**Uncovering the Social-Cognitive Contributors to Social Dysfunction in Borderline Personality Disorder Through Language Analysis**

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**Abstract**

 Borderline personality disorder (BPD) is characterized by severe interpersonal dysfunction, yet the underlying nature of such dysfunction remains poorly understood. The present study adopted a behavioral approach to more objectively describe the social-cognitive contributors to interpersonal dysfunction in BPD. Participants (*N* = 530) completed an online survey comprising validated measures of BPD features and other problematic interpersonal traits (e.g., narcissism), as well as a writing prompt where they were asked to share their personal thoughts about relationships. Computerized language analysis methods were used to quantify various psychosocial dimensions of participants’ writing, which were incorporated into a principal component analysis. Analyses revealed four core social dimensions of thought: 1) *Connectedness/Intimacy*; 2) *Immediacy;* 3) *Social Rumination;* 4) *Negative Affect*. All four dimensions correlated with BPD features in intuitive ways, some of which were specific to BPD. This study highlights the value of natural language analysis to explore fundamental dimensions of personality disorder.

*Keywords:* borderline personality disorder, language analysis, interpersonal dysfunction, factor analysis, social-cognitive dimensions

**Introduction**

Borderline personality disorder (BPD) is a severe mental health condition marked by long-term patterns of emotion dysregulation and distorted self-perceptions, affecting an estimated 1.6% of the general population and around 20% of the psychiatric inpatient population (Ellison et al., 2018). BPD is especially characterized by interpersonal dysfunction (e.g., Hill et al., 2008; Miano et al., 2020), which typically manifests as problematic dependent and/or avoidant attachment patterns (Levy, 2005) and patterns of intense and stormy relationships (APA, 2013). The severity of such social dysfunction is underscored by its association with extremely negative outcomes among people with BPD, with BPD-driven social problems often triggering psychological distress and engagement in maladaptive behaviour, such as self-harm and suicide attempts (e.g., Berenson et al., 2016). Despite widespread awareness of the severity of consequences associated with interpersonal dysfunction in BPD, little is known about the root psychological features that characterize these problematic interpersonal patterns.

A large body of evidence suggests that impairments in social cognition play a major role in the social dysfunction characteristic of BPD (see Lazarus et al., 2014, for a review). For instance, a general disorganisation of social processes within and across social domains (e.g., friendships, colleagues) has been proposed as underpinning interpersonal dysfunction in BPD (Hill et al., 2008). Under this theory, individuals with BPD are believed to have diminished awareness of social boundaries and have difficulty their adapting their behavior according to the social context (e.g., one may frequently discuss unwarranted personal and intimate topics among work colleagues), causing interpersonal problems. Additionally, social dysfunction in BPD may be driven, in part, by deficits in one’s ability to recognise others’ emotions and understand the perspectives of others (e.g., Domes et al., 2009). However, findings on the specific nature of social-cognitive impairments in BPD are inconsistent; for example, some evidence suggests relatively greater empathetic accuracy among individuals with BPD, particularly when faced with relationship threat (Miano et al., 2017).

In addition to social-cognitive impairments, affective dysregulation has been strongly argued to be a fundamental component underpinning interpersonal dysfunction, and potentially all impairments, in BPD (e.g., Euler et al., 2019; Lazarus et al., 2014). In essence, affective dysregulation can result in rapid mood swings and intense emotional outbursts, leading to interpersonal conflict and social rejection. In particular, lower thresholds for feelings of anger as well as greater alexithymia (i.e., the inability to identify and describe one’s emotions) have been found to be associated with greater interpersonal difficulties in BPD (Berenson et al., 2018). As well as instigating social problems in BPD, emotion dysregulation has been found to mediate the relationship between BPD status and social dysfunction, specifically in relation to social rejection sensitivity (Dixon-Gordon et al., 2013) and mentalization ability (Sharp et al., 2011), among others. Emotion dysregulation therefore also plays a major role in propagating social impairments in BPD. Further, disturbances in intimacy are particularly prevalent in individuals with BPD and have also been identified as a characterizing feature of their interpersonal dysfunction (Jeung & Herpertz, 2014).

