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Emotional Granularity and Borderline Personality Disorder

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Abstract

This study examined the affective dysregulation component of borderline personality disorder (BPD) from an emotional granularity perspective, which refers to the specificity in which one represents emotions. Forty-six female participants meeting criteria for BPD and 51 female control participants without BPD and Axis I pathology completed tasks that assessed the degree to which participants incorporated information about valence (pleasant–unpleasant) and arousal (calm–activated) in their semantic/conceptual representations of emotions and in using labels to represent emotional reactions. As hypothesized, participants with BPD emphasized valence more and arousal less than control participants did when using emotion terms to label their emotional reactions. Implications and future research directions are discussed.

Keywords

borderline personality disorder; emotional processing; emotional granularity; affective dysregulation

Affective dysregulation is viewed as the central feature underlying borderline personality disorder (BPD), with other features of the disorder (e.g., behavioral dysregulation and chaotic relationships) conceptualized as strategies to cope with or consequences of this core deficit (e.g., Linehan, 1993; Westen, 1991). However, the exact nature and extent of affective abnormalities associated with BPD remain unclear due to a dearth of laboratory

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studies and translational research (Rosenthal et al., 2008). Our purpose in the current laboratory investigation was to examine individual differences in *emotional granularity* in BPD.

Barrett (Barrett, 2004; Feldman, 1995a, 1995b) developed the emotional granularity framework to understand and investigate individual differences in the valence–arousal circumplex model. The valence–arousal circumplex model purports that affective phenomena can be described as the combination of two dimensions: Valence refers to hedonic tone (pleasure or displeasure) of an affective phenomenon or stimulus, and arousal refers to the felt activation (activated or deactivated). Combining valence and arousal organizes affective states around the circumference of a circle. The valence–arousal circumplex is one of the most empirically supported dimensional models of affect (see Russell & Barrett, 1999). Although the parsimony, utility, and robustness of the valence–arousal circumplex model are generally agreed upon, meaningful differences have been documented across individuals and groups; the model does not account for everyone's experience and representations of affect to the same degree or manner (Feldman, 1995a, 1995b; Remington, Fabrigar, & Visser, 2000; Terracciano, McCrae, Hagemann, & Costa, 2003; Watson, Wiese, Vaidya, & Tellegen, 1999).

Emotional granularity refers to individual differences in the ability to distinguish among emotional states and is a function of how information about valence and arousal is incorporated into representations of emotion (Barrett, 2004). Individuals high in granularity represent their emotional states with high specificity (i.e., with a great deal of distinction between similar emotional states; e.g., anger is clearly distinct from annoyance), whereas individuals low in granularity represent their emotional states in more global terms (i.e., all negatively valenced states are represented as "feeling bad" or "depressed"). Two variables have been developed to operationalize granularity. *Arousal focus* refers to the amount of information about arousal or intensity (i.e., activation and deactivation) that is contained in representations of emotion. *Valence focus* refers to the degree to which information about the valence (i.e., unpleasantness and pleasantness) is contained in representations of emotions. Individuals high in both arousal and valence focus incorporate information about both the activation and the pleasantness of their experience in their verbal reports of emotion, corresponding to a high degree of distinction among emotional states. Barrett and colleagues have conducted a series of studies providing evidence for the construct validity of valence and arousal focus (Barrett, 2004; Barrett & Niedenthal, 2004; Barrett, Quigley, Bliss-Moreau, & Aronson, 2004; Feldman, 1995a, 1995b). However, the model's utility in accounting for pathological emotional processes has yet to be empirically substantiated.

Contemporary models describe individuals with BPD as experiencing emotions in an intense and crude manner. For instance, Linehan's (1993) influential biosocial model posits that BPD is associated with a lower threshold to respond, stronger responses, and slower return to baseline in reaction to emotional stimuli. The object-relations-based, transference-focused psychotherapy model identifies splitting, or "the radical separation of good and bad affect, of good and bad object" (Yeomans, Clarkin, & Kernberg, 2002, p. 10), as a primary defense mechanism in BPD. From this perspective, sudden changes from extremely good to extremely bad representations lead to the chaotic nature of the experience of individuals with BPD. Similarly, Beck's cognitive formulation suggests that dichotomous thinking is a key cognitive characteristic of individuals with BPD and posits that this type of thinking "contributes to the emotional turmoil and extreme decisions of these patients, as lack of ability to evaluate things in grades of gray contributes to the abrupt and extreme shifts patients with BPD make" (Beck, Freeman, Davis, and Associates, 2004, p. 198). Although these conceptualizations each rely on different theoretical foundations, they all describe individuals with BPD as representing emotions in a broad manner (i.e., very good or very bad) with little distinction among similarly valenced emotional states. In other words, the aforementioned models all suggest that individuals with BPD exhibit low emotional granularity.

Although no published research has thoroughly examined affective processes associated with BPD from an emotional granularity perspective, results from several relevant studies suggest that this may be a promising approach. Zanarini et al. (1998) identified 15 negatively valanced emotional states that individuals with BPD reported experiencing more than 50% of the time (e.g., depressed 66.3%, guilty 55.9%, very angry 52.6%, scared 58.9%). These findings suggest a great deal of overlap between negatively valenced states, which is consistent with low emotional granularity. Leible and Snell (2004) documented a negative association between BPD traits and emotional clarity. Furthermore, individuals diagnosed with BPD have been shown to exhibit lower levels of emotional awareness and a decreased capacity to coordinate mixed valence feelings (Levine, Marziali, & Hood, 1997) and to differ from patients with dysthymic disorder on affective availability, described as the extent to which the patient has access to a full range of emotions and can readily distinguish emotional states (Conklin, Bradley, & Westen, 2006). These findings suggest that individuals with BPD experience their emotions in an undifferentiated and less functional manner (i.e., exhibit less emotional granularity).

The current study more directly investigated BPD from an emotional granularity perspective. Participants meeting criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV*; American Psychiatric Association, 1994) for BPD and a control group without BPD and Axis I pathology completed tasks to examine granularity in conceptual representations of affect and granularity in the application of affect labels to describe emotional reactions. We hypothesized that participants with BPD would be high in valence focus and low in arousal focus relative to control participants. That is, we expected their representation of emotions would be strongly influenced by the valence (pleasantness or unpleasantness) and minimally influenced by arousal (activated or deactivated).

Method

Data were collected as part of a larger laboratory investigation of emotional responding in BPD. In addition to examining BPD from an emotional granularity perspective, the larger project had a second and separate goal of examining physiological responding. Although the results of the physiological investigation are not reported in this paper, we include some details about the physiological assessment paradigm to provide an accurate account of the procedures implemented in the study.

