
Mental Representation, Social Cognition, and the Neural Underpinnings of Borderline Personality Disorder: A Multilevel Approach

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The history between psychoanalysis and the neurosciences has recently been fraught with tension between a complex model of the mind and a biologically reductionistic model of the mind. In the present article, we outline a research model that offers a bridge between the two models by fusing a psychoanalytic approach to mental phenomena with neuroscientific assessment of social cognitive functioning in a sample of patients diagnosed with borderline personality disorder. Specifically, neural activity corresponding to trust appraisal, and rejection sensitivity will be compared with clinically rich ratings of narratives derived from the Object Relations Inventory and Adult Attachment Interview. Our strategy permits an analysis across psychological, behavioral, and neurobiological levels of data in order to better understand the multiple levels of analysis at play that lead to borderline personality disorder. Furthermore, we believe this model could provide a template for neuropsychanalytic research that preserves psychoanalytic models without reducing them to solely biological processes.

Keywords: borderline personality disorder; attachment; social neuroscience; object relations; neuroimaging; psychoanalysis

Proponents of neuropsychanalysis argue that neuroscience stands to benefit from the richness of psychoanalytic knowledge, which uniquely contributes to understanding aspects of human subjectivity and the organization of the mind. However, those working in this relatively new field must confront a fundamental paradox: can psychoanalytic constructs be investigated at the brain level if their complexity and subjectivity do not lend themselves to biological reductionism? The unresolved challenge for neuropsychanalysis is to find ways to conduct research that bridges the complexity and subjectivity of psychoanalytic constructs with growing knowledge in neuroscience, without simultaneously conflating the brain with the psychoanalytic mind.

Our project represents an effort to resolve this paradox through the study of patients diagnosed with

borderline personality disorder (BPD; APA, 2000). Individuals with this diagnosis typically exhibit disturbed relationship patterns, emotional instability, and impulsive aggression and are prone to potentially lethal self-harm (Clarkin, Hull, & Hurt, 1993; Sanislow, Grilo, & McGlashan, 2000). This complex constellation of symptoms and personality structure makes BPD a syndrome whose understanding is likely to benefit from integrating different levels of conceptualization. First, we review the relevant literature on BPD and its etiology, and treatment and describe an integrated, mixed-methods approach to study interpersonal processes in BPD. Second, we provide an outline of the aims, measures, and design of our study. Finally, we discuss the relevance of this approach to neuropsychanalysis and the potential to clear a path for a more fruitful dialectic between psychoanalysis and the neurosciences.

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Acknowledgments: This study is supported by grants from the International Psychoanalytical Association to J.E. and from the NIMH (K23 MH077044), the American Psychoanalytic Foundation, and the Neuropsychanalysis Foundation to E.F. The authors have no financial involvement (including employment, fees, share ownership) or affiliation with any organization whose financial interests may be affected by material in the manuscript.

Why BPD?

Borderline personality disorder is a prevalent, high-risk disorder that has devastating health consequences. Between 1% and 2% of adults meet diagnostic criteria for BPD (Lenzenweger, Lane, Loranger, & Kessler, 2007), though one recent report estimates a 5.9% lifetime prevalence of the disorder (Grant et al., 2008). Non-remitting BPD is associated with elevated rates of chronic physical health syndromes and medical hospitalization (Frankenburg & Zanarini, 2004). Consequently, the diagnosis is associated with one of the highest rates of health service utilization (Bender et al., 2001) and therefore poses significant public health risks (Gunderson, 2009).

From the earliest clinical observations of individuals designated as “borderline” (Stern, 1938), those with this syndrome have been a diagnostic and treatment challenge to mental health practitioners. For many years, clinicians treating these patients rarely found much success using traditional treatment approaches. Fortunately, outcome studies from the past decade have documented the clinical (Bateman & Fonagy, 1999, 2001, 2009; Clarkin et al., 2001; Levy et al., 2006) and cost (Bateman & Fonagy, 2003) effectiveness of contemporary psychoanalytically oriented treatments for BPD (i.e., mentalized-based therapy, transference-focused psychotherapy). Despite these clinical gains, the public health toll of this disorder necessitates further research into the mechanisms of BPD. Here we see a crucial opportunity for a neuropsychanalytic perspective to guide scientific progress in the understanding and treatment of BPD, with its emphasis on the interrelatedness of physiological and psychic processes.

