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A Tale of Two Systems: Testing a Positive and Negative Valence Systems Framework to Understand Social Disconnection Across Anxiety and Depressive Disorders

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Abstract

Background: Social disconnection is a common and pernicious feature of anxiety and depressive disorders, yet is insufficiently addressed by our best available treatments. To better understand why people with anxiety and depression feel socially disconnected, we tested a positive and negative valence systems framework informed by research on how normative social connections develop and flourish.

Method: Individuals seeking treatment for anxiety or depression (N=150) completed measures of perceived social connectedness, positive and negative valence temperament, social goals, affect, symptoms, and life satisfaction.

Results: Feeling less socially connected was associated with diminished life satisfaction, beyond clinical symptom severity. Regression analyses revealed that both diminished positive valence and heightened negative valence temperament, and their corresponding motivational and affective outputs, were significantly and uniquely (with no significant interaction between them) associated with lower perceived connectedness.

Limitations: Data was cross-sectional and based on self-report—limiting conclusions about causality and social disconnection processes at different units of analysis.

Conclusions: Understanding social disconnection through the lens of a positive and negative valence systems framework may inform transdiagnostic models and treatment approaches.

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Keywords

The need to belong within social relationships is a fundamental human motivation (Baumeister & Leary, 1995)—one that confers important health benefits (Holt-Lunstad, Smith, & Layton, 2010; House, Landis, & Umberson, 1988; Santini, Koyanagi, Tyrovolas, Mason, & Haro, 2015; Umberson & Montez, 2010; Yang et al., 2016). Individuals who have stronger social connections display fewer psychological symptoms, better stress resilience and immune function, and greater life satisfaction (Chu, Saucier, & Hafner, 2010; Cohen, 2004; Eisenberger & Cole, 2012; Fredrickson, 2001; 2003; Lyubomirsky, King, & Diener, 2005; Teo, Choi, & Valenstein, 2013; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). In contrast, social disconnection and loneliness increase risk for early mortality to levels on par with well-established risk factors such as obesity and smoking (Cacioppo & Cacioppo, 2018; Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Holt-Lunstad et al., 2010).

Social disconnection is one of the more common and pernicious features of anxiety and depressive disorders—two highly prevalent conditions that incur a significant public health burden worldwide (Baxter, Scott, Ferrari, & Whiteford, 2014; Whiteford et al., 2013). Individuals diagnosed with these conditions have smaller networks of people with whom they have important and consistent contact than those with no history of psychiatric illness, and they engage in fewer social activities (Saris, Aghajani, van der Werff, van der Wee, & Pennix, 2017)—they also report higher loneliness and perceived social disability, and diminished quality of life in social domains (Cramer, Torgersen, & Kringlen, 2005; Marver et al., 2017; McKnight & Kashdan, 2009; Olatunji, Cisler, & Tolin, 2007). The strong association between social connectedness and well-being in non-clinical (community) samples suggests that perceived social *dis*connection in people who experience excessive anxiety or depression should account in part for their tendency to be dissatisfied with their lives. It remains unknown, however, whether social disconnection accounts for perceptions of diminished life satisfaction beyond variance accounted for by clinical symptoms.

Current theories of anxiety and depression tend to conceptualize problems in social functioning as byproducts of disorder-specific etiology (e.g., excessive fear and avoidance in anxiety; avolition and avoidance in depression), and prevailing treatment approaches target them as such—yielding modest response rates that leave room for improvement (Hofmann, Wu, & Boettcher, 2014; McKnight & Kashdan, 2009). Dimensional frameworks that begin with an understanding of how normative positive social connections develop and thrive are agnostic about diagnostic categories—accommodating both comorbidity and within-disorder heterogeneity—and may therefore point to key transdiagnostic processes that underpin social impairments that are partially distinct from those that maintain symptoms. This approach is consistent with emerging models of psychopathology that endeavor to study fundamental dimensions of functioning that cut across traditional diagnostic categories (Insel et al., 2010).

