Affective Startle Modulation in Incarcerated Women With Borderline Personality Disorder Features

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Affective startle modulation was assessed in a sample of Caucasian female offenders classified as exhibiting high levels of borderline personality disorder (BPD) features \( n = 19 \) or low levels of BPD features \( n = 43 \) using the Diagnostic Interview for Borderlines-Revised (DIB-R; Zanarini, Gunderson, Frankenburg, & Chauncey, 1989). Contrary to prediction, high-BPD feature participants did not show significantly greater startle blink magnitudes than controls while viewing unpleasant pictures at either a short (2 s) or long (4.5 s) probe time. High-BPD feature participants did show significant blink attenuation while viewing pleasant pictures at the short probe time. The role of attention and the relative specificity of the negative emotion-processing abnormalities exhibited by women with BPD are discussed.

Keywords: borderline personality, female offenders, affective startle modulation, emotion processing

Borderline personality disorder (BPD) is characterized by severe disruptions in emotion regulation, behavior regulation, and the maintenance of functional interpersonal relationships (American Psychiatric Association [APA], 2000). Individuals diagnosed with BPD evidence instability in mood, including intense feelings of negative affect, impulsivity evidenced by binge eating, self-mutilation, and promiscuous sexual activity, and an unstable self-concept (APA, 2000). It is estimated that roughly 2% of the population meets criteria for the disorder, although the representation of individuals with BPD is much higher in clinical settings, with up to 20% of inpatient populations meeting diagnostic criteria (Skodol et al., 2002).

Emotion dysregulation is central to the symptomatology of BPD. In addition, research suggests that the disruptions in behavioral regulation associated with the disorder are most acute in emotional contexts (e.g., Chapman, Dixon–Gordon, Layden, & Walters, 2010; Chapman, Leung, & Lynch, 2008; Sprague & Verona, 2010). In light of this, it is not surprising that leading theories in the field focus on dysregulated emotion as a core underlying feature of BPD. For example, Linehan (1993) has proposed that individuals with BPD are characterized by an affective vulnerability that includes heightened sensitivity to emotion stimuli, greater intensity of emotion experience, and a slow return to emotional baseline.

Overall, support for differences in the emotion processing of individuals with BPD versus healthy controls is mixed. Research suggests that individuals with BPD are sensitive to both positive and negative emotion words on an emotional Stroop task (Sieswerda, Arntz, Mertens, & Vertommen, 2006), and that they remember significantly more negative, borderline-related words during a memory task (Korfine & Hooley, 2000). Some studies have found greater accuracy by individuals with BPD in the recognition of facial expressions of emotion (Lynch et al., 2006; Wagner & Linehan,
1999), although other studies find no consistent differences across groups (e.g., Domes et al., 2008). Further, there is some evidence suggesting that individuals with BPD are less accurate at identifying affective facial expressions (e.g., Levine, Marziali, & Hood, 1997; Bland, Williams, Scharer, & Manning, 2003), although these results may be limited to particular emotions (e.g., anger; Gardner, Qualter, Stylianou, & Robinson, 2010), task conditions (e.g., under time constraints; Dyck et al., 2009), or task complexity (e.g., integrated facial and prosodic emotion recognition; Minzenberg, Poole, & Vnogradov, 2006).

Data from functional imaging and psychophysiological studies complicate the picture further. Donegan et al. (2009) found increased left amygdala activation during facial affect viewing, whereas Minzenberg, Fan, New, Tang, and Siever (2007) showed greater right amygdala activation in response to fearful stimuli. Furthermore, whereas Herpertz and colleagues (Herpertz, Kunert, Schwenger, & Sass, 1999; Herpertz et al., 2000) found significantly reduced skin conductance responses among patients with BPD during emotion picture viewing, the patients with BPD in a study by Kuo and Linehan (2009) showed heightened baseline skin conductance levels relative to controls.