Despite several propositions, clear consensus on the specific, core dimensions characterizing interpersonal dysfunction in BPD, and how they inform our understanding of the disorder, is yet to be established. Recent methodological advances may provide an avenue to improve understanding of social dysfunction in BPD; in particular, by looking at the ways in which people conceptualize and talk about their social connections. A substantial body of research has shown that it is possible to analyze language patterns to unobtrusively reveal the substance and style of thought (see Pennebaker, 2011), which can overcome limitations inherent to traditional assessment methods in personality disorder, such as self-report questionnaires (Entwistle et al., 2022). It could be expected, then, that directly quantifying *how* people think about relationships should be revealing of key social-cognitive dimensions, which may help to characterize interpersonal dysfunction in BPD. Indeed, scholars have emphasized the notion that one’s language use acts as a behavioral indicator of their mental representations of interpersonal relationships (Horn & Meier, 2022), suggesting that the analysis of natural language can allow insight into social-cognitive processes.

In the broader personality literature, numerous studies have highlighted how specific dimensions of personality can be traced in language (e.g., Kulkarni et al., 2018; Pennebaker & King, 1999; Yarkoni et al., 2010). More relevantly, research has also revealed how relationships can be reliably characterized by fundamental social(-cognitive) dimensions (e.g., *power; trust*) at large scale through analyzing language from conversations (Choi et al., 2020). Such research highlights the potential of using computational language analysis methods to gain novel insights into core psychosocial dimensions in a way that goes beyond traditional psychometric approaches. Despite the promising potential of language analytic methods to provide insight into the social-cognitive impairments of individuals with BPD, to date, no such studies have been conducted to our knowledge.

Accordingly, in the present study, we aim to address the following central research question: *What are the core social-cognitive dimensions that characterize interpersonal dysfunction in BPD?* To address this, we analyze the language that people use when describing their relationships to infer core social-cognitive dimensions, then use these dimensions to inform our understanding of the nature of interpersonal dysfunction in BPD. We also measure how such social-cognitive dimensions relate to other constructs associated with problematic social functioning and behavior, to explore the extent to which they are specific to BPD or are reflective of interpersonal dysfunction more generally. Specifically, we assess the “Dark Triad” of personality traits (i.e., psychopathy, narcissism, and Machiavellianism; Jonason & Webster, 2010) in order to capture, in a generalized way, a sphere of interpersonal dysfunction that can be differentiated from BPD.

**Methods**

Data were collected as part of a larger investigation on the associations between natural language and various sociopsychological processes, including BPD features.

**Participants and Procedure**

Participants were recruited via targeted sampling from online forums. The study was advertised by distributing an anonymous link to a Qualtrics questionnaire across various forums. Alongside targeting some general discussion forums, recruitment was particularly targeted toward mental health forums, including a large forum dedicated towards BPD, with the aim of enhancing sample diversity in mental health status. Participants were excluded if they reported that they could not speak or write in fluent English or if they were under the age of 18. Participants were not offered any incentives for participating in the study.

After providing informed consent and demographic information, participants responded to a series of psychological questionnaires and prompts that were presented in a randomized fashion. Participants who did not provide sufficient data – i.e., those who did not provide any responses to the problematic personality measures (*N* = 70) or did not write a minimum of 50 words in the relationship writing task (*N* = 67) – were omitted (total *N* excluded = 137); refer to Supplemental Materials A for an analysis of missing/excluded data (i.e., comparing those included in subsequent analyses with those excluded due to minimum word count criteria on key outcome variables). This process resulted in a final sample of 530 participants (*M* age = 26.22, *SD* = 8.41; 72.88% female; 75.62% White; see Table S1 in Supplemental Materials B for full sociodemographic characteristics of the sample).

**Materials**

***Measures***

**Personality Assessment Inventory-Borderline Scale (PAI-BOR).** The PAI-BOR (Morey, 1991) was used to assess BPD features, specifically assessing four core features: affective instability, identity problems, interpersonal dysfunction, and self-harm. Each of these features are assessed through 6 items (24 items in total) on a 4-point response scale ranging from 0 (false) to 3 (very true). The mean total PAI-BOR score in the present study was 37.24 (*SD* = 13.03; range = 4 – 72; skewness = .01), which falls just below the established cut-off score of 38, whereby BPD features are considered to be significantly present and therefore worthy of further diagnostic investigation (Morey, 1991; see Table S1 for descriptive statistics for BPD features).