Participants

The sample consisted of 46 female participants meeting *DSM–IV* criteria for BPD (BPD group) and 51 nonclinical female control participants without BPD and Axis I pathology (control group). Thirty-six participants with BPD were recruited from the community via advertisements posted on a variety of Internet (e.g., craigslist.org) and community bulletin boards (e.g., near community mental health centers, coffee shops, and laundromats located throughout the greater Boston region).[1] The recruitment advertisments targeting participants with BPD asked, “Are your relationships very painful and difficult? Are you extremely moody? Do you frequently feel out of control? Are you often distrustful of others?” Eight participants with BPD were recruited from a family study of BPD funded by National Institute of Mental Health and being conducted at McLean Hospital. Control participants

[1]All recruitment materials were in English.

were recruited through the community via Internet and flyer advertisements that were placed at the same sites as the BPD advertisements (with the exception of near community mental health centers). The recruitment advertisements targeting control participants asked, "Are you a woman between 18 and 35, with no history of mental health problems? Do your relationships with others tend to be satisfying? Does your life tend to be steady without many ups and downs?" In exchange for participation, all participants were paid $40. We included the age limit of 35 years to minimize heterogeneity that significant age differences might introduce; also, research has shown that individuals with BPD are more labile at this age and that they show a reduction in BPD symptomatology over time as they mature (Zanarini, Frankenberg, Hennen, Reich, & Silk, 2006).

Inclusion criteria for the BPD group included meeting *DSM–IV* criteria for BPD as assessed by the Diagnostic Interview for *DSM–IV* Personality Disorders (described below). Inclusion criteria for the control group included endorsing two or fewer criteria of BPD and no current Axis I pathology. Exclusion criteria included a lifetime diagnosis of schizophrenia or schizoaffective disorder, current psychotic symptoms, a manic episode in the past 6 months, any major medical conditions that could substantially affect physiology or produce psychiatric symptoms (e.g., multiple sclerosis, systemic lupus erythematosus), a history of major head injury, current hearing problems, and a history of significant neurological problems.

In total, 116 participants enrolled in the study. One participant, who screened in as a potential control participant, withdrew consent after the study was described in detail. Study participation was terminated for 14 participants after completion of the first half of the session (i.e., the self-report measures and clinical interviews) who endorsed more than two but less than five BPD criteria on the BPD module of the Diagnostic Interview for *DSM–IV* Personality Disorders (described below). Thus, 101 participants were initially deemed eligible for the study. The first author conducted all study interviews. He received extensive training, supervision, and experience administering each of the semistructured interviews, including training and supervision from one of the primary developers of the BPD interview (Mary Zanarini), while working on two studies of BPD funded by the National Institute of Mental Health. All of the interviews were audiotaped. Tapes of 10 potential participants with BPD whose BPD status was unclear were reviewed by a clinical psychology doctoral student who had extensive experience assessing BPD and administering all of the study interviewers and who was previously trained and supervised by Mary Zanarini. There was disagreement on four of the 10 cases reviewed; these individuals were excluded from the final sample. Therefore, the final sample consisted of 46 individuals with BPD and 51 controls.

One participant with BPD withdrew consent after completing the semantic similarities test but before completing the emotion labeling task. Thus, all 97 participants had usable self-report and semantic similarity data, and 96 participants (45 BPD group, 51 control group) had usable emotion labeling data.

The average age of the final sample was 21.64 years (*SD* = 3.01, range = 18–33 years). The majority of participants were Caucasian (58.8%), with fewer individuals identifying as Asian (10.3%), African American (6.2%), Hispanic (4.1%), Pacific Islander (2.1%), Biracial (12.4%), and Other (6.2%). Participants had completed an average of 15.04 years of education (*SD* = 1.92, range = 11–20 years). Median annual family income fell in the range of $60,000–$70,000 per year, with a mode (n = 23) response of "$100,000-above."

BPD and control participants did not differ in age, $t(95) = 0.77$, $p = .44$; ethnicity, $\chi^2(6, N = 97) = 1.91$, $p = .93$; or annual family income category, $\chi^2(12, N = 89) = 10.45$, $p = .58$.

Although participants with BPD (*M* = 14.62) reported completing slightly fewer years of education than control participants (*M* = 15.41), $t(95) = .2.06$, $p = .04$, the associated effect size ($\eta^2 = .04$) suggests a very small difference.

As expected, participants with BPD demonstrated high rates of comorbidity, with 95.7% receiving an additional current or lifetime diagnosis. Eight (17.4%) met criteria for a current major depressive episode, 37 (80.4%) for a past major depressive episode, one (2.2%) for a past manic episode, three (6.5%) for panic disorder without agoraphobia, four (8.7%) for panic disorder with agoraphobia, four (8.7%) for agoraphobia without panic disorder, 12 (26.1%) for social phobia, two (4.4%) for obsessive–compulsive disorder, 15 (32.6%) for posttraumatic stress disorder, 18 (39.2%) for generalized anxiety disorder, four (6.5%) for anorexia, four (8.7%) for bulimia, and 7 (13.7%) for eating disorder not specified. Twenty-two (48%) participants with BPD indicated that they had been in individual therapy sometime over the past 2 years, with 15 indicating being in therapy for 1 to 11 months and 7 indicating being in therapy for more than 12 months out of the past 2 years. Thirteen (28.3%) participants with BPD reported taking psychotropic medications, with the breakdown of specific medications as follows: selective serotonin reuptake inhibitor antidepressant (e.g., Prozac, Celexa), 8 (17.3%); atypical/dual action antidepressant (e.g., Wellbutrin, Effexor), 5 (10.9%); anticonvulsant/mood stabilizer (e.g., Lamictal), 3 (6.6%); stimulant (e.g., Adderall), 3 (6.5%); atypical antipsychotic (e.g., Abilify), 3 (6.5%); benzodiazepine antianxiety (e.g., Klonopin), 2 (4.4%); standard antipsychotic (Trilafon), 2 (4.4%); nonbenzodiazepine antianxiety (e.g., Inderal), 2 (4.4%).

Measures

Diagnostic interviews—The BPD module of the *Diagnostic Interview for DSM–IV Personality Disorders* (DIPD–IV; Zanarini, Frankenburg, Sickel, & Yong, 1996) was used to assess the nine *DSM–IV* criteria for BPD. The use of the DIPD–IV in the Collaborative Longitudinal Personality Disorders Study has provided data in support of its reliability and validity (see Widiger, 2005, for an alternative perspective). Median kappa coefficients ranged from .69 to .97 for all Axis II disorders (Zanarini et al., 2000), and factor analytic studies have provided support for four of the *DSM–IV* Axis II constructs measured by the DIPD–IV (schizotypal, BPD, avoidant, and obsessive– compulsive; Sanislow et al., 2002, 2009). Select modules (mood disorders, anxiety disorders, psychotic screen, and eating disorders) from the *Structured Clinical Interview for DSM–IV–TR Axis I Disorders* (SCID; First, Spitzer, Gibbon, & Williams, 2002) were administered to assess the presence of Axis I diagnoses.