Data from studies of startle responses are similarly mixed. Grootens et al. (2008) failed to find differences in prepulse startle inhibition in patients with BPD versus controls, although diminished prepulse startle inhibition has been observed among nonclinical populations with borderline features (e.g., Franklin, Heilbron, Guerry, Bowker, & Blumenthal, 2009). Differences in symptom profile may be crucial to detecting such differences. Ebner–Priemer and colleagues (2004) showed that, whereas startle inhibition was enhanced among patients with BPD with low levels of dissociative symptoms, startle was reduced among those with high dissociative levels.

Using the acoustic startle-response paradigm, researchers have also examined emotion modulated startle among participants with BPD. Research has reliably shown that the magnitude of the eyeblink reflex recorded in response to an acoustic startle probe is influenced by the emotion content of stimuli being viewed by participants when the probe occurs. Specifically, the eyeblink-reflex magnitudes recorded when the startle probe occurs while participants are viewing an unpleasant picture (e.g., a weapon, a mutilated body) are greater than the magnitudes recorded when the participants are viewing a pleasant picture (e.g., erotic scene, baby animals; Lang, 1995; Lang, Bradley, & Cuthbert, 1990). Deviations from this typical pattern of startle modulation have been used to test hypotheses related to emotion processing across myriad psychological disorders, including psychopathy (e.g., Patrick, Bradley, & Lang, 1993; Sutton, Vitale, & Newman, 2002), mood disorders (e.g., Taylor–Clift, Morris, Rottenberg & Kovacs, 2011), and schizophrenia spectrum disorders (e.g., Gooding, Davidson, Putnam, & Tallent, 2002).

Studies of emotion-modulated startle in participants with BPD have yielded inconsistent findings. Herpertz and colleagues have failed to find significant differences in the startle response patterns of patients with BPD versus controls during emotion picture viewing (Herpertz et al., 1999; Herpertz et al., 2000). In contrast, Hazlett et al. (2007) found that patients with BPD exhibited significantly potentiated startle responses relative to controls when they were presented with unpleasant emotional words. The discrepancies across these studies may be due to differences in the methodologies employed. For example, whereas Herpertz and colleagues used pleasant/unpleasant pictures to examine emotion modulated startle in their studies, Hazlett et al. (2007) used negative/positive emotion words.

Another variable that may influence the performance of participants with BPD on emotion processing tasks is the time course of the stimuli presentations. In a study of affect recognition among individuals with BPD, Dyck et al. (2008) found no difference between participants with BPD and controls when participants were given unlimited time on the task. However, under conditions requiring rapid discrimination, individuals with BPD showed significant impairment in emotion recognition. Thus, individuals with BPD may require more time than controls to fully process the emotion content of a picture stimulus.

In this context, earlier failures to demonstrate abnormalities in startle response during emotional picture viewing (e.g., Herpertz et al., 1999; Herpertz et al., 2000) may be related to the timing of the startle probe. This has been
shown to be the case for other disorders. For example, among psychopathic individuals, differences in startle patterns emerge at later probe times (e.g., 3,000 ms–4,000 ms) but not at early probe times (300 ms–2,000 ms; Levenston, Patrick, Bradley, & Lang, 2000; Sutton et al., 2002). Hazlett et al. (2007) included 4,000-ms and 5,000-ms probe times in their study, which may have allowed participants with the time needed to process the emotion content of the words. In contrast, Herpertz and colleagues utilized randomized probe times ranging from 3–5 s, making it difficult to isolate the role of probe timing.

The purpose of the current study is to add to our existing knowledge of emotion processing among individuals with BPD using the acoustic startle-response paradigm. Although some previous research has used nonpictorial stimuli (i.e., Hazlett et al., 2007), in the current study we chose to examine startle responses during affective picture viewing. Further, because there may be differences in the time course of emotion processing among individuals with BPD we also examined startle responses at two different probe times (2 s vs. 4.5 s).

It was hypothesized that, as compared with women with low levels of BPD features, women with high levels of BPD features would show significantly greater startle potentiation in response to unpleasant slides, particularly at a late probe time (4.5 s) that provided them sufficient time to process the emotional content of the slides.

