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REACTIVITY TO SENSATIONS IN BORDERLINE PERSONALITY DISORDER: A PRELIMINARY STUDY

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Individuals with borderline personality disorder (BPD) are widely considered to have problems with emotional reactivity. However, the specific kinds of stimuli that are associated with heightened emotional reactivity in BPD have not been well characterized. Thus, it is unclear whether the emotional dysfunction in BPD occurs in response to any emotionally evocative stimuli, or to specific classes of stimuli. In this study, we used subjective measures (self-report and interview-based) to compare reactivity to sensations (auditory, gustatory, olfactory, tactile, visual) between participants with BPD ($n = 30$) and healthy controls ($n = 50$). Controlling for trait negative emotional reactivity, individuals with BPD reported being significantly more reactive across sensory stimuli. However, the difference between controls and BPD was significantly greater for reactivity to auditory stimuli compared to other sensory stimuli. Findings from this study provide preliminary data suggesting individuals with BPD may be characterized by heightened self-reported reactivity to aversive sounds.

Problems with heightened emotional reactivity are widely considered to be central to borderline personality disorder (BPD). However, it is unknown whether individuals with BPD are best characterized as generally emotionally reactive across all contexts, or whether certain kinds of stimuli are differentially associated with heightened reactivity. Empirical research has consistently found that individuals with BPD report higher levels of trait negative affective intensity, reactivity, and lability compared to con-

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trols. However, studies examining changes in state emotional reactivity in BPD using objective, laboratory measures have yielded inconsistent results, with findings variably indicating that compared to controls, individuals with BPD are over-responsive, under-responsive, or equally responsive (e.g., Links et al., 2007; Tolpin, Gunthert, Cohen, & O'Neill, 2004; for a review, see Rosenthal et al., 2008) to emotionally evocative stimuli. Several parsimonious explanations for these inconsistencies include the use of few studies mostly with small sample sizes, different methods of emotion induction, and/or measurement of reactivity, and/or measurement error.

Another possible reason for mixed findings of emotional reactivity is that individuals with BPD may be differentially reactive to certain kinds of stimuli. Laboratory-based studies of BPD investigating state emotional reactivity have used emotionally evocative visual cues, largely ignoring nonvisual stimuli such as auditory, gustatory, olfactory, or tactile sensations. To improve the characterization of heightened reactivity in BPD, studies are needed that examine whether particular kinds of stimuli differentially elicit emotional reactivity.

One way to conceptualize potentially relevant classes of stimuli that may elicit negative affect in BPD is by examining whether particular kinds of sensations are more or less associated with emotional reactivity in BPD. Indeed, studies are needed to better understand whether BPD is associated with differential responding to aversive sensations more generally, or to particular classes of sensations specifically. In order to investigate the relationship between BPD and responsivity to classes of sensory input, the present study examined self-reported reactivity to aversive stimuli across sensory systems (e.g., auditory, tactile, etc.) in healthy controls and individuals with BPD.

Specifically, we hypothesized that individuals with BPD would report greater reactivity to sensations across sensory domains compared to a sample of healthy controls (HCs). Given the preliminary nature of this study, we made no directional hypotheses about types of sensory stimuli that would be differentially heightened among participants with BPD. However, we explore whether individuals with BPD were more reactive than HCs to any single domain of sensations, after controlling for trait emotional reactivity.

METHOD

PARTICIPANTS

Individuals aged between 18 and 60 were recruited through internet advertisements, brochures, and flyers within the general community and Duke University Medical Center, and received approximately $20 per hour for participation. The sample included 80 participants (females = 83.8%, $n = 67$), mean age was 34.97 years ($SD = 10.69$), and ethnic composition was 46.3% Caucasian, 45.0% African American, 3.8% Hispanic American, 1.3% American Indian, 1.3% Asian, and 2.5% reported "Other."

HCs had no current Axis I or Axis II diagnoses and no more than one symptom of BPD. Co-occurring current Axis I disorders in the BPD group primarily included (out of total BPD sample): mood disorders (53.3%; e.g., major depressive disorder = 26.7%), substance use disorders (30.0%; e.g., alcohol abuse/dependence = 13.3%), and anxiety disorders (70.0%; e.g., generalized anxiety disorder = 26.7%). Co-occurring current Axis II disorders in the BPD group included: avoidant (23.3%), obsessive compulsive (13.3%), paranoid (13.3%), antisocial (6.7%), dependent (3.3%), and schizoid (3.3%).

MEASURES

Demographics. A self-report measure was used to obtain demographic and descriptive information, including age, ethnicity, marital status, and years of education.