**Dirty Dozen.** In order to disambiguate dimensions characterizing interpersonal dysfunction in BPD from other constructs associated with problematic social functioning, participants were asked to complete the Dirty Dozen questionnaire – a well-validated tool for assessing the “Dark Triad” of personality traits: psychopathy, narcissism, and Machiavellianism (Jonason & Webster, 2010). The Dirty Dozen is a 12-item measure, with four items assessing each of the three Dark Triad traits on a 5-point response scale, ranging from 1 (strongly disagree) to 5 (strongly agree), including items such as “I tend to manipulate others to get my way” (Machiavellianism), “I tend to be callous or insensitive” (psychopathy), and “I tend to want others to admire me” (narcissism). The mean total score from the Dirty Dozen measure in the current sample was 31.80 (*SD* = 10.15; range = 12 – 60; skewness = .61; see Table S1 for descriptive statistics for specific Dark Triad traits).

***Writing Task***

To collect natural language data reflecting participants’ social cognitions, a prompt was included which asked participants to write about their relationships, broadly defined:

*When you think about your relationships with other people, what comes to mind? For the next 7 minutes (or more), we would like for you to write about how you get along with people. This can include your relationships with coworkers, family, friends, and romantic partners. Try to say as much as you can about both the good and the bad. Do not worry about spelling or grammar. Simply write everything that comes to mind, giving as much detail as possible. Once you begin writing, try to write continuously until you have finished. If you run out of things to say, re-tell what you have previously said in other words.*

Participants’ essays were corrected for common misspellings (e.g., “boyfreind” instead of “boyfriend”) and elongations (e.g., “sooo unhappy”). All written responses containing fewer than 50 words were removed from the dataset, to ensure validity of measurement and reliable scores (see, e.g., Boyd, 2017; Cutler et al., 2021; Pennebaker & Ireland, 2011). On average (after removing texts with < 50 words), participants wrote 211.60 words (*SD* = 186.22).

**Language Analysis**

Language data were analyzed using the automated word-counting, text analysis program Linguistic Inquiry and Word Count (LIWC2015; Pennebaker et al., 2015). Briefly described, the LIWC software calculates the percentage of words belonging to psychologically meaningful dimensions in each text using an internal dictionary that maps words onto meaningful categories. Categories measured by LIWC include the extent to which people are thinking about themselves, other people, emotions, leisure activities, work, and so on. The use of LIWC has been extensively validated across diverse disciplines, spanning fields such as psychology, health and medicine, and computer science, and has been particularly prominent in mental health research (Tausczik & Pennebaker, 2010).

**Results**

Following the approach of Pennebaker and King (1999), LIWC scores were incorporated into a principal component analysis (PCA) to reduce the linguistic features into core, language-based, social-cognitive dimensions. Specifically, the PCA was conducted using LIWC scores (derived from the relationships essays) as factors, using the Maximum Likelihood method of extraction with a varimax rotation applied. All LIWC variables from the 2015 built-in dictionary were included in the PCA, with the exception of summary categories (e.g., “analytic”, “clout”), filler words, non-fluencies, and punctuation, in order to minimize redundancies and the inclusion of measures comprised entirely of other LIWC measures. In total, 70 LIWC variables were included in the PCA (see Table S2 in Supplemental Materials C for a full list of included LIWC variables and their descriptive statistics). Although the Kaiser-Meyer-Olkin (KMO) statistic was on the lower side (KMO = 0.41), Bartlett’s test of sphericity was significant (χ2(2415) = 28371.11, *p* < .001), indicating the appropriateness of the factor analytic model for this dataset.

The PCA resulted in the extraction of four social-cognitive components, comprising 18 LIWC variables (see Table 1 for factor loadings for each component). The 4-component solution was generated on the basis of eigenvalues (all components >= 3), inspection of the scree plot, and interpretability of components in the context of social-cognitive functioning. Only LIWC variables with an absolute factor loading greater than 0.5 were retained.