Method

Participants

Participants were 65 Caucasian females incarcerated at the Taycheedah Correctional Institution, a multisecurity level prison in central Wisconsin.

A prescreen was conducted to exclude individuals who were 45 or more years old, who had performed below the fourth grade level on the prison’s standardized measures of reading or math achievement, who scored below 70 on a brief measure of intelligence quotient (i.e., the Shipley Institute of Living Scale; Zachary, 1986), or who had diagnoses of bipolar disorder or psychosis.

Individuals meeting the inclusion criteria were invited to participate in an ongoing study being conducted at the prison. All participants were presented with the elements of informed consent both orally and in writing. All received $10 for completing an initial diagnostic interview and questionnaires and an additional $25 for completing testing sessions between 2 and 24 months following the initial interview.

Materials

The Diagnostic Interview for Borderlines-Revised (DIB-R; Zanarini, Gunderson, Frankenburg, & Chauncey, 1989). Borderline personality disorder was assessed using the DIB-R. This 186-question, semistructured interview obtains information that the interviewer uses to rate the individual according to 22 core borderline personality characteristics (e.g., chronic helplessness/hopelessness/worthlessness/guilt, nondelusional paranoid experiences, self-mutilation, abandonment concerns, treatment regressions). These 22 summary statements yield scaled section scores, which in turn yield a total score between 0 and 10. The DIB-R was administered and scored in accordance to the manual by one of two paid, female research assistants who had recently completed their bachelor’s degrees. Individuals with scores 8 or higher were placed into the high-BPD feature group (n = 19). All others were placed into the low-BPD feature group (n = 43).

International Affective Picture System (IAPS; Center for the Study of Emotion and Attention, National Institute of Mental Health [CSEA-NIMH], 1999). For the picture-viewing task, pictures were selected from the IAPS. Pictures were selected on the basis of (1) normative ratings collected at the University of Florida (unpleasant: negative valence and high arousal; neutral: neutral valence and low arousal; pleasant: positive valence and high arousal) and (2) appropriateness for the target prison population (e.g., no pictures of men assaulting women). Original digitized IAPS pic-

1 These data overlap partially with data on the association between psychopathy and emotion-modulated startle presented separately by Sutton et al. (2002). BPD was not included as a variable in that study and the current study includes data from only six of the 24 psychopathic individuals included in Sutton et al. (2002).
tures were redigitized at $800 \times 600 \times 256$ using Adobe Photoshop (Version 4.0), with black framing where needed.

The IAPS numbers of the pictures included in this study were: For practice trials: 2791, 5030, 7004, 7010, 7040, 7050, 7185, 8041, and 9600. For neutral trials: 2190, 2840, 5500, 5510, 5520, 6150, 7000, 7006, 7020, 7080, 7100, 7130, 7150, 7160, 7175, 7491, 7500, and 7950. For pleasant trials: 4470, 4510, 4572, 4660, 4680, 5450, 5621, 5626, 5629, 8030, 8080, 8161, 8180, 8190, 8200, 8400, 8490, and 8501. For unpleasant trials: 1120, 1201, 1300, 1930, 2730, 3051, 3140, 3150, 3230, 3400, 6230, 6260, 6570, 9140, 9250, 9300, 9410, and 9570. A list of the presentation order of pictures with probe times is available on request.

**Additional Materials**

**Psychopathy assessment.** Psychopathy was assessed using the Hare Psychopathy Checklist-Revised (PCL-R; Hare, 2003). The PCL-R is composed of 20 items that tap the personality and behavioral characteristics of psychopathy. Each item is rated as 0 (not present), 1 (may be present), or 2 (definitely present). PCL-R scores were based upon information gathered during 1-hr semistructured interviews and reviews of the inmates’ prison files (including presentence investigation/s and conduct reports) that were conducted by trained graduate students. Scores of 30 or above are typically used to diagnose psychopathic personality.

The PCL-R is composed of two factors: Factor 1 assesses a cold, callous disregard for others (e.g., shallow affect, glibness, grandiose sense of self-worth, lack of empathy); and Factor 2 assesses a persistent antisocial lifestyle (e.g., juvenile delinquency, criminal versatility) (Harpur, Hakstian, & Hare, 1988).