Social relationships provide opportunities for both reward and punishment—developing a meaningful connection with others or being rejected. We therefore drew on bivariate models

of human motivation and behavior (Elliot, 2006; Elliot & Thrash, 2010; Gable, 2006; Gable & Berkman, 2008; Gable, Reis, & Elliot, 2000, 2003; Gray, 1987; Lang, 1995; Watson, Clark & Tellegen, 1988) to examine the role of positive and negative valence systems as broad dispositional factors hypothesized to account for social disconnection across anxiety and depressive disorders. The negative valence system (also referred to as the avoidance or aversive system) coordinates psychological and behavioral processes involved in preventing the experience of unwanted outcomes (e.g., loss, punishment, rejection) and is characterized by negative cognitions (e.g., rumination, attentional biases toward negatively valenced stimuli), emotions (e.g., sadness, anxiety), and inhibitory/avoidance behaviors. The positive valence system (also referred to as the approach or appetitive system) is a partially independent dimension (Aupperle & Paulus, 2010; Paulus et al., 2017; Watson et al., 1988) that coordinates processes involved in pursuing desired or rewarding outcomes (e.g., social acceptance), including fostering attention toward reward-relevant stimuli, positive emotions such as excitement and joy, and approach-oriented behaviors (e.g., curiosity, social initiation). The positive and negative valence systems framework has been applied to understand *symptom* dimensions underlying anxiety and depressive disorders (e.g., Rodebaugh et al., 2017; Struijs et al., 2017, 2018). Symptoms, however, are at least partially distinct from positive social functioning (Alden & Taylor, 2011; Keyes, 2005). Our purpose herein was to determine whether this framework can be applied transdiagnostically to inform the nature of social disconnection across the anxiety and depression spectrum.

The current work draws heavily on hierarchical models of approach and avoidance temperament within the social domain (Gable, 2006; Gable & Berkman, 2008) and seeks to extend initial disorder-specific applications of this framework (Trew & Alden, 2012). Individual differences in temperament that preferentially activate either system have been shown in non-clinical samples to underlie (1) differential frequencies of having proximal social goals that are either positive valence (approach) oriented (e.g., meeting new people; deepening existing relationships) or negative valence (avoidance) oriented (e.g., not making a fool of oneself; avoiding conflict), and (2) differential propensities to experience positive vs. negative affect (Elliot, Gable, & Mapes, 2006; Gable, 2006; Gable et al., 2000). Negative valence processes (e.g., avoidance-oriented social goals) are linked to relationship insecurity, loneliness, low relationship satisfaction, and a higher likelihood of relationship dissolution over time, whereas positive valence processes (e.g., approach-oriented social goals) are positively associated with relationship satisfaction and the frequency of positive relational events (Elliot et al., 2006; Gable, 2006; Impett, Gable, & Peplau, 2005; Impett, Peplau, & Gable, 2005). Heightened negative valence sensitivity is a core defining feature of anxiety and depressive disorders that is reliably observed across multiple units of analysis (Brown, Chorpita, & Barlow, 1998; Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014; Dillon et al., 2014). Diminished positive valence sensitivity (e.g., low positive affect, diminished approach motivation and behavior, reduced behavioral and neural reactivity to rewards) is also observed within depression (Bijttebier, Beck, Claes, & Vandereycken, 2009; Trew, 2011), as well as social anxiety disorder (Coplan, Wilson, Frohlick, & Zelenski, 2006; Kashdan, 2007, Trew & Alden, 2012) and posttraumatic stress disorder (Nawijn et al., 2015; for reviews see Carl, Soskin, Kerns, & Barlow, 2013; Craske, Meuret, Ritz, Treanor, & Dour, 2016; Dillon et al., 2014). Social disconnection within anxiety and depressive disorders may

therefore be the product of dysregulation in either positive or negative valence systems, or both.