Self-report measures of Axis II pathology—The *Personality Assessment Inventory—Borderline Scale* (PAI–BOR; Morey, 1991) was administered to provide a continuous measure of BPD severity. The PAI–BOR consists of 24 items that tap features of severe personality pathology associated with BPD and are grouped into four, six-item subscales assessing affective instability, identity problems, negative relationships, and self-harm. Evaluating several self-report measures of BPD pathology in a large nonclinical sample, Trull (1995) identified the PAI–BOR as the most reliable self-report measure of BPD. A cutoff score of 38 on the PAI–BOR was used to identify the presence of significant borderline features. Cronbach’s alpha for the current sample was .97. The *Inventory of Interpersonal Problems—Personality Disorder Scales* (IIP–PD; Pilkonis, Kim, Proietti, & Barkham, 1996) was administered to assess Axis II pathology. Pilkonis and colleagues developed a screening method to identify individuals with significant Axis II pathology using a subset of items from the Inventory of the original 127-item IIP (Pilkonis et al., 1996; Scarpa et al., 1999). Subsequent studies produced high specificity and negative predictive power estimates in nonclinical samples demonstrating the accuracy of the 28-item IIP–PD scale as a screening tool for the presence or absence of a personality disorder (Stern, Kim, Trull, Scarpa, & Pilkonis, 2000). Stern et al. recommended adopting a cutoff score in the range of 1.1 to 1.3 (on a 0–4 scale), as this range is rarely exceeded by individuals who do not meet *DSM–IV* criteria for a personality disorder. Cronbach's alpha for the current sample was .96.

Self-reports of Axis I pathology—The 21-item short form of the *Depression, Anxiety, and Stress Scales* (DASS; Lovibond & Lovibond, 1995) was administered to measure current symptoms of depression, anxiety, and stress, three psychometrically distinct scales consisting of seven items each. Items are rated on a scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). The scale shows good psychometric properties (Antony, Bieling, Cox, Enns, & Swinson, 1998). Cronbach's alphas for the current sample were .86, .93, and .94 for the anxiety, depression, and stress scales, respectively.

Trait measures of emotional behavior—The 20-item *Positive and Negative Affect Schedule* (*PANAS)* measured two primary dimensions of mood: positive affect (PA; 10 items; $\alpha = .90$) and negative affect (NA; 10 items; $\alpha = .95$). The trait version instructing participants to report "how you feel in general" was used for the current study. The PANAS is widely used in experimental studies and has good reliability and validity (A. Mackinnon et al., 1999; Watson, Clark, & Tellegen, 1988). The 40-item *Affect Intensity Measure* (AIM; Larsen & Diener, 1987) was administered to assess emotional reactions to everyday events and mood traits. Although the AIM was originally conceptualized as a uni-dimensional construct, a series of confirmatory factor analyses identified a three-factor model that included 27 of the original 40 AIM items with subscales labeled as negative intensity (AIM-neg intensity), negative reactivity (AIM-neg reactivity), and positive intensity/reactivity (AIM-positive; Bryant, Yarnold, & Grim, 1996; Weinfurt, Bryant, & Yarnold, 1994). The scoring of the AIM described by Bryant et al. (1996) was used in the current study, and Cronbach's alphas for the current sample were .66, .90, and .90 for the AIM-neg intensity, AIM-neg reactivity, and AIM-positive subscales, respectively. The clarity subscale of the *Trait Meta-Mood Scale* (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) was administered to assess the degree to which individuals are able to understand and identify their emotions and discriminate among feelings (10-item clarity subscale, $\alpha = .92$). The construct validity of the TMMS has been established in studies showing the subscales to be related to scores on other self-report measures and behavioral/performance measures in theoretically predicted manners (Coffey, Berenbaum, & Kerns, 2003; Dizén, Berenbaum, & Kerns, 2005; Gohm & Clore, 2002). The five-item labeling subscale of the *Mood Awareness Scale* (MAS; Swinkels & Giuliano, 1995) assessed evaluations of how well participants felt that they were able to label their mood states. Convergent/divergent validity of the MAS has been established in studies showing the subscales to be related to scores on other self-report measures and behavioral/performance measures in theoretically predicted manners (Gohm & Clore, 2000, 2002). Cronbach's alpha for the current sample was .77.

General vocabulary ability—The Shipley Institute of Living Scale, Vocabulary Subscale (SIL-V; Shipley, 1940) was used to measure overall verbal (vocabulary) performance. For 40 multiple-choice items, respondents must choose which one of four words is closest in meaning to a target word (i.e., a synonym). Psychometric data suggest that this scale provides an accurate estimate of overall vocabulary performance (Dalton, Pederson, & McEntyre, 1987).

Procedure

Participants were mailed copies of the informed consent form and a packet of questionnaires that assessed traitlike characteristics (Demographics Questionnaire, PAI–BOR, IIP–PD, PANAS–trait, TMMS, MAS, and AIM). Upon participant arrival, study procedures were described and written informed consent was obtained. Consent was followed by the administration of the clinical interviews and completion of a questionnaire packet that included measures assessing statelike processes (DASS) and the SIL-V.

After completing the diagnostic interviews and self-report measures, participants were seated in a padded recliner directly in front of a 21-in. computer monitor. Their eyes were positioned at a distance of approximately forty inches from the monitor and six inches below the center of the screen, such that they were gazing up at a very slight angle. The sensors used for measuring physiological activity were attached.

A paper-and-pencil version of the semantic similarities task was administered once sensors were attached and before the psychophysiological assessment paradigm commenced. The semantic similarities task involved having participants rate the similarity of all possible pairs of 16 emotion terms that equally represented all octants of the affective circumplex (i.e., all combinations of valence and arousal), resulting in 120 ratings. The terms used in the current study were *afraid*, *aroused*, *calm*, *disappointed*, *enthusiastic*, *happy*, *nervous*, *peppy*, *quiet*, *relaxed*, *sad*, *satisfied*, *sleepy*, *sluggish*, *still*, and *surprised* (from Barrett, 2004, Study 2). Participants were instructed to rate the degree to which they thought the words were conceptually similar strictly on the basis of the meanings of words. Ratings were made on a 7-point Likert scale (1 = *extremely dissimilar*, 4 = *unrelated*, 7 = *extremely simil*ar). The adjective pairs were presented in a single random order. Similarity judgments are believed to represent cognitive organization. As described in detail below, these ratings were subjected to the multidimensional scaling procedures described by Barrett (e.g., Barrett, 2004; Kring, Barrett, & Gard, 2003) to derive estimates of valence and arousal focus representing the degree to which individuals weigh information about valence and arousal in their semantic/ conceptual structure of emotion language.