Object relations, attachment, and BPD

Psychoanalytic object relations and attachment theories have made substantial contributions to our understanding of the interpersonal and intrapsychic processes of infant development. The child’s internalization of experiences with primary caregivers can be conceptualized in terms of internal working models of attachment (Bowlby, 1988) or object representations (Kernberg, 1975). These internalized mental representations contribute to identity development and consolidation (Blatt, 1974, 1990; Blatt, Wild, & Ritzler, 1975; Kernberg, 1975; Mahler, Pine, & Bergman, 1975; Sandler & Rosenblatt, 1972; Stern, 1985) and the formation of interpersonal patterns and subjective meaning (Ainsworth, 1985a, 1985b; Bowlby, 1988; Main, Kaplan,

& Cassidy, 1985). As the child matures, reciprocity between a differentiated and integrated sense of self and empathic attunement to significant others emerges as a central dynamic in development (Blatt & Blass, 1990; Blatt & Shichman, 1983; Miller, 1984; Stern, 1985). In other words, differentiation and relatedness may be understood as interactive polarities (Blatt & Blass, 1990, 1995; Blatt & Shichman, 1983; Diamond, Blatt, Stayner, & Kaslow, 1993; Sander, 1983) in an unfolding developmental process.

In optimal development, the reciprocal relationship between differentiation and relatedness creates the conditions for both a secure attachment relationship and a sense of psychological autonomy. These conditions enable the child to reflect upon the interplay between his or her own mind and the minds of others, vis-à-vis “mentalization” (Fonagy, Steele, Moran, Steele, & Higgitt, 1991). By contrast, individuals that develop borderline personality often suffer from affective polarization of internalized self and object representations, in which others are viewed as either intentionally harmful and/or unrealistically good (Kernberg, 1975). As a result, the mentalizing capacity of these patients is often compromised during relational disturbances, especially when negative affect is mobilized in interpersonal situations (Fonagy et al., 1996). Fonagy and Luyten (2009) argue that this deficit in the capacity for mentalization is related to the insecure and/or disorganized working models of attachment that tends to characterize patients with BPD. These studies suggest the fruitfulness of looking at the interplay between the internal world of mental representation and interpersonal functioning and at the way this interplay might function in the intergenerational transmission of attachment patterns. There is now an impressive body of research that suggests a key factor in understanding transgenerational transmission of attachment is the capacity for reflective functioning (RF; i.e., mentalization), which may impede or exacerbate the transgenerational transmission of insecure and/or disorganized attachment patterns (Fonagy & Luyten, 2009; Fonagy et al., 1996; Slade, 2005).

Psychodynamic researchers have shown that the quality of internalized self-and object-representations can be assessed from descriptions of self and significant others (e.g., parents, romantic partner). The Object Relations Inventory (ORI; Blatt, Chevron, Quinlan, Schaffer, & Wein, 1988; Blatt, Wein, Chevron, & Quinlan, 1979) elicits these representations from brief questions that invite participants to provide a spontaneous narrative regarding several important figures in their life. Patients with BPD produce descriptions of others

that lack differentiation and cognitive complexity, as compared to descriptions from healthy controls (Marziali & Oleniuk, 1990). Investigations have also shown that the ORI is a valid and reliable method of assessing changes in object relations and interpersonal functioning over the course of psychodynamic treatment (Blatt & Auerbach, 2001; Blatt, Auerbach, & Aryan, 1998; Blatt, Stayner, Auerbach, & Behrends, 1996; Diamond, Kaslow, Coonerty, & Blatt, 1990; Lowyck et al., 2009). Specifically, both increased structural complexity of object descriptions and differentiation-relatedness (D-R) are strongly correlated with clinical improvement (Blatt et al., 1996; Diamond et al., 1993; Vermote et al., 2010).

The Adult Attachment Interview (AAI; George, Kaplan, & Main, 1996) has also been widely used to assess attachment representations of early attachment figures and experiences, as well as reflective function in both clinical and nonclinical samples. Previous studies using the AAI with borderline patients have found an association with the preoccupied attachment classification (Fonagy, Target, & Gergely, 2000; Fonagy et al., 1996; Patrick, Hobson, Castle, Howard, & Maugham, 1994), the dismissing attachment classification (Levy et al., 2006), and unresolved attachment status (Barone, 2003; Diamond et al., 2003; Levy et al., 2006). In a review of 13 empirical studies on attachment and BPD, the authors concluded that, across the studies, BPD patients were rated unresolved with preoccupied features and fearful of rejection in close relationships (Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004). Further research using the ORI and AAI will allow us to better understand the relationship between these mental representations from an empirical perspective as well as their relationship to social cognition and neurobiological processes.