[Table 1]

The four components extracted are described (including snippets of quotes from participants’ relationship essays as examples) as follows:

1. *Connectedness/Intimacy* – high socially connected and affiliated language (i.e., social, family, and affiliation words), and low cognitive processing language and impersonal pronouns (e.g., “My best friend and I are very alike, and we get along quite well. She’s like my sister”; “I get on very well with my partner. We are best friends and lovers. He is my soul mate.”).
2. *Immediacy* – high self-focused, present-tense (in the “here-and-now”), action-oriented (i.e., verbs) language, and personal pronouns (e.g., “I’m probably too attached to her if I'm being honest. I need to move out”; “I've got it so they [family members] won't call me unless it is something important for me, otherwise I will only call them when I need something or in the mood to talk”).
3. *Social Rumination* – high relativity and time-oriented language, past-tense reflective language, and low positive emotion (e.g., “I used to try to make everyone laugh when I was little, which eventually put me in a position where I was treated as a joke by all my friends”; “My mother and father divorced when I was 7. My mom held me personally responsible for it and hated me for it.”).
4. *Negative Affect* – high affective language, general negative emotion, and anger (e.g., “I do not love any other family members. I rather hate them”; “I constantly lose people in my life, they realise how awful I am as a person and leave. I've come to hate people.”).

The model accounted for 25.60% of the total variance. Although this percentage may seem somewhat small with respect to traditional factor analyses, it is in alignment with typical factor analyses conducted using natural language data (see, e.g., Chung & Pennebaker, 2008).

Scores for the four social-cognitive components were generated for each participant and correlated with BPD features and Dark Triad scores using partial Pearson’s correlations (two-tailed). Age and gender were controlled for in all correlation analyses due to their differential associations with language use and BPD features, as well as due to significant associations with the social-cognitive components (note that the overall findings remained the same when not controlling for age or gender – see Supplemental Materials D). Although another potential confound, education level was not included as a control variable as it was not significantly associated with any of the four social-cognitive components. Analyses revealed that BPD features significantly correlated with all four social-cognitive components. Specifically, BPD features correlated negatively with *Connectedness/Intimacy* and positively with *Immediacy*, *Social Rumination*, and *Negative Affect* (see Table 2 for statistics).

Further, several social-cognitive components and Dark Triad traits were correlated at statistically significant levels. *Connectedness/Intimacy* correlated negatively with overall Dark Triad traits, Machiavellianism, and psychopathy, but not with narcissism. *Immediacy* correlated positively with psychopathy only. *Social Rumination* did not correlate with any of the Dark Triad traits. *Negative Affect* correlated positively with overall Dark Triad traits, Machiavellianism, and narcissism, but did not correlate with psychopathy. All correlation analysis results can be seen in Table 2.

[Table 2]

**Discussion**

The goal of the present study was to generate new insights into social-cognitive dimensions that characterize and contribute to interpersonal dysfunction in BPD, through analyzing natural language. The analysis of a large sample writing about their relationships with others revealed four core social-cognitive components that were related to BPD in intuitive ways: 1) *Connectedness/Intimacy*; 2) *Immediacy*; 3) *Social Rumination*; 4) *Negative Affect*. Several components were associated with both BPD and Dark Triad traits, while others appeared specific to BPD.

Of methodological interest, several dimensions found in the present study strongly overlap with those found in the classic Pennebaker and King (1999) study. Specifically, the *Immediacy* and *Social Rumination* dimensions show distinctive similarities to the “Immediacy” and “The Social Past” dimensions found by Pennebaker and King, including the language variables that comprise them. Such similarities highlight how language-based dimensions of thought can be somewhat reliably replicated across samples. Moreover, similarities between our findings and findings from general personality research suggest that such social-cognitive dimensions may characterize social (dys)function in personality disorder and in normative personality more broadly, thereby supporting the current consensus that personality disorders are dimensional in nature (e.g., Wilmot et al., 2019).