Current study

The current study had three objectives. First, to determine whether indices of positive social functioning (e.g., perceived connectedness) were related to life satisfaction in individuals with clinically impairing anxiety or depression, beyond variance accounted for by symptoms. Evidence of such a link would underscore the importance of social connections, in addition to symptoms, to life satisfaction within a treatment-seeking sample— emphasizing that both are important outcomes in treatment. We hypothesized that greater perceived social disconnection would be associated with diminished life satisfaction beyond symptoms. The second aim was to determine the unique contribution of individual differences in positive and negative valence temperament to perceived social disconnection, and the extent to which these do or do not interact. We hypothesized that diminished positive valence temperament and higher negative valence temperament would be associated with greater social disconnection. The third aim was to examine processes that may account for the predicted relationship between positive and negative valence temperament and social disconnection, namely approach/avoidance social goals as well as positive/negative affect. Consistent with prior work in non-clinical samples (Gable & Berkman, 2008), we hypothesized that positive valence temperament would be related to approach-oriented social goals and positive affect (but not avoidance goals and negative affect), whereas negative valence temperament would be more strongly related to avoidance-oriented social goals and negative affect (cf. approach goals and positive affect). We also predicted that diminished social approach goals and positive affect as well as greater social avoidance goals and negative affect would relate to greater social disconnection. Examining unique variance accounted for by individual positive and negative valence processes is the first step in identifying potential distinct pathways and intervention targets that give rise to and maintain social disconnection across anxiety and depressive disorders.

Method

Participants

The sample included 150 individuals between the ages of 18 and 55 (91 women, 57 men, 2 participants did not identify with either gender category) seeking treatment for depression or anxiety within the context of three parent clinical trials that, respectively, selected for participants with (1) a current principal diagnosis of social anxiety disorder (SAD) defined using the Structured Clinical Interview for the Diagnostic and Statistical Manual (4th ed.; DSM–IV; American Psychiatric Association, 2000) Axis 1 Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 2002)[1] and clinician administered Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) score 50 (n=71); (2) a current principal diagnosis of major depression defined using the clinician administered Mini International Neuropsychiatric Interview for DSM-5 (MINI Version 7.0.0)[2], as well as scoring 10 or higher on the Patient

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[1]Enrollment began prior to the release of the SCID for DSM-5. Interview questions were subsequently scored to reflect DSM-5 criteria for SAD.

Health Questionnaire-9 (PHQ-9; n=42), and (3) current clinically elevated symptoms of anxiety and/or depression, defined as scoring 10 or higher on the Patient Health Questionnaire-9 (PHQ-9) and/or scoring 8 or higher on the Overall Anxiety Severity and Impairment Scale (OASIS; n=37). Participants were recruited through clinical referrals as well as posted announcements in community and online settings (e.g., ResearchMatch.org).

Assessments to determine principal and comorbid diagnoses were conducted using the MINI Version 7.0.0[3] by a PhD-level clinician, a PhD student in clinical psychology, and two post-baccalaureate clinical research coordinators, all of whom received extensive training in the interview protocols. Diagnostic consensus was reached by reviewing completed interviews during team meetings with the first author. Exclusionary criteria across all three samples used to determine parent study eligibility were: (1) active suicidal ideation with intent or plan; (2) moderate to severe alcohol or marijuana use disorder (past year); (3) all other mild substance use disorders (past year); (4) bipolar I or psychotic disorders; (5) moderate to severe traumatic brain injury with evidence of neurological deficits, neurological disorders, or severe or unstable medical conditions that might be compromised by participation in the study; (6) inability to speak or understand English; (7) concurrent psychotherapy (unless 12-week stability criteria had been met for non-empirically supported therapies only); (8) concurrent psychotropic medication (e.g., SSRIs, benzodiazepines); and (9) characteristics that would compromise safety to complete an MRI scan (e.g., metal fragments in body)[4].