Linking social cognition and mental representations

Noting the central importance of interpersonal functioning, researchers have begun to investigate the social behavior and cognition of patients with BPD. These patients tend to report more negative relationship features, relative to nonpatients, in terms of trust and social support (Clifton, Pilkonis, & McCarty, 2007). One of us (EF) has reported that BPD patients are better able to discriminate mental states than healthy controls from the Reading the Mind in the Eyes task (Fertuck et al., 2009). This apparently enhanced capacity might be the basis for social impairments in this population.

Other investigators have proposed that dysfunctional cognitive schemas underlie social impairments in BPD (Barnow et al., 2009). Gunderson and Lyons-Ruth (2008) have identified as an interpersonal hypersensitivity phenotype (see also Lynch et al., 2006).

Relatedly, other investigators have focused on interpersonal trust appraisal in individuals with BPD. There appears to be a consistent finding that those with BPD are less trusting of others during social exchanges than are healthy controls (Franzen et al., 2011; King-Casas et al., 2008; Unoka, Seres, Aspán, Bódi, & Kéri, 2009). The impetus for understanding this feature of patients with BPD is underscored by the findings from a qualitative study that explored the treatment experiences of individuals diagnosed with BPD and of their clinicians. Attaining trust was judged to be the most crucial factor in the establishment and maintenance of the therapeutic alliance (Langley & Klopfer, 2005).

Westen (1991) argues that social cognition and object relations share a common interest in cognitive and affective processes that “mediate interpersonal functioning” (p. 429). Blatt and Auerbach (2003) have observed that intersubjectivity is the prerequisite context for both object-relational and attachment perspectives of mental life. They argue that the term “mental representation” is well suited to encompass certain aspects of social cognition, representations of self and significant others, and internal working models of attachment (Blatt & Auerbach, 2003). In other words, mental representations denote both the unique experiential features of individual development (i.e., object representations) and those that come to represent cognitive and affective schemas (e.g., trust appraisal; see Methods section). These schemas function as heuristic prototypes that are the basis for social interaction and behavior (Fiske & Taylor, 1984; Horowitz, 1988; Markus, 1977; Westen, 1991).

It follows that the bias to mistrust observed in patients with BPD is closely associated with object-relations and attachment impairment (e.g., low D-R and RF) and is likely to be related to distinctive alteration in neural mechanisms underlying these processes. Examining correspondences between the D-R from the ORI, RF from the AAI, and social cognitive processes (i.e., trust appraisal) can distinguish between distinct features of these mental phenomena. Furthermore, understanding the relationship between mental representations and behavioral and social cognitive processes in individuals with BPD will allow us to begin to delineate the ways in which internal representations predict “real-world” social interactions (e.g., emotion appraisal, cooperation, communication).

A social cognitive neuroscience approach to BPD

Social cognitive neuroscience (SCN; Adolphs, 2003; Lieberman, 2007; Ochsner & Lieberman, 2001) is an empirical approach that addresses the interactional relations between social behavior, social cognitive processes, and the brain mechanisms underpinning social cognition. Typically, SCN studies utilize social cognitive laboratory approaches in a neuroimaging environment to bridge the social mind with the functioning of the brain. Therefore, this approach is well suited for addressing the problem of interpersonal dysfunction in BPD.

A number of studies have reported altered brain structure and volume (e.g., measuring gray-matter density) in patients with BPD. Abnormal brain maturation in adolescent girls with features of borderline personality (Houston, Ceballos, Hesselbrock, & Bauer, 2005) and other structural findings in brains of individuals with BPD (Irle, Lange, Weniger, & Sachsse, 2007; Minzenberg, Fan, New, Tang, & Siever, 2008; Rüscher et al., 2003; Tebartz van Elst et al., 2003) have been reported. These findings are preliminary and may indicate structural brain changes associated with BPD, though at this point we do not know if they are the cause or consequence of BPD and the environmental risk factors associated with its development.

The neurobiology of social appraisal in BPD has been investigated using various paradigms from social psychology and cognitive neuroscience. When these patients are exposed to emotional and neutral faces and negative emotional stimuli, they exhibit greater amygdala activation than do controls (Donegan et al., 2003; Herpertz et al., 2001; Koenigsberg et al., 2009). Fear, in particular, has been shown to produce increased activation of the right amygdala and less activation in the bilateral rostral/subgenual anterior cingulate cortex (ACC) in BPD relative to controls (Minzenberg, Fan, New, Tang, & Siever, 2007). One report has suggested that the amygdala might be a modulator of perceptual cortex, thereby increasing attention to emotional stimuli in patients with BPD (Herpertz et al., 2001). Individuals with BPD also exhibit problems *regulating* stress and emotion, as evidenced by a dysfunctional network including the ACC and frontal brain regions (Wingenfeld et al., 2009). Some have suggested that a broader dysfunction in the frontolimbic network mediates borderline pathology (Minzenberg et al., 2007, 2008; New et al., 2007; Schmahl & Bremner, 2006).