The primary component of the psychophysiological procedure was the picture processing paradigm developed by Peter Lang and colleagues (e.g., Bradley, Codispoti, Cuthbert, & Lang, 2001). Sixty-two images were selected from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005). A trial consisted of an IAPS image presented for 6 s, the presentation of a startle probe occurring 3.5–7 s after the onset of the IAPS image (emotion modulation of the eye-blink startle response was the primary physiological indicator of emotion), a recovery period lasting 6 s, a 4-s delay, and finally Self-Assessment Manikin (Bradley & Lang, 1994) and emotion labeling ratings. An intertrial interval ranging from 12 to 24 s followed the last rating.

For 16 of the IAPS images (same images as Barrett, 2004; representing all combinations of valence and arousal), in addition to the normal picture processing procedure task of rating valence and arousal in response to each image, participants were asked to rate their affective reaction using 16 emotion-related adjectives (same terms used for the semantic similarities task, representing all combinations of valence and arousal). Following the ratings of valence and arousal, a screen presenting the image asked participants, “How [insert emotion label] did you feel while viewing this image?” Ratings were made with a 7-point Likert scale (0 = *not at all*, 4 = *a moderate amount*, 6 = *a great deal*). Participants used the computer mouse to click on a box indicating their response and continued to make ratings for each of the 16 emotion terms. The presentation order of the 16 terms was determined randomly for each image. The image set for the emotion labeling task was constant across participants. However, the order of presentation varied across six stimulus presentation orders to control for possible order effects. Within each stimulus presentation order, the 16 IAPS images for the emotion labeling task were spread out with two or three emotion labeling images occurring within each block of 10 stimuli. This ensured equal distribution throughout the procedure. Each participant produced a 16 × 16 matrix. As described in detail below, these matrices were submitted to the quantitative procedure described by Barrett (2004) to derive estimates of valence and arousal focus.

Data Analyses and Results

Self-Report Measures

Table 1 contains means and standard deviations for each of the self-report symptom and trait measures for the two groups, as well as the results of a series of one-way analyses of variance (ANOVAs) conducted to test group differences. For the PAI–BOR scores, the mean for the control group (M = 11.27) fell substantially below and the mean for the BPD group (M = 46.18) exceeded the cutoff of 38 identified as indicating significant levels of BPD features (Trull, 1995). As for general Axis II functioning, the mean of the control group (M = 0.52) on the IIP–PD scales fell well below and the mean of the BPD group (M = 2.02) exceeded the cutoff score of 1.38 suggested as indicating the likely presence of an Axis II diagnoses (Stern et al., 2000). Scores on the DASS indicated that the control group fell in the normal range on the depression (M = 2.04), anxiety (M = 1.13), and stress subscales (M = 7.38), whereas the BPD fell in the moderate range on the depression scale (M = 18.05) and in the moderate to severe range on the anxiety (M = 14.52) and stress subscales (M = 25.66) (Antony, Orsillo, & Roemer, 2001).

On trait measures of emotional responding (see Table 1), the BPD group reported experiencing negative affect more frequently (PANAS–NA, AIM-neg reactivity) and more intensely (AIM-neg intensity) than the control group did. The BPD group reported experiencing positive affect less frequently (PANAS–PA) than the control group, but the two groups did not differ on the intensity of positive episodes (AIM-positive). Participants with BPD also described experiencing their emotions in a less clear manner (TMMS-Clarity) and reported being less able to label their emotions (MAS-Labeling) than control participants did.

Finally, a significant difference emerged on the SIL-V, with control participants tending to exhibit higher general vocabulary ability than participants with BPD did. This finding is noteworthy, given that the semantic structure of emotion knowledge and the use of emotion labels to describe experiences are both likely influenced by general vocabulary ability. This suggested that general vocabulary should be included as a covariate in the analyses.

Semantic Similarities

Multidimensional scaling (MDS) was used to analyze the similarity ratings. MDS is an alternative to factor analysis when the goal is to detect meaningful underlying dimensions in observed similarities or dissimilarities (i.e., distances) between stimuli (Davison, 1983). To examine mental representations of affect knowledge and derive estimates of semantic valence and arousal focus, we followed the MDS procedures described by Kring et al. (2003). First, separate MDS analyses were applied to similarity ratings from the BPD and control groups to determine whether the best fitting models were congruent enough to conduct one combined individual difference MDS technique (INDSCAL). INDSCAL analyses provide information about what overall structure best accounts for the similarity ratings and computes dimension weights for each individual, quantifying the extent to which a particular attribute or dimension influenced the similarity ratings. MDS solutions derived from similarity judgments of emotion-related words consistently support a two-dimensional model with valence and arousal dimensions, and INDSCAL weights represent the degree to which individuals weigh valence and arousal when making similarity judgments (i.e., estimates of semantic valence and arousal focus; see Barrett, 2004).

INDSCAL produces solutions with two or more dimensions. Because a two-dimensional solution was expected, to determine the best fitting model for each group, we estimated separate nonmetric group Euclidean distance analyses (group solution; Barrett, 2004; Kring et al., 2003). This procedure provided fit values identical to the INDSCAL solution. It also provided fit values for a one-group solution and was used to assess model fit only. All other results are based on the INDSCAL analyses.

Three criteria were used to evaluate dimensionality: (a) fit, (b) interpretability, and (c) reproducibility across samples. Fit was evaluated by two estimates. A stress value indicates the extent of a solution's deviation from the observed data (higher value = worse fit), and the squared correlation (R^2) signifies the proportion of variance in the scaling solutions that is accounted for in the distances between emotion-related words (higher value = better fit). For both groups, a clear elbow emerged in the stress value at two dimensions. This suggested that the two-dimension solution fit better than the one-dimension model, but adding additional dimensions did not substantially improve fit. Both estimates suggested slightly better fit (lower stress values, higher R^2) for the control group than the BPD group. In sum, the estimates of stress and R^2 suggest that the two-dimension solution fit the data best for both groups but perhaps slightly better for the control group. For both BPD and control participants, the affect terms were ordered in a circular structure around the two dimensions of valence (Dimension 1, horizontal axis) and arousal (Dimension 2, vertical axis) in a similar manner. Thus, the valence and arousal dimensions that have consistently emerged in past studies fit the data best for both groups.

