



Individuals with Borderline Personality Disorder show larger preferred social distance in live dyadic interactions

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A B S T R A C T

Personal space regulation is a key component of effective social engagement. Personal space varies among individuals and with some mental health conditions. Simulated personal space intrusions in Borderline Personality Disorder (BPD) reveal larger preferred interpersonal distance in that setting. These findings led us to conduct the first test of live interpersonal distance preferences in symptoms in BPD. With direct observation of subjects' personal space behavior in the stop-distance paradigm, we found a 2-fold larger preferred interpersonal distance in BPD than control ($n = 30$, $n = 23$). We discuss this result in context of known biology and etiology of BPD. Future work is needed to identify neural circuits underlying personal space regulation in BPD, individual differences in preferred interpersonal distance in relation to specific symptoms and relationship to recovery status.

1. Introduction

1.1. Personal space

Personal space refers to “the area individuals maintain around themselves into which others cannot intrude without arousing discomfort” and governs each person's preferred interpersonal distance from others (Hayduk, 1983). Personal space has been theorized to serve a protective function by regulating one's distance from potential emotional and physical threats while also allowing for an appropriate level of intimacy and trust in social contexts (Lloyd, 2009). Preferred interpersonal distance is one way to describe personal space in a measurement task (e.g. the stop-distance paradigm described in detail below). For each individual, preferred interpersonal distance varies according to psychological state and situational circumstances, for example, degree of familiarity with one's interaction partner (Hayduk, 1983), gender roles (Uzzell and Horne, 2006), and emotional valence of the interaction (Tajadura-Jiménez et al., 2011). However, there is also evidence that personal space is a stable trait (Perry et al., 2016), varying between individuals according to such factors as attachment style (Yukawa et al., 2007b) and varying levels of social anxiety in adults with Autism

Spectrum Disorder (Perry et al., 2013).

1.2. Personal space and Borderline Personality Disorder

Personal space regulation is understudied in borderline personality disorder (BPD), a severe personality disorder characterized by problems with mood, impulse control, and interpersonal functioning (Lieb et al., 2004) as well as altered amygdala function (Schulze et al., 2016), disordered attachment (Levy et al., 2015) and impairments in mentalization (see discussion of mentalization below) (Bateman and Fonagy, 2004; Fonagy, 2003).

Disturbed social relationships have been considered central to the phenotype of BPD (Gunderson, 2007) and empirical studies of interpersonal functioning in BPD have found widespread alterations in perceptual biases, social cognition, theory of mind, trust and cooperation (for review see (Lazarus et al., 2014)).

Two recent studies of imagined social experiences have suggested that personal space may be altered in BPD. In a study of implicit and explicit behavioral activation, BPD patients and controls were asked how many steps they imagined they would take toward or away from faces shown to them in photographs. BPD patients imagined more steps

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away from both the happy and fearful faces than controls (Kobeleva et al., 2014). More recently, a neuroimaging study found that simulating personal space intrusion by zooming in on pictures of emotional faces activated fronto-parietal regions and the amygdala in BPD patients and controls (Schienle et al., 2015). BPD patients endorsed a larger preferred interpersonal distance in a pen and paper task. They also had increased activation of both amygdala and fronto-parietal cortex in the fMRI task, but only towards looming disgusted faces (not faces expressing other emotions). It is important to note, however, that neither of these studies involved live interpersonal interactions – only imagined ones.

1.3. Methods for measuring personal space regulation

Personal space regulation is an essential component of social interaction. However, these dynamic aspects of social exchange have been difficult to capture in traditional experimental probes of social cognition. Typically, studies of preferred interpersonal distance have relied on derivative stimuli (e.g. disembodied faces) abstracted from social context (Adolphs, 2006; McCall, 2016). When looking at individuals with BPD, utilizing methods such as drawing circles around figures (e.g. Schienle et al., 2015) is likely less reliable than observing live interaction (Harrigan, 2008; Hayduk, 1983; McCall, 2016). Some researchers have argued that individuals with BPD may struggle to accurately describe their emotions in response to hypothetical situations, particularly when they are emotionally aroused (Bateman, 2004). If this is the case, direct observation of behavior may be essential to accurately measuring differences in preferred interpersonal distance (and other social behaviors) among people with BPD.

1.4. Current study: a live interpersonal paradigm to test personal space preferences in BPD

To overcome the limitations of previous studies in BPD, we employed a more ecologically valid method: the stop-distance paradigm. This is a highly reliable measure of preferred interpersonal distance that is performed in a live 2-person interaction in the lab (Aiello, 1987; Hayduk, 1983; Perry et al., 2016). Study participants are asked to indicate when an approaching confederate has stepped into their personal space.