In the presence of social emotional stimuli, when individuals with BPD were instructed to employ distancing strategies to negative pictures, compared to looking at them, there was less activation change be-

tween conditions, compared with controls, in cognitive control regions (dorsal ACC, intraparietal sulcus, superior temporal sulcus, and superior frontal gyrus) and less deactivation in the amygdala (Koenigsberg et al., 2009). This finding suggests that lack of functional connectivity between frontal regions (e.g., orbitofrontal cortex) and the amygdala causes impaired cognitive control of emotion in BPD (Berlin, Rolls, & Iversen, 2005; New et al., 2007; Silbersweig et al., 2007).

In contrast to studies of emotion processing of social stimuli, SCN reports on interpersonal processes in BPD are limited. One fMRI study reported that individuals with BPD were impaired, relative to controls, in their ability to trust their partners in an economic exchange task, and this lack of cooperation was related to dysregulated activation in the anterior insula in those with BPD (King-Casas et al., 2008).

Few studies have been conducted on the neurobiological correlates of attachment patterns in patients with BPD. One study employed a paradigm (Adult Attachment Projective) in which patients with BPD were asked to construct a narrative in response to attachment-related stimuli. Individuals with BPD showed greater activation in anterior medial cingulate cortex (aMCC) in response to monadic pictures (single character) and more right superior temporal sulcus activation and less activation in right parahippocampal gyrus for dyadic pictures (two characters), relative to healthy controls (Buchheim et al., 2008). The authors argued that attachment trauma might underlie interpersonal symptoms of BPD.

Although a handful of studies have reported on the neural correlates of attachment classification (Lemche et al., 2006; Suslow et al., 2009; Vrticka, Andersson, Grandjean, Sander, & Vuilleumier, 2008), no one has looked at the neural correlates of interpersonal processes in patients with BPD, relative to quality of attachment (e.g., classification, RF, D–R). In our paradigm, this is a crucial concern because, as Vrticka et al. (2008) have argued, over and above its effects on facial-feature processing, attachment status contextualizes perception of social stimuli. Therefore, we are assessing whether attachment status, RF, or D–R correlate with differential trust responses and associated neural activity between individuals with BPD and nonclinical participants.

Research questions and hypotheses

In an ongoing project, we are investigating whether the interpersonal hypersensitivity evident in BPD is subserved by a bias to mistrust others and high levels

of rejection sensitivity. Moreover, we are investigating whether these behavioral and interpersonal characteristics are related to a lower developmental quality of differentiation-relatedness of mental representations of self and others, and to the capacity for reflective function. Our goal is to examine the link between patterns of neural activity and mental representations via the face-appraisal task. Our model stipulates that negative cognitive affective schema and/or insecure/disorganized attachment representations are related to the activation of negative affect in interpersonal situations, which biases both social appraisals and interpersonal behavior. Furthermore, both are in turn related to greater amygdala activation in the context of mistrust of others (see Figure 1). Our primary hypotheses are that (1) patients with BPD will exhibit lower developmental quality of D–R and RF than controls (i.e., lower scores); (2) compared to controls, patients with BPD will rate neutral faces as less trustworthy, and those ratings will correlate with lower D–R and RF; (3) low trust ratings and low D–R and RF scores in BPD will correlate with greater amygdala and less frontal (e.g., cingulate cortex) activation. Although the temporal and developmental direction of the mutual influence between these three levels of functioning—the intrapsychic, interpersonal, and neurobiological—is not clear, our investigations may ultimately help us to improve coordinated measurement of all three levels and, ultimately, to develop and evaluate more effective treatments for BPD.

Methods

Table 1 outlines the layers of investigation in our empirical paradigm. Neural activity is directly linked to trust appraisal. Also, D–R and RF, measured from participant narratives, are analyzed in relation to the trust rating data. Correspondence between these three layers of data is then evaluated

Our clinical sample is comprised of women diagnosed with BPD who are being compared with non-clinical controls that are matched on key demographics and intelligence. Participants undergo a face-appraisal task, which is conducted while participants are in the fMRI scanner; the task is divided into two conditions: (1) a trait-appraisal task in which they are asked to rate how “trustworthy” to “untrustworthy” the person appears, and (2) an emotion-appraisal task in which they are asked to rate how fearful the person appears (see Table 1, Levels 1 and 2).