Congruent coefficients were derived to evaluate the replicability of the solutions across groups. These coefficients were computed from the dimension 1 (valence) and dimension 2 (arousal) coordinates derived for each affect term in each model. These coordinates were highly correlated across the groups for the valence ($r = -.99$, $p < .001$) and arousal ($r = -.99$, $p < .001$) dimensions. The cross-dimension correlations (control-valence with BPD-arousal and vice versa) were not significantly different from zero (rs < .13, ps > .65). These correlations indicate an excellent match between the BPD and control semantic structures.

The high degree of congruence allowed for a final combined INDSCAL analysis to allow for direct empirical comparisons between the two groups. INDSCAL produces estimates of model fit (i.e., stress values and R^2) for each participant. Overall, the two-dimensional solution fit the data adequately (stress value = .17, $R^2 = .83$). INDSCAL also computed individual subject weights indicating the degree to which each participant weighted valence (semantic valence focus) and arousal (semantic arousal focus) when making similarity ratings of the affect terms.

A series of hierarchical regression analyses examined the association between group (BPD vs. control) and estimates of fit (stress, R^2), semantic valence focus, and semantic arousal focus. In the first step, group was entered as a dummy coded variable (control = 0, BPD = 1). In the second step, SIL-V scores were entered to control for general vocabulary. Scores from all of the subscales of the DASS were entered into the third step. Because the current study did not include a clinical control group, this final step was included to control for the general effects of psychopathology. The results of the findings are presented in Table 2.

Results were consistent across the goodness-of-fit indicators (stress and R^2). The first step demonstrated a bivariate association between group and goodness of fit, with the two-dimensional valence-arousal model fitting the data better for the control group. Step 2 showed that this relationship remained significant when controlling for general vocabulary ability, which exhibited a significant, positive relationship with fit. In Step 3, the relationship between group and fit was no longer statistically significant. However, a significant, negative relationship between anxiety symptoms and fit emerged. In sum, these results suggest that two-dimensional valence-arousal model does not account for the similarity ratings as well for the BPD group as for the control group. However, this difference appears to be accounted for by the higher levels of anxiety reported by the BPD group.

None of the predictors were significantly associated with semantic valence focus. In contrast, group was a significant predictor of semantic arousal focus at Step 1, indicating that at a bivariate level, the BPD group exhibited lower arousal focus. This association was no longer significant at Step 2, when controlling for general vocabulary, which was positively associated with semantic arousal focus. At Step 3, the group effect was not statistically significant suggesting that the difference in semantic arousal focus that emerged in Step 1 was due to difference between the BPD and control groups in general vocabulary ability. At Step 3, significant negative and positive associations emerged between semantic arousal focus and the Anxiety and Stress subscales of the DASS, respectively,

Emotion Labeling Task

Procedures described by Barrett (2004) were followed to compute indices of valence and arousal focus from the emotion labeling task ratings (hereafter referred to as EL valence focus and EL arousal focus). Each participant produced a 16 (ratings) × 16 (pictures) matrix of data representing 120 correlations among each emotion label (i.e., each pairwise emotion label pair, such as afraid–aroused, afraid–calm, and aroused– calm) across the 16 images. Quantifying granularity (i.e., producing indices of EL valence and EL arousal focus) involved examining and summarizing correlations among each emotion label pair. For instance, as described by Barrett (2004), if a participant sometimes reports feeling emotion A and emotion B in response to an image and at other times reports feeling emotion A or emotion B, but not both, this would result in a zero correlation. In contrast, if a participant always reports feeling emotion A and emotion B together to the same degree, that would result in a correlation of 1. EL valence and EL arousal indices were formed by estimating how much of an individual's patterns of correlations is accounted for by the valence or arousal.

First, participants' data were organized into separate 16 × 16 matrixes representing correlations among each emotion label (referred to as P-correlation matrices). Second, Fisher's *r* to *Z* transformations rescaled the sample *r*s and yielded a more normal distribution, which is more optimal for use in hypothesis testing. The next step consisted of correlating each participant's P-correlation matrix with the sample's valence- and arousal-based semantic similarity matrix (i.e., entire sample's solution, not idiographic estimates, derived from the MDS analyses described above) that contained the same word set. The proportion of variance in the correlations between ratings of emotional experiences accounted for by the valence-based similarity of words describes how much each participant is utilizing valence information when using emotion labels and is an indicator of EL valence focus. Higher levels of variance accounted for suggest that valence information was being heavily relied upon when using labels to describe experience and are indicative of greater levels of valence focus (Barrett, 2004). Because the resulting estimate is a correlation coefficient (*r*), a final Fisher's *r* to Z transformation produces the final estimate of EL valence focus. A similar procedure was used to derive estimates of EL arousal focus.

Hierarchical regression analyses similar to those described above for the semantic similarities data were conducted to examine the relationship between group and EL valence and arousal focus, with one additional step. In Step 3 of the analyses, after controlling for general vocabulary ability, the estimates of semantic valence or arousal focus (corresponding to the outcome of that particular analysis) were entered. This evaluated and controlled for an association between how individuals think about emotions and how they use labels. Step 4, as with Step 3 in the above analyses, controlled for general effects of Axis I and Axis II pathology.

The results of the regression analyses are summarized in Table 3. The bivariate association (Step 1) between group and EL valence focus approached statistical significance ($p < .07$), with a trend for participants with BPD to exhibit larger EL valence focus than participants in the control group. At Step 2, neither group nor general vocabulary ability was significantly associated with BPD. At Step 3, none of the predictors were significantly associated with EL valence focus. At Step 4, the association between group and EL valence focus became statistically significant, indicating that when controlling for the variability in the outcome due to general Axis I pathology, a diagnosis of BPD was significantly associated with larger EL valence focus. None of the other variables in Step 3 were significantly associated with EL valence focus.

Group also demonstrated a significant bivariate (Step 1) association with EL arousal focus, with BPD participants exhibiting smaller EL arousal focus than control participants. This association remained significant in all steps of the analysis. The only other significant predictor of EL arousal focus that emerged was semantic arousal focus. The degree to which arousal was emphasized when using labels to describe emotional reactions was modestly ($\beta = .25$) but significantly associated with the degree to which arousal was emphasized when making similarities ratings.

Discussion

We investigated the affective dysregulation component of BPD from an emotional granularity perspective by examining how individuals with BPD use information about valence and arousal to conceptually represent emotions and use emotion labels to describe experience. We hypothesized that participants with BPD would tend to emphasize valence more and arousal less in their representations of emotion, contributing to an “all-or-nothing” pattern of emotional responding low in emotional granularity.