Affect Intensity Measure—Negative Reactivity Scale (AIM-NR). The AIM-NR (Bryant, Yarnold, & Grimm, 1996; Larsen & Diener, 1987) is a self-report measure used to assess the tendency to become easily disturbed by emotional events. Respondents indicate how they usually react to specific events (e.g., the sight of someone who is hurt badly affects me strongly) using a 6-point Likert-type scale (1 = never, 6 = always). Bryant et al. (1996) indicated that the internal reliability for the validation sample was adequate (.66). In the present study, Cronbach's alpha for this scale was .69.

Self-Perception of Sensory Reactivity. An interviewer-administered measure modeled after validated measures of sensory defensiveness in adults and children (e.g., Adult Sensory Interview; Pfeiffer & Kinnealey, 2003; Short Sensory Profile; McIntosh, Miller, Shyu, & Dunn, 1999) was used to obtain reports of reactivity to sensory stimuli in each sensory domain (auditory, gustatory, olfactory, tactile, & visual). Participants were asked to provide examples of bothersome stimuli across sensory domains; after this priming participants responded to items beginning with the phrase, "Compared to other people" and ending with a sensory example (e.g., are you bothered by car horns) using a Likert type scale (1–10), with higher scores reflecting higher reactivity. Sensory domains reviewed include auditory (18 items; e.g., "are you bothered by car horns?"), tactile (16 items; e.g., "do tags in clothes bother you?"), gustatory (10 items; e.g., "how sensitive are you to spices like cinnamon or mint?"), olfactory (6 items; e.g., "do smells of food or cooking bother you?"), and visual (6 items; e.g., "do bright lights bother you?").

Item scores for each sensory domain were averaged, and the mean scale was used in data analyses as an index of reactivity to specific sensory domains. In the present study, Cronbach's alpha across all sensory items was .92; on specific scales, the alpha was .83 for auditory, .61 for gustatory, .82 for tactile, and .64 for visual. Thus, these scales demonstrated acceptable reliability. Because the Cronbach's alpha on the olfactory scale was .44, reflecting poor reliability; this scale was not used in subsequent analyses.

Structured Clinical Interview for DSM-IV Axis-I Disorders (SCID-I; First, Gibbon, Spitzer, Williams, & Benjamin, 1997). The SCID-I was used to assess current and lifetime symptoms of Axis I disorders for all participants. Inter-rater reliability was assessed by a blind rater randomly rating 20% of SCID-I interviews via DVD. Kappas ranged from .63 to 1.0, reflecting acceptable inter-rater reliability.

Structured Clinical Interview for DSM-IV Personality Disorders (SCID-II; First et al., 1997). The SCID-II was used to assess diagnostic symptoms of personality disorders. Inter-rater reliability was assessed by a blind rater randomly rating 15% of SCID-II interviews via DVD. Inter-rater reliability on total BPD symptoms was evaluated using intraclass correlation coefficients (ICCs). The ICC for BPD symptoms was .98, indicating excellent reliability. The ICCs for all personality disorders ranged from .66 (Schizotypal) to 1.0 (Histrionic).

PROCEDURE

Prospective participants were screened via telephone using the Structured Clinical Interview for DSM-IV Axis I Disorders screening modules (First, Spitzer, Gibbon, & Williams, 1996), to exclude individuals with current mania or a history of psychosis. Upon arrival at the laboratory, participants provided written informed consent, and completed all interviews and self-report measures with a trained clinical assessor. Finally, participants listened to a relaxation exercise to reduce any unpleasant emotions associated with participation, were provided a list of community treatment resources, and debriefed.

RESULTS

First, one-sample Kolmogorov-Smirnov tests were conducted and variables with significant ($p < .05$) nonnormality were subjected to square root transformations. This included each scale on the measure of Self-Perception of Sensory Reactivity. Subsequent analyses used these transformed scale scores. For all analyses, an alpha of .05 was used.

Second, differences between BPD and HCs across scales were evaluated using repeated measures ANCOVA procedures. Because the olfactory scale yielded an unacceptably low Cronbach's alpha, a 2 (Group: BPD v. HCs) × 4 (Sensory Type: Auditory, Gustatory, Tactile, Visual) repeated measures ANCOVA was conducted. The use of trait negative emotional reactivity as a covariate was planned a priori, and was further justified by significant bivariate correlations between AIM-NR and each of the sensory reactivity scales (auditory $r = .44$, $p < .001$; tactile $r = .48$, $p < .001$; gustatory $r = .29$, $p < .05$). Multivariate ANCOVA tests revealed a significant Group × Sensory Type interaction effect, $F(3,74) = 5.65$, $p < .01$, $\eta_p^2 = .19$, power = .94. The overall multivariate test and Group × AIM-NR test were nonsignificant. As hypothesized, a significant between-group effect was found for the sensory scales, $F = 10.27$, $p < .01$, $\eta_p^2 = .12$, power = .89, indicating that individuals with BPD reported higher levels of reactivity to sensory stimuli than HCs. Post-hoc tests indicated that participants with BPD reported significantly higher reactivity than HCs to each specific type of sensory stimuli (all *p*s, <.05). Mean scores for HCs ranged from .32 to 1.08 (auditory = .56, *SD* = .83, tactile = .91, *SD* = 1.10, olfactory = 1.08, *SD* = 1.36, visual = .80, *SD* = 1.40, and gustatory = .32, *SD* = .56), while scores for the BPD group ranged from .86 to 2.23 (auditory = 2.23, *SD* = 1.40, tactile = 2.08, *SD* = 1.66, olfactory = 1.97, *SD* = 1.62, visual = 1.87, *SD* = 1.64, and gustatory = .86, *SD* = 1.18).