Findings that BPD features were associated with lower levels of intimacy (*Connectedness/Intimacy* component) and more negative affect, and anger in particular (*Negative Affect* component), in the discussion of social connections highlight how individuals manifesting BPD conceptualize relationships in a highly negative and disconnected way; in turn, such maladaptive mental representations of relationships likely contribute to their social dysfunction. These findings support the notion that affective dysregulation is a fundamental feature characterizing, and likely contributing to, interpersonal dysfunction in BPD (e.g., Lazarus et al., 2014). Yet, the same associations were also found with Dark Triad traits, implying that problems with intimacy and affect are important components characterizing social dysfunction in general, and not necessarily specific to BPD.

Interestingly, *Immediacy* (present-tense, action-orientated language) was solely associated with BPD and psychopathy, in that those with higher levels of BPD features and psychopathy scored higher on this dimension. Notably, the positive association with *Immediacy* appears to reflect the notion that relationships and social processes may be characterized by immediacy/urgency in individuals manifesting BPD (and psychopathy), such as seeking instantaneous gratification from one’s social connections. The notion that social(-cognitive) processes in BPD are shaped by immediacy may help to explain the problems with intimacy associated with BPD, as the highly instantaneous social-interactive nature of individuals with BPD would likely make it difficult for them to form longstanding relationships characterized by intimacy and connection. Such immediacy is also intuitively linked to the high impulsivity associated with BPD (and psychopathy), thereby providing further indication that impulsivity may be a characterizing dimension of interpersonal dysfunction in BPD (Euler et al., 2019), as well as other severe problematic interpersonal constructs. From a clinical perspective, severe interpersonal dysfunction could, then, be potentially addressed by targeting the immediacy/impulsivity that characterizes maladaptive social-cognitive processes through therapeutic intervention.

Importantly, the *Social Rumination* dimension (time-orientated, past-tense, non-positive language) was found to be associated with BPD exclusively, with people with higher levels of BPD features scoring higher on this dimension; a novel finding regarding the central themes characterizing interpersonal dysfunction in BPD. It is likely that this dimension reflects the (negative) past-orientated nature of individuals with BPD (Miano et al., 2020), as well as how such individuals may have difficulty developing and maintaining healthy new relationships due to being stuck processing past relationships, events, and trauma. Vitally, as *Social Rumination* was revealed to be exclusively related to BPD (when compared to Dark Triad traits), it may be that this component distinguishes interpersonal dysfunction in BPD from other problematic interpersonal traits. Yet, it is highly likely that this notion of being ‘stuck’ processing past (negative) events/relationships (i.e., social rumination) may also be characteristic of other personality disorder types characterized by rumination, that were not assessed in the present study, such as obsessive-compulsive PD and avoidant PD; further research is needed to clarify distinctions across types of personality pathology.

Nevertheless, in individuals who experience longstanding, persistent patterns of severe interpersonal dysfunction, this notion of being ‘stuck in the past’ could potentially be the predominant mechanism *prolonging* such interpersonal dysfunction across time and contexts. Thus, the treatment of longstanding patterns of social dysfunction may benefit from focusing on individuals’ past relationships and experiences, with the eventual aim of shifting their focus from past traumatic relationships to developing new healthy relationships. Indeed, Schema Therapy (ST) – an effective therapeutic treatment for BPD (Sempértegui et al., 2013) – somewhat incorporates this notion of identifying and shifting the focus from past traumatic experiences to improve functioning. However, ST primarily focuses on improving general cognitive functioning, with less emphasis placed on past relationships and interpersonal functioning specifically. Adapting the focus of ST to place more emphasis on improving social functioning may prove effective in treating longstanding patterns of social dysfunction.

Altogether, the present study has allowed for the discovery of social-cognitive dimensions that help to better understand social dysfunction in BPD through the analysis of natural language. Nonetheless, the study is not without limitations. One potential limitation of the present research surrounds the fact that the study did not comprise a clinical sample, and so we cannot be certain as to whether our findings would replicate in those with clinical BPD diagnoses. A further limitation surrounds the use of self-report measures of problematic personality constructs, which are subject to various biases. In particular, there are established shortcomings surrounding assessment methods of the Dark Triad, as well as the entire construct itself (see Miller et al., 2019). Although the purpose of the Dark Triad measure used in the present study was solely to capture social dysfunction that can be differentiated from BPD, we acknowledge that other constructs could have been assessed that are more closely related to BPD (e.g., other personality disorder traits). Finally, the correlational nature of the data means that causality cannot be inferred from the present findings.