Our hypothesis that BPD would be associated with increased valence focus, or an increased tendency to emphasize information about valence in representations of emotions, was partially supported. Although data from the semantic similarities task did not indicate that BPD was associated with a larger proclivity to emphasize valence when making rational judgments about emotion concepts, data from the EL task indicated that BPD was associated with an increased tendency to emphasize valence when using emotion labels to describe experience. At a bivariate level, this association approached statistical significance ($B = .07$, $p = .068$). It became statistically significant when controlling for overall levels of Axis I pathology ($B = .16$, $p = .025$). We conducted follow-up analyses in an attempt to understand why the relationship became stronger and reached statistical significance when controlling for the DASS subscales. We discovered that this was due to a suppressor effect (D. P. MacKinnon, Krull, & Lockwood, 2000). Although the direct relationship between BPD status and EL valence focus was positive, the indirect relationship from BPD to EL focus through anxiety was negative.[2] Thus, when we took into account this indirect effect, which was in the opposite direction of the direct effect, the relationship between BPD status and EL arousal focus became statistically significant. This finding highlights the importance of

[2]The distribution of products test (D. P. MacKinnon, Lockwood, & Williams, 2004) was used to evaluate the indirect effect.

controlling for the heterogeneity in BPD due to high comorbidity with Axis I disorders (for a review, see Pfohl, 2005) when examining emotional processes in BPD. Because of the combination of the BPD-EL valence focus association approaching statistical significance at a bivariate level and reaching statistical significance when controlling for Axis I pathology, this effect is worthy of consideration. However, we emphasize the need for replication in future studies that more carefully control for Axis I pathology.

Support for our hypothesis that BPD would be associated with smaller arousal focus was more robust. First, a significant bivariate relationship emerged between group and semantic arousal focus. However, this relationship was no longer significant when controlling for general vocabulary ability. Second, a bivariate relationship emerged between group and EL arousal focus, and this remained significant when controlling for general vocabulary ability, semantic arousal focus, and Axis I and II pathology.

One additional notable result emerged. The two-dimensional valence-arousal MDS solution fit the data significantly better for the control group than the BPD group. This does not suggest that there were additional attributes (i.e., dimensions or factors) important to participants with BPD representation of affect knowledge, as the fit statistics indicated that the two-dimensional solution was optimal for both groups. Instead, this suggests more unreliable variance in the similarity judgments made by participants with BPD than by control participants. This effect was no longer statistically significant when controlling for Axis I, and the BPD–poorer fit association seems to have been accounted for by higher levels of anxiety endorsed by the BPD group.

The only previous study examining conceptual/semantic structure of emotion knowledge and psychopathology administered the semantic similarities task to individuals diagnosed with schizophrenia and controls without a history of Axis I or II pathology (Kring et al., 2003). Participants with schizophrenia weighted valence more and arousal less than normal controls did in their mental representations of affect knowledge, and one indicator of model fit (RSQ) suggested more disorganization in the representations of emotions in the schizophrenia group. The schizophrenia effect reported in the previous study is similar to the BPD effect that emerged in the current study. Participants diagnosed with schizophrenia and BPD both emphasized arousal less than and exhibited slightly more disorganized structures than did normal controls. The earlier study documented that individuals diagnosed with schizophrenia emphasized valence more than did normal control participants, an effect that did not emerge in the current study. Kring et al. (2003) did not assess or control for general vocabulary ability. Therefore, it is unclear whether their results were due to emotion-specific semantic representations or language ability more generally. In addition, Kring et al. examined granularity only at the semantic/conceptual level and did not examine granularity in how labels are applied to experience, processes that are likely related yet distinct (Barrett, 2004).

How individuals experience and represent emotions involves a variety of complex processes operating a multiple levels of processing and functioning (Barrett, Mesquita, Ochsner, & Gross, 2007). The two tasks employed in the current study tap two separate but related processes. The semantic similarities task measured how individuals think about emotions on a rational level and conceptually represent emotions in semantic knowledge. The emotion labeling task assessesed how individuals represent emotional reactions when using emotion labels. One other important piece of information that might inform the interpretation of the current findings is the amount of arousal and valence that participants experienced in response to the IAPS images. Immediately following the presentation of the IAPS images and immediately before rating reactions to the images using emotion terms, current feelings of valence and arousal were assessed with the Self-Assessment Manikin (SAM; Bradley &

Lang, 1994). SAM is an animated, interactive computer display that utilizes a cartoon figure that participants use to rate how "happy" or "unhappy" (valence) and how "calm" or "excited" (arousal scale) they felt. Therefore, it is a nonverbal assessment of arousal and valence levels. Table 4 presents zero-order correlations among estimates of valence and arousal focus and SAM ratings of valence and arousal levels.[3] There was only one significant association among the semantic and EL estimates of valence and arousal focus. Semantic arousal focus and EL focus were modestly correlated ($r = .31$), suggesting a slight tendency for individuals who emphasize arousal in their conceptual representations of emotion to utilize arousal when using emotion labels to represent their emotional reactions. This is consistent with the findings of Barrett (2004) demonstrating that how individuals represent their emotional experience in everyday life is only modestly related to semantic understanding of words.

Table 4 also indicates that semantic and EL estimates of valence and arousal focus were only modestly related to self-reports of the experience of valence and arousal in response to the IAPS images. Regarding the semantic estimates, only semantic arousal focus was negatively associated with SAM valence ratings, suggesting that individuals who emphasize arousal more in their semantic conceptualization of emotion tend to report less valence in response to the IAPS images. Although both EL estimates were associated with SAM valence and arousal ratings, the size of these associations were modest with the largest association between EL valence and SAM valence ($r = .33$), indicating individuals who tend to emphasize valence when using labels to represent their experience tend to report experiencing more valence in reactions to emotional stimuli. Similar to the semantic arousal focus–SAM valence relationship, the association between EL arousal focus and SAM valence ratings was negative. This suggest that the more one attends to information regarding arousal when using labels, the less one responds emotionally on the valence dimension.

Finally, to examine whether or not the differences between BPD and control participants on EL valence and arousal focus reported above were accounted by differential responses to the IAPS images, we added the SAM valence and arousal ratings as covariates to the regression analyses. The negative association between BPD status and EL arousal focus was maintained, but the positive association between BPD status and EL valence was no longer statistically significant and appeared to be accounted for by higher levels of responding by the BPD group on the valence dimension.

These follow-up analyses aid in the interpretation of the primary results in several important ways. First, they highlight that valence and arousal focus, or the degree to which information about arousal and valence is incorporated into representations of emotion, is related to, but distinct from, how one responds emotionally along the valence and arousal dimension. Second, they highlight the complexity of emotional granularity. For instance, how one represents emotions conceptually/semantically is only modestly related to how one uses emotion labels to represent emotional reactions. Finally, the follow-up analyses demonstrated the robustness of the finding that BPD is associated with smaller EL arousal focus, as this effect maintained when controlling for self-reported valence and arousal. At the same time, the follow-up analyses highlighted the tenuous nature of the finding that BPD was associated with larger EL valence focus, as this association was not maintained when controlling for self-reports of valence and arousal.

