Synergy of Mind and Brain in Borderline Personality Disorder: A Social Neuroscience Approach

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In 2008, U.S. House of Representatives voted 414-0 to pass the Resolution, H. Res. 1005 designating May as *Borderline Personality Disorder Awareness Month.*
Three symptom dimensions in BPD

- **Emotional Instability** – Negative emotion reactivity and dysregulation, intense and inappropriate anger, and emptiness
- **Behavioral Instability** – Self-destructive impulsivity, suicidality, and self-injurious behavior
- **Disturbed Self and Interpersonal Relatedness** – Turbulent relationships, frantic efforts to avoid abandonment, and identity disturbance
Trust Appraisal and Social Exclusion in BPD

- “Borderline Empathy”
- Facial Trust Appraisal and Rejection Sensitivity in BPD
- Social Exclusion in BPD
- Implications for Treatment
“[B]oth doing and observing psychotherapy, I became convinced that there was an awful lot in the face and the body apart from the words, and if we were to really understand the process, we needed to be able to measure it. Little did I know how long it would take.” Perspectives in Psychological Science (2006)
Put an example of an empathy "paradox" in BPD (Krohn, 1974, *International Journal of Psychiatry*)

- **Impaired** social relations (turbulent relationships with therapists and significant others)

- **Enhanced** sensitivity to the mental states of others ("borderline empathy")
Example of facial stimuli from the Reading the Mind in the Eyes Test

1. Hateful
2. Jealous
3. Arrogant
4. Panicked
Empathy Paradox: Review


- “[A] sufficient number of studies (14 of 28) and different tests (8) showed enhanced empathic skills in BPD ... this phenomenon is worthy of further attention”
“The eyes of others our prisons; their thoughts our cages”

-- Virginia Woolf
Passive viewing of Facial Expressions in BPD and Healthy Control groups in fMRI scan.

Region of Interest: Amygdala, associated with automatic processing of potentially threatening stimuli.
Figure 2. Activation map showing regions in the amygdala slice in which activation exceeded the criterion threshold level of $p < .005$ for the normal control and borderline personality disorder groups for each of the four facial expressions.
“In the present study, ... much greater incidence of BPD patients projecting negative attributes onto the faces...”

BPD patients on Neutral Faces:
“They look like mug shots, like someone who just got arrested,” “They look fake, like a facade—they are hiding something,” “They look like they are plotting something.”

Trustworthiness?
Trustworthy to Untrustworthy Morphs

50% Morph
Morphed Fear Faces

50% Morph
Stimulus Presentation

RT = Reaction Time
ITI = Intertrial Interval

Rating:
Trust-Untrust
1-5
## Clinical Characteristics BPD Group

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
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<tbody>
<tr>
<td>Past suicide attempter</td>
<td>11</td>
<td>64.71</td>
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<tr>
<td>Physical or sexual abuse (prior to age 18)</td>
<td>7</td>
<td>41.18</td>
</tr>
<tr>
<td>Sexual Abuse</td>
<td>4</td>
<td>23.53</td>
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<tr>
<td>Physical abuse</td>
<td>5</td>
<td>29.41</td>
</tr>
<tr>
<td>Lifetime non-suicidal self-injury (NSSI)</td>
<td>9</td>
<td>52.94</td>
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<tr>
<td>GAS score</td>
<td>M = 55.12</td>
<td>SD = 7.84</td>
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Trust and Fear Reaction Times by Group

A

Trust RT vs Ratings

B

Fear RT vs Ratings

RT (s)

Rating

0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4

0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4

Rating

BPD
Controls

***

**

1 2 3 4 5

1 2 3 4 5
fMRI Facial Appraisal Runs

- Alternation of 3 Trust Appraisal and 3 Fear Appraisal Runs (6 mins Each)
- Addition of Todorov stimuli for Trust condition (all male, greater dynamic range)
Neural Dynamics of Trust in BPD
(Fertuck et al., under review)

- Are untrustworthy appraisals of others in BPD mediated by?
  
  1). A hyper-reactive **emotional processing system** (amygdala) – **Bottom Up Processing**
  
  2). A biased and reflexive **social cognitive appraisal system** (medial prefrontal cortex) – **Top Down Processing**
Uncertainty and Splitting

- BPD may utilize a binary decision making processes to make a “categorization” of trust (good) vs. untrust (bad).

- Clinically, BPD exhibits “splitting” of interpersonal and emotional experiences into polarized “good” and “bad” dichotomies (Kernberg, 1967, 1984).
The Trustworthiness Learning Project allowed us to build upon our fMRI and behavioral findings. EEG utilized to identify differences in sensory and cognitive learning of interpersonal trustworthy related stimuli (human faces and traits). To identify interpersonal trust learning mechanisms to target for intervention. The results of the research will inform investigators and clinicians regarding potential learning mechanisms, creating the potential for understanding the mechanisms of therapeutic change.
A H-BPD group will exhibit an untrustworthiness bias that is more resistant to short term social learning (trait-pairing associations) relative to a L-BPD group.

