ^{<i>a</i>}	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
<i>EMA Aggregates</i>						
Negative Affect	1.58	0.59	1.58	0.44	0.03	.975
Negative Affect Instability	0.23	0.25	0.19	0.19	1.06	.292
Impulsivity ^{<i>b</i>}	6.21	1.62	5.62	1.32	1.32 ^{<i>c</i>}	.081
Disagreements	0.16	0.17	0.11	0.10	1.10	.154
<i>FFM Domain Scores</i>						
Neuroticism	135.35	21.13	124.52	18.72	2.72	.008
Extraversion	94.92	25.00	89.20	26.73	1.12	.257
Openness	118.32	19.82	114.86	24.24	0.82	.416
Agreeableness	108.53	18.75	127.20	18.60	−5.08	<.001
Conscientiousness	91.27	22.29	94.68	20.62	−0.80	.425

Note. BPD = Borderline Personality Disorder, DD = Major depressive disorder/dysthymia.

^aLevene's test for homogeneity of variance was not significant for all comparisons.

^bAnalyses based on subsample of 62 BPD and 32 MDD participants respectively, for whom impulsivity scores were collected.

^cDenominator degrees of freedom = 92 due to reduced sample size.

Table 3

Pearson correlations between the Borderline symptom aggregates across 28 days and the FFM domain scores, presented separately for the BPD and DD group.

	N	E	O	A	C
<i>BPD group</i>					
Negative Affect	.42***	-.19	-.14	-.11	-.31**
Negative Affect Instability	.29*	.00	.02	-.20 [†]	-.02
Impulsivity ^a	.17	.16	.06	-.39**	-.17
Disagreements	.13	.15	-.04	-.27*	-.09
<i>DD group</i>					
Negative Affect	.41**	-.29 [†]	-.25	.14	.14
Negative Affect Instability	.49**	-.04	.03	.04	.06
Impulsivity ^a	.29	-.16	-.26	-.21	-.45**
Disagreements	.03	-.23	-.35*	-.17	.05

Note. BPD = Borderline Personality Disorder, DD = Major depressive disorder/dysthymia, N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness.

^aAnalyses based on subsample of 67 BPD and 32 DD participants for which impulsivity scores were collected.

[†] $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Multi-level models predicting momentary BPD symptoms with group (dummy coded), CSC (dummy coded) and FFM domain scores. Main effects are displayed separately for models using the BPD vs. DD group and CSC vs. no CSC as the reference group.

	BPD				DD			
	CSC		no CSC		CSC		no CSC	
	Est.	SE	β^z	β^z	Est.	SE	Est.	β^z
<i>Negative affect</i>								
N	0.012	0.004	0.475	0.011	0.436	0.012	0.005	0.450
E	0.002	0.003	0.098	0.002	0.084	0.001	0.004	0.062
O	-0.005	0.004	-0.174	-0.003	-0.118	-0.007	0.005	-0.267
A	-0.002	0.003	-0.087	-0.003	-0.098	0.008	0.007	0.320
C	-0.004	0.003	-0.156	-0.004	-0.158	0.002	0.005	0.076
<i>Affective instability</i>								
N	0.005	0.002	0.483	0.007	0.652	0.005	0.002	0.486
E	0.002	0.001	0.198	0.003	0.331	0.002	0.002	0.168
O	-0.001	0.002	-0.010	-0.001	-0.109	-0.001	0.002	-0.048
A	-0.002	0.001	-0.160	-0.002	-0.184	0.002	0.003	0.141
C	0.002	0.001	0.200	0.001	0.124	0.001	0.002	0.065
<i>Impulsivity</i>								
N	0.032	0.012	0.434	0.019	0.262	0.015	0.016	0.206
E	0.032	0.009	0.527	0.023	0.385	0.001	0.013	0.021
O	-0.013	0.010	-0.186	-0.013	-0.181	-0.020	0.015	-0.279
A	-0.039	0.010	-0.527	-0.027	-0.368	0.001	0.023	0.009
C	-0.016	0.010	-0.223	-0.020	-0.280	-0.034	0.015	-0.482
<i>Disagreements</i>								
N	0.002	0.001	0.237	0.001	0.130	0.001	0.002	0.151
E	0.003	0.001	0.427	0.001	0.240	0.001	0.001	0.138
O	-0.002	0.001	-0.225	-0.001	-0.070	-0.001	0.001	-0.203
A	-0.002	0.001	-0.308	-0.000	-0.125	-0.002	0.002	-0.260
C	-0.001	0.001	-0.110	-0.000	-0.029	0.001	0.001	0.076

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Note. Significant main effects ($p < .05$) are shown in boldface. Main effects with $p < .10$ are shown in italics. Standard errors within each group are equal for situations in which CSC was endorsed and those in which it was not (therefore presented only for CSC). Est. = Estimate; N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness. All models controlled for influences of weekday, weekend, study day, time elapsed since the participant awoke, and the mean level of social contact experienced throughout the study period. ^aEffect sizes are estimated using the corresponding person-level standard deviations for personality and occasion-level standard deviations for CSC and the dependent measures to standardize variables in the models.