**The Welsh Anxiety Scale (WAS; Welsh, 1956).** The WAS is a 39-item true/false questionnaire that was derived from the Minnesota Multiphasic Personality Inventory (MMPI) to measure anxiety and negative affect. Consistent with Gray’s (1991) anxiety construct, the WAS correlates approximately .66 with neuroticism and .33 with introversion.

**The Symptom Checklist-90-Revised (SCL-90; Derogatis, 1992).** The SCL-90 is a 90-item questionnaire that assesses the degree to which a participant is experiencing current major psychiatric symptoms. The measure consists of nine primary symptom scales (e.g., depression, schizophrenia) and three global indices. The Global Symptom Index (GSI) is one of the three indices and provides an estimate of individuals’ overall self-reported pathology. The SCL-90 demonstrates test–retest reliability coefficients ranging from .80–.90 (Derogatis, 1992), and correlates with other measures of psychopathology (e.g., MMPI, Social Adjustment Scale, and General Health Questionnaire; Derogatis, 1992).

**Apparatus**

Psychophysiology was collected and displayed using equipment and software from the James Long Company (Caroga Falls, NY). All signals were collected using an optically isolated, battery-powered Bio-amplifier (SA Instrumentation, San Diego, CA), then digitized at 500 Hz using a 12-bit analog-to-digital board. SnapStream software (HEM Corporation, Springfield, MI) was used to display and store the data using on a standard personal computer.

Electromyographic (EMG) signals from the orbicularis oculi muscle region were collected using Ag/AgCl minielectrodes (In Vivo Metric, Rochester, NY) filled with a standard electrolyte gel. Orbicularis electrodes were placed according to Lang (1995). An isolated ground electrode was placed in the middle of the forehead. Impedance values for all paired combinations of electrodes were below 20 kΩ. EMG signals were hardware-filtered in two ways—a high-pass filter set at 1 Hz and a 60-Hz notch filter—before being amplified 5,000 times.

Stimulation and data acquisition was controlled using STIM software and computer-to-computer hardware (James Long Company) on a standard personal computer. The acoustic startle probes were played through a 12-bit digital-to-analog board into a standard stereo receiver (Radio Shack Model STA-3850) and then through standard headphones (Radio Shack Model Optimus Pro40). Sound levels were calibrated at the start of each session (Radio Shack Model 33–2055). The startle stimulus was 102 dB of white noise presented for 50 ms, with immediate onset. Both signals were created and played at 20,000 Hz.
**Procedure**

Data on the DIB-R and supplementary materials were collected within the first 2 weeks of participation in the study. Participants then returned for a psychophysiological testing session between 2 and 24 months later. The psychophysiological data were collected by one of three female experimenters who were blind to group membership. These three women were all paid research assistants who had recently completed a bachelor's degree program.

At the physiological test session, the participant was told that she was going to view pictures presented on the monitor and that she would occasionally hear a short burst of noise through the headphones. She was instructed to focus on the pictures and ignore the noise bursts. Each picture was presented for 6 s, with a variable interpicture interval of 14 s to 21 s. Acoustic startles were presented at either 2 s or 4.5 s following picture onset, or midway through the interpicture interval. All participants received the same quasi-random order of pictures and probes. Pictures and probe times were paired in order to balance (1) picture content and probe time within a picture category and (2) overall serial position of picture category and probe time.

A set of nine practice trials (eight startle probes, 3.5 min) were used to acclimate the participant and for initial habituation of the eyeblink reflex to the startle probe. The 54 test trials lasted 21 min and presented 48 startle probes. There were 18 exemplars from each of the three picture categories. For each category, there were six exemplars with a startle probe at 2 s, six exemplars with a startle probe at 4.5 s, four exemplars with a startle probe during the subsequent interpicture interval, and two exemplars with no startle probe.