Assessed via behavioral and EEG response before and after 3 conditions of trustworthiness learning.
Undergraduates at CCNY selected to be High or Low in BPD Features
13 High BPD and 13 Low BPD underwent behavioral and EEG testing
Matched on demographics (40% female; Mean age=21)
Procedure

- 3 different male facial identities were paired with 3 names: George, Owen, and David.
- Morphs of the identities were rated on trustworthiness for a baseline rating (Time 1).
- Identities were then randomly assigned to 1 of 3 trustworthiness trait learning conditions.
Participants rate trustworthiness of trust morphs of all 3 identities 2 times. First rating baseline (Time 1). Second rating after Trustworthiness Trait Learning (Time 2).
Three Training Conditions

- **Untrustworthy Traits**
  - [Name] ignores phone calls, texts and emails from his girlfriend.
  - [Name] lies about others to make himself look better.

- **Trustworthy Traits**
  - [Name] is always interested in his friends' problems
  - [Name] practices what he preaches.

- **Ambiguously Trustworthy Traits**
  - [Name] sometimes cancels plans with friends at the last minute without explanation.
  - [Name] ignores his old girlfriend at parties.
Next, participant must select the facial identity that matches a paired trust related trait, shown on the previous trail ("one back task").
EEG with ANT System

168 ELECTRODE EEG
**Levels of Processing**

- High BPD participants displayed a faster early stimulus evaluation ($P_1$, $N_1$, $P_2$) than Low BPD participants

- **BUT...**

  - With more complex processing ($N_2$, $P_3$, Slow waves), High BPD participants slowed down, and displayed a longer evaluation time than Low BPD participants
Effects of Trustworthiness Training

- Training impacts how Low BPD participant process and evaluate the stimuli (even though effects are condition dependent)
  - Low BPD participants are more amenable to learning about trustworthiness
- Training does not impact how High BPD participants evaluate stimuli
  - It is harder to change the trustworthiness perception of High BPD participants.
Implications

- Those with BPD features evaluate untrustworthiness based on early stimulus processing more than controlled, cognitive processing.
- This may impair real-time updating of the untrustworthiness bias in light of new trustworthiness information.
- Changing the valence and accuracy of trustworthiness appraisal may require more intensive interpersonal learning in BPD.
Romantic Relationship Dysfunction in Borderline Personality Disorder—A Naturalistic Approach to Trustworthiness Perception
Miano, Fertuck, Roepke, and Dziobek, PD: TRT, 2016
Fertuck, et al. (2016). "Facial trustworthiness perception bias elevated in individuals with PTSD compared to trauma exposed controls." Psychiatry Research
Diogenes
Rejection Sensitivity and Social Pain in BPD
(Eisenberger, 2012, Nat. Rev. Neurosc.)

- The unpleasant experience that is associated with actual or potential damage to one’s sense of social connection or social value through social rejection, exclusion, negative social evaluation or loss

- Hypersensitivity in BPD?
The Neurotic Personality of Our Time (Horney, 1937)

Anxiety about rejection leads people to respond with anger and rage to "what is felt to be a rejection, but also to the anticipation of a rejection. The hostility provided . . . is an important factor in establishing a vicious cycle which is difficult to escape from" (italics added; pp. 136–137).
## Multi-Level Model with Mixed-Methods

(Erbe, Diamond, & Fertuck, 2012)

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<tr>
<th>Level</th>
<th>Measure</th>
<th>Unit(s) of Measurement</th>
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<tbody>
<tr>
<td>1. Mental Representation</td>
<td>Narrative ORI, ECR (Attachment style)</td>
<td>Differentiation-Relatedness, Anxiety/avoidance scores</td>
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<tr>
<td>2. Social Cognition</td>
<td>Cyberball Task</td>
<td>Rejection &amp; anger ratings</td>
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<td>3. Neural</td>
<td>fMRI</td>
<td>Neural activation patterns</td>
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Cyberball Runs

- 5 Runs at 3.5 Minutes Each
- Inclusion rates vary each run: 10, 20, 40, 50, 60% inclusion rates
- Initial run is 50% inclusion for all participants
- Subsequent runs are in randomized order
- After each run participants rate subjective experience (liked, rejected, in control, angry, etc.)
Brain Regions for Social Cognition (Zaki & Ochsner, 2012)

Blue = Mentalizing, inferring the mental states of others based on social cues
Green = Empathy (concordance between 1st and 3rd person experience)
A Neural Mechanism for Rejection Sensitivity in BPD

- Rejection sensitivity in BPD is characterized by a combination of insensitivity in the rmPFC and PCn to rejection frequency (context) and hypersensitivity to discrete rejection (events).
Summary: Rejection Sensitivity and Social Pain

- Those with BPD report more feelings of rejection and anger as exclusion rates increase compared to controls.

- Exclusion events recruit greater brain activity in areas involved in “mentalization” in BPD (pCC, precuneus, mPFC), opposite effect for exclusion context.
Empirically Supported Treatments for Borderline Personality Disorder

Prominent approaches:
- Dialectical Behavior Therapy (DBT),
- Mentalization Based Treatment (MBT),
- General Psychiatric Management (GPM)
- Transference-Focused Psychotherapy (TFP)
Clinical Questions/Implications

- Face to Face therapy: Do individuals with BPD “need” to see our faces?
- Negative (“paranoid”) transferences will be a common therapeutic focus
- Differentiating “projection” from accurate emotion recognition
Collaborators

Barbara Stanley  Tor Wager
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J. John Mann  Paul Pilkonis
Diana Diamond

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<tr>
<th>Social Neuroscience and Psychopathology (SNAP) Lab</th>
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<td>Jay Edelman – Co-PI</td>
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<td>Esen Karan</td>
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<td>Ana Kodra</td>
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<td>Grace John</td>
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A Bridge Too Far?