[3]The SAM arousal ratings range from *calm* (1) to *extremely activated* (9). The SAM valence ratings range from *unpleasant* (1) to *neutral* (5) to *pleasant* (9). Thus, we used a 1–9 score for valence. However, for valence, we computed how much valence an individual indicated (whether positive or negative) derived by taking the absolute value of 5 minus the raw score (i.e., how much the value differed from neutral). Therefore, SAM valence scores ranged from 0 (*neutral*) to 4 (*extremely positive or extremely negative*).

More research measuring emotional granularity on multiple levels of processing is needed to clearly elucidate emotional granularity's role in BPD and psychopathology more generally. Multiple possibilities exist. First, lower levels of emotionally granularity, in particular the failure to utilize information about arousal to moderate representations of emotion, may represent a nonspecific effect associated with multiple types of psychopathology. Alternatively, different patterns of emotional granularity might be associated with different forms of psychopathology. For instance, perhaps panic disorder would be associated with larger arousal focus, as opposed to the smaller semantic arousal focus documented in schizophrenia and BPD, given that a large body of research has documented that individuals with panic disorder are more vigilant toward information suggesting increased arousal (for a review, see McNally, 2002). In the current study, higher levels of anxiety as measured by the DASS were associated with smaller semantic arousal focus, indicating that, compared to those reporting lower levels of anxiety, individuals who endorsed more anxiety symptoms tended not to emphasize information about arousal when making rational judgments about emotion concepts. Future research is needed to understand this unexpected finding. It could be that anxiety in the context of BPD is different than anxiety without BPD, or it could be that vigilance towards physical manifestations of arousal does not necessarily translate to an increased ability to use this information to construct refined representations of emotion. In fact, increased anxiety might deplete attentional resources needed to do so. Given the differential role of arousal across anxiety and mood disorders (e.g., Brown, Chorpita, & Barlow, 1998), examining the possibility of different patterns of emotional granularity across anxiety and mood disorders (e.g., high arousal focus and low valence focus associated with diagnoses characterized by high levels of anxious arousal vs. low arousal and high valence associated with associated with diagnoses characterized by high levels of anxious apprehension) would be a prudent next step in establishing the viability of the emotional granularity perspective in understanding emotional processes underlying psychopathology.

The results of the EL task build upon past studies that have documented that individuals with BPD or high levels of BPD traits describe themselves as having difficulty identifying, differentiating, understanding, and labeling emotions (e.g., Leible & Snell, 2004; Levine et al., 1997; Webb & McMurran, 2008) in two important ways. First, the results of the current study identified two potential mechanisms that might contribute to these processes: (a) high levels of valence focus (b) and low levels of arousal focus, leading to a less refined application of emotion labels. Second, the estimates of EL valence and arousal focus were derived from behavior (i.e., from the correlations among emotion labels used to describe reactions to stimuli) and were not self-report descriptions. Therefore, they were less susceptible to biases associated with self-report. Overemphasizing valence and underemphasizing arousal might also be an explanation for the findings from other laboratory studies that have documented an association between BPD and lower levels of emotional awareness, less capacity to coordinate mixed valence feelings, and lower accuracy at recognizing facial expressions of emotion (e.g., Levine et al., 1997).

A few methodological limitations of the study should be noted. The absence of a clinical control group is the most notable limitation. Although statistically controlling for Axis I pathology in the regression analyses indirectly addresses this issue, future research is needed to determine whether the effects documented are specifically due to BPD pathology or psychopathology more general. The ecological validity of the picture processing paradigm is questionable. In the real world, people do not sit passively and view emotionally evocative stimuli but instead interact with and actively respond to stimuli (including other people) that produce emotional responses. Nonetheless, the laboratory may be the only setting in which both valence and arousal can be systematically varied and carefully controlled. Future research using methodologies such as experiential sampling procedures, the methodology used to initially document the construct validity of valence and arousal focus, would allow for an examination of these processes in individuals' natural environments. The cross-sectional design also provides no information as to whether the documented effects are causes or consequences of BPD pathology. Future longitudinal research examining relationships between BPD and valence and arousal focus over time is needed to address this issue. Finally, participants of the study were relatively young, well educated, and affluent. To minimize heterogeneity that significant age differences might introduce, we implemented a 35-year upper age limit, and the study was conducted on a campus surrounded by several other college campuses. Although not exclusively targeted, college students represented a vast pool of potential participants because of the study's location. Attempts to replicate these findings should include a sample more representative of the population of individuals diagnosed with BPD.

Despite these limitations, the results of the study have important implications and suggest avenues for future research. The current findings suggest that emotional processes underlying BPD might not be due to overall levels of arousal and associated physiological activity. Instead, the affective dysregulation of BPD may be due to how this information is incorporated into representations of emotion. These preliminary findings suggest that interventions targeting BPD could be enhanced by novel strategies (e.g., biofeedback techniques) to help more fully integrate information about arousal into representations of emotional experience leading to higher levels of emotional granularity. Future research incorporating methodologies that more directly assess how physiological indicators of emotion are incorporated into experience and guide behavior, such as a heartbeat detection task (e.g., Barrett et al., 2004) or the Iowa Gambling Task (e.g., Bechara et al., 2001), could lead to a better understanding of the relationship between physiological activity and how this information is incorporated into representations of emotion and whether related mechanisms contribute to BPD pathology and should be considered as targets for intervention.

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Table 1

Descriptive Statistics for Self-Report Measures Completed for Each Group

	Control	BPD		
Measure	***M* (SD)**	***M* (*SD*)**	***F***	***df***
PAI–BOR	11.25 (5.76)	46.18 (9.82)	467.125***	1, 95
IIP–PD	0.52 (0.36)	2.02 (0.69)	183.35***	1, 95
DASS-Anxiety	1.06(1.89)	14.87 (8.93)	116.31***	1, 95
DASS-Depression	2.00 (2.71)	18.48 (11.56)	97.83***	1, 95
DASS-Stress	3.84 (1.93)	24.73 (9.39)	212.73***	1, 95
PANAS–NA	12.63 (2.76)	29.70 (8.34)	190.39***	1, 95
PANAS–PA	34.84 (5.87)	29.25 (6.32)	13.46***	1, 95
TMMS-Clarity	44.33 (7.77)	29.89 (8.07)	80.52***	1, 95
MAS-Labeling	24.57 (3.96)	19.52 (5.30)	28.55***	1, 95
AIM-positive	3.56 (0.62)	3.81 (0.89)	2.71	1, 95
AIM-neg intensity	2.31 (0.58)	4.39 (0.82)	209.55***	1, 95
AIM-neg reactivity	3.65 (0.71)	4.13 (0.78)	9.94***	1, 94
SIL-V	33.02 (3.11)	30.76 (3.33)	11.81**	1, 94

Note. BPD = borderline personality disorder group; *df* = degrees of freedom; PAI–BOR = Personality Assessment Inventory—Borderline Scale; IIP–PD = Inventory of Interpersonal Problems—Personality Disorder Scales; DASS = Depression, Anxiety, and Stress Scales; PANAS–NA = Positive and Negative Affect Scales—Negative Affect subscale; PANAS–PA = Positive and Negative Affect Scales—Positive Affect subscale; TMMS = Trait Meta-Mood Scale; MAS = Mood Awareness Scale; AIM = Affective Intensity Measure; SIL-V = Shipley Institute of Living Scale, Vocabulary Subscale.