To verify that these pictures in this version of the paradigm would produce the typical pattern of emotion modulation, a preliminary study was performed with 19 female undergraduates between the ages of 18 and 23 years who received course credit for participation. As reported in Sutton et al. (2002), analyses showed full emotion modulation of startle magnitude at both the 2.0 s and 4.5 s probe times.

**Psychophysiology data reduction.** Digitized psychophysiological data were further reviewed and processed off-line using software from the James Long Company.

**Eyeblink reflex magnitude.** The measure of emotional reactivity during the picture-viewing task was the acoustic startle eyeblink-reflex magnitude. Recorded orbicularis oculi EMG signals were converted to microvolts, then band-pass-filtered at 30 Hz and 240 Hz. Once rectified, the signal was smoothed using a 60-Hz low-pass filter. For each acoustic startle probe, a baseline was computed by averaging values for 50 ms prior to the onset of the probe. Trials with baselines greater than 6 μV and more than 3 standard deviations (SD) above the mean baseline for the participant were dropped from further processing. This occurred on less than 2% of all trials across all participants.

The largest microvolt value between 40 and 90 ms postprobe onset was selected as the response peak. Response values were computed by subtracting the trial’s baseline from peak value. Peak values less than 3 SD above the trial’s baseline value were deemed nonresponses and were assigned a response value of 0 μV. These values were standardized within subject across the 48 startle probes during the test phase because of the large between-subjects variability in the distribution of response values in microvolts. These z scores denote the relative magnitude of a single response within each subject. Standardized values were averaged within each combination of the six Picture category × Probe time conditions. Interpicture interval responses also were averaged. Data from three participants (one from the borderline group) were dropped before analyses because of a lack of scorable responses.

**Results**

**Preliminary Results**

Descriptive data on the high- and low-BPD feature groups can be found on Table 1. Relative to the low-BPD feature group, the high-BPD feature group scored significantly higher on both the WAS, $F(1, 60) = 5.14$, $p < .05$ and PCL-R factor 2, $F(1, 60) = 11.86$, $p < .05$. The two groups did not differ on age, PCL-R factor 1, total number of crimes, or the GSI of the SCL-90.

Average blink magnitudes for the two groups were also compared. Average reflex magnitudes...
during the interpicture interval were not significantly different, $F(1, 61) = 5.93, ns$, nor were magnitudes during the practice trials $F(1, 61) = .04, ns$.

### Primary Analyses

To examine emotion modulated startle in this sample, an omnibus picture category (unpleasant vs. neutral vs. pleasant) $\times$ Probe time (2.0 vs. 4.5 s) $\times$ Group (low vs. high BPD features) mixed-design analysis of variance was conducted. Results revealed a significant main effect for picture category, $F(2, 120) = 18.9, p < .001, \eta^2_p = .24$, and a significant two-way interaction between picture category and time, $F(2, 120) = 4.96, p < .01, \eta^2_p = .08$. However, both of these effects were qualified by a significant three-way (Picture category $\times$ Probe time $\times$ Group) interaction, $F(2, 120) = 8.10, p < .01, \eta^2_p = .12$.

To clarify the significant three-way interaction, results were examined separately for each probe time. In order to compare the unpleasant picture versus neutral picture difference with the pleasant picture versus neutral picture difference across the high- and low-BPD feature groups, we used repeated interaction contrasts. Analyses at the 2-s probe time revealed a significant main effect for picture category, $F(2, 120) = 12.80, p < .001, \eta^2_p = .18$ that was qualified by a significant Picture category $\times$ Group interaction, $F(2, 120) = 5.45, p = .005, \eta^2_p = .08$. See Figure 1.

The interaction contrast indicated that the high- and low-BPD feature groups did not differ on the unpleasant pictures versus neutral pictures comparison, $F(1, 60) = .02, ns$. However, the contrast testing group differences for the pleasant versus neutral pictures comparison was statistically significant, $F(1, 60) = 9.01, p < .01, \eta^2_p = .13$. Further examination showed that this effect was due to differences during the pleasant picture trials. Specifically, contrasts showed that high-BPD feature group differed significantly from the low-BPD feature group during pleasant picture trials, $t(60) = 3.45, p < .01, \eta^2_p = .17$, but not during the neutral picture trials, $t(60) = −1.34, p = .18, \eta^2_p = .03$.