Participants also participate in the Object Relations Inventory (Blatt et al., 1979) and the Adult Attachment Interview (George, Kaplan, & Main, 1996). The ORI is an open-ended projective measure that asks for descriptions of self and significant others (e.g., mother, father, therapist). The ORI is scored with the differentiation-relatedness scale (Diamond et al., 1993), which assesses the developmental quality of descriptions of self and significant others (see Table 1, Level 3).

From the AAI we are assessing attachment status and RF (see Table 1, Level 4). As previously discussed,

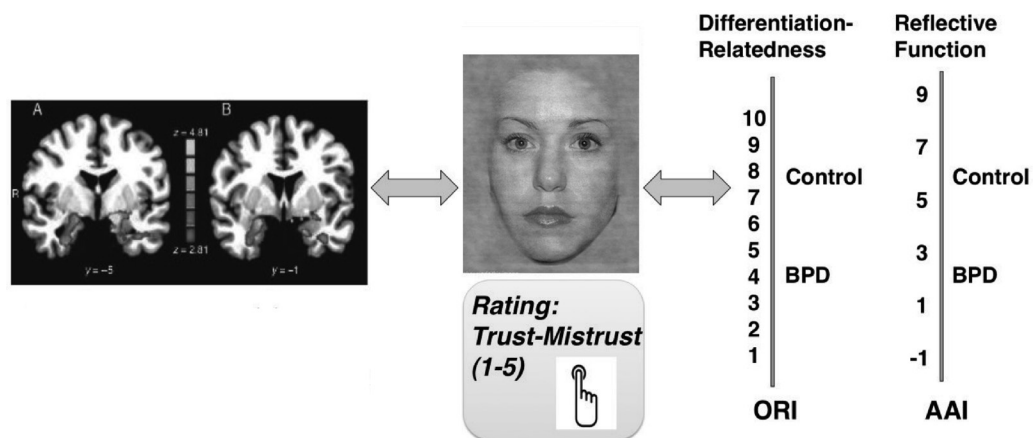


Figure 1 Pictorial representation of correspondence between multiple levels. There is evidence of a correlation between amygdala activation and appraisal of faces as untrustworthy (Engell, Haxby, & Todorov, 2007). We hypothesize that, in comparison with a nonclinical sample, individuals with BPD will rate faces as less trustworthy, which will correlate with greater amygdala activation. These behavioral and neural responses of the participants with BPD should also correlate with lower scores on the D–R and RF scales. The arrows signify that directionality of the influence between levels of data (i.e., neural, behavioral, narrative) is unclear.

Table 1. A multilevel approach to BPD

<i>Level</i>	<i>Measure</i>	<i>Unit(s) of measurement</i>
1. Neural	fMRI	Regional brain activation
2. Social appraisal	Face task	Appraisal ratings and reaction time
3. Object relations	Narrative (ORI)	Differentiation-relatedness
4. Attachment representations	Narrative (AAI)	Reflective function

these components of the patient's narrative are closely related to the qualities of differentiation and relatedness of the self. Our design will further address the overlap and complementary nature of these constructs.

Discussion

Despite advances in psychoanalytic treatment for BPD and emerging neuroscientific knowledge, the underlying social cognitive, emotional, and neural substrates of borderline pathology have not been adequately studied from a psychoanalytically informed laboratory approach. We argue, as do others, that a model that incorporates neurobiological, behavioral, and psychological phenomena is needed (Brendel, Stern, & Silbersweig, 2005).

An SCN model such as ours can move beyond the discord between psychoanalysts and basic scientists. Our model utilizes empirical methods without sacrificing experience-near and clinically relevant concepts such as mental representation, concepts that are derived from patients' language. In retaining language in clinical research, one opens the possibility for further investigation into psychodynamic unconscious mechanisms and invites clinicians into a common discussion. The future of our understanding of this disorder will rely on progressive methods that will bridge the clinical and empirical realms of investigation.

The novel mixed-methods paradigm we have outlined aims to circumvent reductionist explanations that have hampered investigations of BPD and other pathologies. Reductionism has plagued both neuroscience and psychoanalysis (Ansermet & Magistretti, 2007). As Gabbard (2005) argues, severe personality disorders, such as BPD, should not be treated as "either-or dichotomies of brain and mind" (p. 648). If psychoanalytic models of the intrapsychic and interpersonal dynamics of patients with BPD are integrated with social cognitive neuroscience, a comprehensive,

neuropsychanalytic approach promises to improve understanding and treatment for this devastating syndrome.

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