** $p < .01$.

*** $p < .001$.

Table 2

Summary of Multiple Regression Analysis Predicting INDSCAL Estimates of Fit and Semantic Valence and Arousal Focus

Outcome	Variable	*B*	*SE B*	β	*t*
Stress					
Step 1	(R^2 = .13)				
	Group	.030	.008	.36	3.69*
Step 2	(R^2 = .19)				
	Group	.023	.008	.27	2.72*
	SIL-V	−.003	.001	−.26	−2.58*
Step 3	(R^2 = .25)				
	Group	.021	.015	.25	1.45
	SIL-V	−.003	.001	−.26	−2.66*
	DASS-Anxiety	.002	.001	.40	2.33*
	DASS-Depression	.000	.001	.03	0.21
	DASS-Stress	−.001	.001	−.36	−1.90
RSQ					
Step 1	(R^2 = .14)				
	Group	−.068	.017	−.37	−3.91*
Step 2	(R^2 = .19)				
	Group	−.054	.018	−.30	−2.99*
	SIL-V	.006	.003	.23	2.33*
Step 3	(R^2 = .26)				
	Group	−.042	.031	−.23	−1.34
	SIL-V	.006	.003	.23	2.39*
	DASS-Anxiety	−.004	.002	−.41	−2.41*
	DASS-Depression	.000	.001	−.04	−0.26
	DASS-Stress	.002	.001	.32	1.71
Semantic valence focus					
Step 1	(R^2 = .00)				

Outcome	Variable	*B*	*SE B*	β	*t*
	Group	−.009	.014	−.06	−0.59
Step 2	(R^2 = .04)				
	Group	−.018	.015	−.13	−1.20
	SIL-V	−.004	.002	−.21	−1.90
Step 3	(R^2 = .09)				
	Group	.021	.027	.15	0.80
	SIL-V	−.004	.002	−.21	−1.90
	DASS-Anxiety	.000	.001	.04	0.21
	DASS-Depression	−.001	.001	−.23	−1.29
	DASS-Stress	−.001	.001	−.18	−0.83
Semantic arousal focus					
Step 1	(R^2 = .07)				
	Group	−.052	.020	−.26	−2.62*
Step 2	(R^2 = .19)				
	Group	−.027	.020	−.14	−1.37
	SIL-V	.011	.003	.38	3.80*
Step 3	(R^2 = .27)				
	Group	−.057	.034	−.29	−1.69*
	SIL-V	.011	.003	.38	3.90*
	DASS-Anxiety	−.005	.002	−.44	−2.60*
	DASS-Depression	.001	.001	.15	0.93
	DASS-Stress	.004	.001	.45	2.38*

Note. INDSCAL = individual differences multidimensional scaling technique; *B* = unstandardized regression coefficient; *SE B* = standard error of the unstandardized regression coefficient; β = standardized regression coefficient; R^2 = squared correlation; IIP–PD = Inventory of Interpersonal Problems—Personality Disorder Scales; DASS = Depression, Anxiety, and Stress Scale; SIL-V = Shipley Institute of Living Scale, Vocabulary Subscale.

* $p < .05$.

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Table 3

Summary of Multiple Regression Analysis Predicting Estimates of Emotion Labeling Valence and Arousal Focus

Outcome	Variable	*B*	*SE B*	β	*t*
Valence focus					
Step 1	(R^2 = .04)				
	Group	.071	.038	.18	1.84[a]
Step 2	(R^2 = .05)				
	Group	.056	.040	.15	1.39
	SIL-V	−.007	.006	−.12	−1.08
Step 3	(R^2 = .06)				
	Group	.062	.041	.17	1.52
	SIL-V	−.005	.006	−.09	−0.85
	Sem VF	.317	.276	.12	1.15
Step 4	(R^2 = .12)				
	Group	.162	.071	.43	2.29*
	SIL-V	−.007	.006	−.12	−1.13
	Sem VF	.266	.279	.10	0.95
	DASS-Anxiety	−.006	.004	−.31	−1.63
	DASS-Depression	.003	.003	.17	0.95
	DASS-Stress	−.003	.003	−.20	−0.93
Arousal focus					
Step 1	(R^2 = .11)				
	Group	−.120	.036	−.33	−3.35*
Step 2	(R^2 = .12)				
	Group	−.109	.038	−.30	−2.87*
	SIL-V	.005	.006	.09	0.89
Step 3	(R^2 = .17)				
	Group	−.113	.038	−.31	−2.95*
	SIL-V	.004	.006	.08	0.72
	Sem AF	−.211	.259	−.08	−0.82

Outcome	Variable	*B*	*SE B*	β	*t*
Step 4	(R^2 = .21)				
	Group	−.209	.067	−.57	−3.14*
	SIL-V	.006	.006	.10	1.03
	Sem AF	−.159	.263	−.06	−0.60
	DASS-Anxiety	.002	.004	.12	0.64
	DASS-Depression	−.002	.003	−.15	−0.88
	DASS-Stress	.005	.003	.36	1.69

Note. B = unstandardized regression coefficient; *SE B* = standard error of the unstandardized regression coefficient; β = standardized regression coefficient; R^2 = squared correlation; SIL-V = Shipley Institute of Living Scale, Vocabulary Subscale; Sem VF = semantic valence focus; Sem AF = semantic arousal focus; DASS = Depression, Anxiety, and Stress Scale.

[a] $p = .068$.

[*] $p < .05$.

Table 4

Bivariate Associations Among Estimates of Valence and Arousal Focus and SAM Ratings

Variable	1	2	3	4	5	6
1. Semantic valence focus	—					
2. Semantic arousal focus	−.57*	—				
3. EL valence focus	.13	−.03	—			
4. EL arousal focus	−.07	.31*	−.32*	—		
5. SAM valence	.06	−.36*	.33*	−.20*	—	
6. SAM arousal	.04	−.08	.24*	.24*	.36*	—

Note. EL = emotion labeling; SAM = Self-Assessment Manikin.

* $p < .05$.