Analyses at the 4.5-s probe time also revealed a significant main effect for picture category, $F(2, 120) = 12.35, p < .001, \eta^2_p = .17$. However, the Picture category $\times$ Group interaction did not achieve significance, $F(2, 120) = 2.60, p = .08, \eta^2_p = .04$. See Figure 2. Despite the nonsignificant interaction, specific interaction contrasts were used to test the a priori hypothesis that, relative to participants with low-BPD features, those with high-BPD features would display greater startle responses to the unpleasant versus neutral pictures. This interaction contrast was not significant, $F(1, 60) = 1.46, p = .23, \eta^2_p = .024$. In addition, in contrast to the results at the 2-s probe time, the interaction contrast for pleasant versus neutral pictures was also nonsignificant, $F(1, 60) = 1.57, p = .215, \eta^2_p = .025$.

### Supplemental Analyses

There is debate regarding the categorical versus dimensional nature of personality disorders and associated symptoms (e.g., Widiger, 1992). To ensure that the results reported above were
not due to the use of the DIB-R categorically, a supplemental set of analyses using the DIB-R scores continuously was conducted. Like the categorical analyses, these analyses indicated a significant three-way interaction between picture category, probe time, and DIB score, $F(2, 120) = 2.94, p = .05, \eta^2_p = .05$. Further, as in the categorical analyses, examination of the contrasts indicated that DIB-R scores were not related to the difference between unpleasant and neutral picture trials at either the 2-s probe time, $F(1, 60) = .96, p = .33, \eta^2_p = .02$ or the 4.5-s probe time, $F(1, 60) = 1.41, p = .24, \eta^2_p = .02$.

**Discussion**

The results failed to support our hypothesis. Individuals with BPD did not differ from controls in the magnitude of their blink response during unpleasant pictures at either the short or long probe times, which suggests that these individuals are not characterized by a generalized sensitivity to negative emotion stimuli. These data—and others like it (e.g., Herpertz et al., 1999; Herpertz et al., 2000)—suggest that the emotion-processing abnormalities demonstrated by individuals with BPD may be specific to particular conditions and emotion contexts.

In their review of the literature on facial affect recognition, Domes, Schulze, and Herpertz (2009) note that the accumulated data suggest a “bias toward negative emotions (p. 10),” but specify that this bias is clearest for anger and fear. A specific bias was also demonstrated by Sieswerda et al. (2007), who found that it was the negative words associated with BPD symptomatology, specifically (e.g., “powerless”) that evoked the greatest differences in the performance of BPD participants versus controls on a Stroop task. Functional neuroimaging data support further
the need to distinguish between types of negative emotional stimuli. For example, in one study (Minzenberg et al., 2007), BPD individuals showed patterns of fronto-limbic activation that differed significantly from controls during the presentation of fearful facial expression, but also showed a different pattern of discrepant activation during the presentation of angry facial expressions.

In light of this, it is important to consider the nature of the emotion stimuli used in the present study. Among the IAPS slides used, there was a wide variety of unpleasant scenes, some of which might be conceptualized as primarily threat-related (i.e., a gun pointed at the viewer, a growling dog), some which might elicit disgust (i.e., a filthy toilet), and some that might elicit mixed emotion states (i.e., a severed hand, a burn victim). Thus, it is may have been the nonspecific character of the negative stimuli used in this study that contributed to the failure to elicit abnormalities in emotion responding. This possibility is consistent with research showing that the specific negative emotion evoked by a picture (i.e., fear vs. disgust) can moderate the associations between personality types and startle responses (e.g., Caseras et al., 2006).

Participants with BPD did not differ from controls in their responses to the unpleasant slides during the acoustic startle paradigm. However, participants with BPD did show significantly attenuated startle responses, relative to controls, at the short probe time, while viewing pleasant slides. This finding was unexpected, but could potentially be understood within the context of attention processing.