The study included only female subjects. The approaching strangers (confederates) were also all young women. We selected the single-gender experimental design given expected differences in BPD presentation by gender which we predicted might markedly increase heterogeneity of preferred interpersonal distance. Men with BPD are less likely to present for clinical care, though the condition has been found in some studies to be equally prevalent in men and women in community samples, and men with BPD are more likely to have substance use disorders and to exhibit externalizing behavior (Bayes and Parker, 2017). Proxemic behavior in the stop-distance task has been shown to differ between women and men: female research subjects show a larger difference between distance preferences from men (larger) and women (shorter) than do male subjects (Miller et al., 2013; Holt et al., 2014).

To our knowledge, this is the first study of personal space regulation in BPD in a live dyadic context, involving face to face interaction with another individual. We used the stop-distance paradigm to test the hypothesis that disrupted interpersonal functioning in BPD manifests in increased preferred interpersonal distance in an encounter with a stranger.

2. Methods

2.1. Subjects

Women aged 18–60 were recruited from the community via posters and online advertisements. This study was approved by the Yale

Institutional Review Board and all subjects gave informed consent. Initial screen was done over the phone; subjects were then screened by a psychiatrist (SKF) using semi-structured interviews (Structured Interview for DSM-IV: controls had no psychiatric conditions, BPD subjects had no current substance dependence and no primary psychotic disorder; Revised Diagnostic Interview for Borderline Personality Disorder (Zanarini et al., 2002): controls scored ≤ 4 (scaled total), BPD subjects scored ≥ 8 (scaled total)). Included subjects also read English well (no history of special education, ≤ 11 errors on the Wide Range Achievement Test 4th Edition (WRAT-4) reading test (Wilkinson and Robertson, 2006)), had no history of head injury or neurologic condition, and had no gait disturbance.

We collected information on subject education level, hours of work and/or schoolwork per week, current relationship status, and reading level (to detect differences among the more literate subjects in our sample, we used the more challenging North American Adult Reading Test (NAART) instead of the WRAT-4 score here) (Uttil, 2002).

2.2. Self-report scales

Subjects also completed commonly used validated self-report scales. The Borderline Symptom List (BSL-23) is a 23 item scale with established reliability (Cronbach's alpha 0.94–0.96) and validity ($r = 0.96$ versus the longer BSL-95, $r = 0.87$ versus the Beck Depression Inventory, and $r = 0.48$ versus the general psychopathology scale SCL-90) in initial psychometric studies (Bohus et al., 2009). In our sample, Cronbach's alpha is 0.95. The Beck Anxiety Inventory (BAI) is a 21 item scale with established reliability (Cronbach's alpha 0.94) and validity ($r = 0.54$ versus diary reports of anxiety) in an initial psychometric validation study (Beck et al., 1988; Fydrich et al., 1992). In our sample, Cronbach's alpha is 0.95. The Beck Depression Inventory (BDI-II) is a 21 item scale with established reliability (Cronbach's alpha 0.9) and validity ($r = 0.71 - 0.86$ versus a range of commonly used depression scales) in a large meta-analysis (Steer et al., 1999; Wang and Gorenstein, 2013). In our sample, Cronbach's alpha is 0.97. The Barratt Impulsiveness Scale (BIS-11) is a 30 item scale with slightly lower reliability (Cronbach's alpha 0.79–0.82) and good discriminant validity (ANOVA comparing healthy to impulsive groups $F(3657) = 27.49$, $p < 0.0001$) (Patton et al., 1995). In our sample, Cronbach's alpha is 0.61 (consistent with lower value in established psychometric properties). The Peters Delusion Inventory (PDI) is a 21 item scale to measure delusions and delusion-like experiences (Peters et al., 2004), including PDI subscales for belief intensity, belief-associated distress, and conviction. It has established reliability (Cronbach's alpha is 0.82) and validity ($r = 0.61$ versus other delusion scales). In our sample, Cronbach's alpha was 0.88.

2.3. Stop distance paradigm

To determine preferred interpersonal distance, subjects began standing face-to-face and 6 feet away from a female confederate. On each of 3 trials, the confederate slowly approached the subject. The confederate was always a young woman, and always stood up straight, made consistent eye contact, and maintained a neutral facial expression. Several different graduate students served as confederate over the course of the study. The subjects were instructed that the confederate would walk towards them until they said stop. They were instructed, "Say stop when you feel uncomfortable." Final toe to toe distance was measured using a tape measure, and mean preferred interpersonal distance for the three trials was computed.

3. Results

We enrolled 30 women in the control group and 23 women in the BPD group. The two groups were matched on age, years of education, current work status, current relationship status, and reading ability

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