Next, 2 × 2 repeated measures ANCOVAs were conducted to compare participants with BPD and HCs on sensory reactivity to pairings of sensory types (i.e., auditory v. tactile, auditory v. visual, etc.). Controlling for trait negative emotional reactivity (AIM-NR), a 2 (Group) × 2 (Auditory v. Tactile) ANCOVA revealed a significant multivariate interaction effect, $F\ (1,76) = 10.84$, $p < .01$, $\eta_p^2 = .\ 13$, power = .90, with a significantly greater difference for auditory compared to tactile stimuli. This same pattern was found in the 2 × 2 ANCOVA comparing auditory and gustatory reactivity, $F\ (1,76) = 11.51$, $p < .01$, $\eta_p^2 = .13$, power = .92, and comparing auditory and visual reactivity, $F\ (1,76) = 4.85$, $p < .05$, $\eta_p^2 = .06$, power = .59. No other 2 × 2 ANCOVAs comparing BPD and HC participants by pairings of tactile, visual, or gustatory reactivity scores yielded any significant Group × Sensory Type interaction effects. Taken together, this pattern suggests that when controlling for trait negative emotional reactivity, individuals with BPD reported differentially greater aversive reactivity than HCs to auditory stimuli, relative to tactile, olfactory, and gustatory stimuli.

DISCUSSION

Consistent with some previous studies, participants with BPD reported significantly higher reactivity than HCs across sensory stimuli. Extending previous findings, participants with BPD reported being more reactive than HCs to auditory stimuli compared to other kinds of sensory stimuli. Specifically, the difference between BPD and HC participants in reactivity to auditory stimuli was more pronounced than the difference between these two participant groups in reactivity to gustatory, tactile, and visual stimuli. There were no other differences in the magnitude of reactivity between BPD and HC participants on any other sensory domains. These data suggest that, although BPD participants reported being generally more reactive than HCs across sensory domains, they reported being most differentially reactive compared to HCs in response to auditory sensations.

Although preliminary, the pattern of findings from this study suggests the possibility that individuals with BPD may report being particularly emotionally reactive to sounds compared to cues in other sensory domains. It is unclear, however, whether over-responsivity to sounds is specific to BPD, as this phenomenon occurs in other psychiatric disorders (e.g., posttraumatic stress disorder). Not specific to psychiatric disorders per se, environmental studies have found that subjective noise sensitivity predicts higher irritation and stress (e.g., Stansfeld, 1992), and chronic exposure to unpleasant noise sounds (e.g., automobile or air traffic noise) are positively correlated with cognitive impairment and psychiatric problems (e.g., depression; Hardoy et al., 2005). In addition, atypical sensory processing mechanisms have been linked to problems with emotional reactivity, including heightened autonomic arousal in response to aversive sensations, such as sounds (e.g., McIntosh, Miller, Shyu, & Hagerman, 1999; Schaaf, Miller, Sewell, & O'Keefe, 2003). Thus, problems responding to auditory stimuli may be associated with a general vulnerability to psychiatric disorders, if not to BPD specifically. Nonetheless, findings from the present study suggest that it may be useful to further examine reactivity to auditory sensations in BPD.

Results from this study should be considered preliminary until replicated using more rigorous methods of measurement. Several key limitations of this study warrant attention. First, the use of a single subjective measure of reactivity to sensations is somewhat problematic. Research can be advanced by using multiple measures, including objective indices of reactivity (e.g., psychophysiologic). Second, the measure of self-reported reactivity to sensations, though adapted from validated instruments, requires further psychometric validation. Scales from this measure were moderately positively correlated with a trait measure of emotional reactivity, suggesting preliminary convergent validity. Third, the alphas were somewhat low for the AIM-NR (.69) and self-reported measures of reactivity to aversive visual (.64) and gustatory (.61) sensations. Further research in this area using larger sample sizes with measures with established construct validity and reliability is needed. Last, no family-wise error correction procedures were used. The use of such procedures would provide a more conservative data analytic approach. Despite these primary limitations, this is the first study that we are aware of to examine reactivity in BPD across sensory domains. Additional studies are needed to determine whether heightened reactivity to sounds is characteristic of BPD.

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