Differences in the attention processes of individuals with BPD were noted by Grootens et al. (2008), who studied sensory gating among patients with BPD. Their results showed that, although their responses to a

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**Figure 2.** Mean blink magnitude (z score) for the borderline and control groups across three picture categories at the 4.5-s probe time.
second auditory stimulus were normal, relative to controls BPD patients exhibited increased P50, N100, and P200 amplitudes in response to an initial auditory stimulus. According to the authors, this pattern suggests that, although sensory gating is normal among individuals with BPD, these patients may be characterized by a biologically based bias toward responding to new stimuli. This bias toward preattention (as represented by P50 amplitudes) and early attention allocation (as represented by N100 and P200 amplitudes) is similar to that exhibited by individuals high in sensation seeking (e.g., Wang & Wang, 2001).

In light of these data, the suppression of the startle response to pleasant pictures exhibited in this study may reflect biased attention allocation (both automatic and effortful). Although clearly speculative at this point, this possibility is consistent with research on emotion modulated startle. For example, blink attenuation is positively correlated with the “interest” level of pictures (Lang, 1995), leading some theorists to suggest that startle attenuation results from depletion of the attention resources available to process the startle probe when an individual is engaged in picture viewing (Anthony & Graham, 1985). One possibility is that, because of a predisposition to attend to these stimuli, this effect is exaggerated among individuals with BPD. Further, because the relation between “interest” and blink attenuation is curvilinear for unpleasant pictures (i.e., increased interest is related to increased attenuation only to a point at which defensive processes are evoked; Bradley, Codispoti, & Lang, 2006; Lang, 1995), this could explain the specificity of the results to pleasant pictures in the present study. Future research should consider the intersection of attention and emotion among individuals with BPD.

The current study is not without important limitations related to both the methodology and the sample. Previous studies of startle in participants with BPD have differed in the types of stimuli used (e.g., pictures vs. words) and in the conceptualization of BPD used (e.g., the importance of symptom subtypes). Thus, it would be ideal to compare different stimulus types and to consider the influence of different symptom groups within the same sample. The current study does not attempt to do this, however, and focuses on the use of picture stimuli and a general BPD classification. This limits our ability to specify the source of the differences that have appeared in prior research.

In addition to the limits on power that are presented by the use of a relatively small sample, there may be other limitations stemming from our reliance on a nonclinical population. Although the participants were classified according to a reliable diagnostic measure (i.e., the DIB-R) that compares favorably with other measures of BPD (Zanarini et al., 1989), the measure is not without flaws. Specifically, research suggests that the DIB-R may be overinclusive (Zanarini et al., 1989), thereby increasing the risk for “false positives” in the current sample. These data do test for differences in emotion modulated startle among participants with relatively higher or lower levels of BPD features and, in that sense, the current study is similar to those conducted in other nonclinical populations using assessments of BPD-like symptoms (e.g., Franklin et al., 2009; Minzenberg et al., 2007).

A second issue related to the sample is the use of an incarcerated population. Obviously there are major differences between incarcerated and nonincarcerated women. Thus, the individuals exhibiting high levels of BPD features in the current sample may differ in important ways from nonincarcerated women with the same symptom profile. This limits the generalizability of these findings. However, studies such as this one allow us to test the generalizability of findings from previous studies of hospitalized and community samples. Further, because BPD is among the most commonly occurring diagnoses in female inmates (e.g., Jordan, Schlenger, Fairbank, & Caddell, 1996), it is important to investigate the processes associated with the diagnosis in this population.

In summary, the current study failed to support the presence of a generalized sensitivity to negative emotion stimuli among incarcerated female offenders with high levels of BPD features. These unexpected results support the recent trend toward examining the processing of specific emotion stimuli (e.g., anger vs. fear; BPD-relevant and negative vs. general negative). Further, the unexpected difference in startle attenuation during pleasant picture viewing highlights the possible role for attention factors in the performance differences exhibited by individuals with
BPD, and offers an interesting route for future study.

References


Center for the Study of Emotion and Attention, National Computer Services, Inc.


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