It would be valuable for future research to attempt to replicate our findings in a clinical sample to see whether the social-cognitive components extend to describing interpersonal dysfunction in individuals with a BPD diagnosis, and those with other mental health conditions. Moreover, the linguistic factor analytic approach adopted in the present study is just one of many possible approaches for better understanding social dysfunction in BPD; there are numerous techniques for analyzing qualitative data that have the potential to shed further light into the nature of BPD, attenuating the need for self-report methods (e.g., methods that assess the conceptual level of individuals’ verbal behavior).

To conclude, through the analysis of natural language, the present study uncovered four social-cognitive components all related to BPD: *Connectedness/Intimacy*; *Immediacy; Social Rumination;* and *Negative Affect*. Problems with intimacy and affect appear to characterize interpersonal dysfunction across a range of constructs, whereas immediacy and social rumination are more specific to BPD. Notably, our findings suggest that social rumination may distinguish interpersonal dysfunction in BPD from other problematic interpersonal constructs. Computational analysis of natural language has therefore allowed for the identification of fundamental social-cognitive components that provide novel insights into the nature of interpersonal dysfunction in BPD. Our findings provide paths to new research questions surrounding the origins, trajectory, and treatment options for BPD.

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**Table 1**

*Principal Component Analysis, Rotated Matrix and Factor Loadings for LIWC Variables*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| LIWC Variable | Mean (*SD*) | Component 1 *(Connectedness/**Intimacy)* | Component 2 *(Immediacy)* | Component 3 *(Social Rumination)* | Component 4 *(Negative Affect)* |
| Affiliation | 5.31 (2.60) | 0.75 |  |  |  |
| Family | 1.30 (1.34) | 0.68 |  |  |  |
| Social | 12.61 (3.31) | 0.66 |  |  |  |
| Drives | 10.50 (3.31) | 0.66 |  |  |  |
| Cognitive processes | 15.67 (3.84) | -0.50 |  |  |  |
| Impersonal pronouns | 5.00 (2.21) | -0.52 |  |  |  |
| Personal pronouns | 15.39 (3.49) |  | 0.62 |  |  |
| Verb | 18.23 (3.06) |  | 0.60 |  |  |
| Auxiliary verb  | 10.29 (2.43) |  | 0.57 |  |  |
| 1st person singular pronouns  | 12.58 (3.10) |  | 0.56 |  |  |
| Focus present | 14.96 (3.43) |  | 0.54 |  |  |
| Relativity | 11.29 (3.29) |  |  | 0.60 |  |
| Focus past | 2.33 (2.02) |  |  | 0.56 |  |
| Time | 4.69 (2.18) |  |  | 0.54 |  |
| Positive emotion | 4.55 (2.30) |  |  | -0.53 |  |
| Negative emotion | 3.11 (1.90) |  |  |  | 0.65 |
| Affect | 7.84 (2.84) |  |  | -0.56 | 0.62 |
| Anger | 0.77 (0.89) |  |  |  | 0.54 |

*Note.* Mean values represent the mean percentage of total words used. Only LIWC measures with an absolute factor loading > 0.5 are presented.

**Table 2**

*Correlations between Social-Cognitive Components and BPD Features and Dark Triad Traits*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Connectedness/Intimacy | Immediacy | Social Rumination | Negative Affect |
| BPD Features (n = 483) | -.12\*\* | .10\* | .15\*\* | .20\*\*\* |
| Overall Dark Triad (n = 497) | -.10\* | .08 | .00 | .11\* |
| Machiavellianism (n = 497) | -.11\* | .08 | -.02 | .13\*\* |
| Narcissism (n = 497) | -.02 | .00 | -.03 | .11\* |
| Psychopathy (n = 497) | -.10\* | .10\* | .04 | .03 |

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

*Note.* All tests are two-tailed and include age and gender as control variables.