The sample demographic composition was as follows: age ($M = 26.04$, $SD = 8.50$), gender (38.0% men, 60.7% women, 1.3% who did not identify with either gender), race (45.3% Caucasian, 28.7% Asian American, 4.7% African American, 1.3% Native American/Alaskan Native, 8.7% more than one race, 5.3% identified as "other," and for 4.0% of participants, race was unknown or they declined to respond), ethnicity (24.0% Hispanic); and years of education ($M = 15.65$; $SD = 1.98$). Thirty-five percent of participants reported their annual household income as $50,000 or above; 30.7% reported $20,001 to $50,000; 13.3% reported $5,001 to $20,000, and 20.7% reported $5,000 or less. The majority of participants (72%) identified their romantic relationship status as single, 8.7% were married, 8.0% were cohabitating with a romantic partner, 5.3% were divorced or separated, 0.7% were widowed, and 4.7% identified their relationship status as "other." The sample met DSM criteria for a range of diagnoses: social anxiety disorder (70.7%), major depressive disorder (current; 55.3%), generalized anxiety disorder (28.7%), panic disorder (3.3%), agoraphobia (5.3%), obsessive compulsive disorder (2.7%), posttraumatic stress disorder (6.0%), mild alcohol use disorder (4.7%), and mild marijuana use disorder (2.7%). Approximately two-thirds (62.7%) of participants reportedly received prior psychological treatment, and 27.3% previously received psychotropic medication.

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[2]We thank David Sheehan for giving us permission to use a preliminary version of the MINI for DSM-5 in this study.
[3]Because enrollment began prior to the release of MINI Version 7.0.0 for DSM-5, 40 participants were administered MINI Version 5.0.0 for DSM-IV to assess comorbid diagnoses.
[4]Participants completed a functional magnetic resonance imaging (fMRI) scan to address a separate research question. Several of the exclusion criteria were therefore implemented to ensure MRI safety and minimize confounding of the imaging findings.

Measures

A full description of each measure and review of psychometric properties is presented in the Supplemental Materials.

Symptom measures.—The Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) assessed depression severity during the past two weeks based on DSM-5 symptom criteria. Anxiety symptoms were assessed using the Overall Anxiety Severity and Impairment Scale (OASIS; Norman et al., 2006), a widely used 5-item scale that measures the frequency and severity of anxiety symptoms, as well as level of anxiety-based avoidance and interference during the previous two weeks.[5] Current sample Cronbach's α = .82 and .84, respectively.

Positive and Negative Valence Temperament.—The Approach-Avoidance Temperament Questionnaire (ATQ; Elliot & Thrash, 2010) is a 12-item measure designed to measure sensitivity to positive (i.e., reward; 6 items) and negative (i.e., punishment; 6 items) stimuli or contexts. Items within each of these domains measure temperament dimensions of affective reactivity, perceptual vigilance, and behavioral inclination. Current sample Cronbach's α = .87 and α = .82 for positive and negative valence temperament, respectively.

Social Relationship Functioning.—The Social Connectedness Scale-Revised (SCS-R; Lee, Draper, & Lee, 2001) served as our primary measure of social connectedness. The SCS-R is a 20-item measure that assesses one's sense of belonging, or the degree to which individuals perceive closeness with others in their interpersonal world (Lee et al., 2001). Current sample Cronbach's α = .87. Participants also completed ancillary measures of positive social functioning (social initiation and relationship satisfaction; Alden & Taylor, 2011; Alden, Buhr, Robichaud, Trew, & Plasencia, 2018). Results using a composite index comprised of the SCS-R and ancillary measures are reported in the Supplemental Materials for parsimony.

Affect.—Participants completed the 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) to assess activated forms of positive and negative affect; and the 20-item Modified Differential Emotions Scale (mDES; Fredrickson, Tugade, Waugh, & Larkin, 2003) to assess a broader array of discrete positive (e.g., joy, love, awe) and negative emotions (e.g., guilt, anger, fear). Participants responded according to how they felt *daring the past week*. Current sample Cronbach's α = .90 for both PANAS positive and negative affect scales, and .91 and .84 for mDES positive and negative emotions, respectively. Given the high correlation between the PANAS and mDES scales (see Supplemental Table 1), composite indices for positive and negative affect were created by averaging the standardized scores (i.e., Z scores; M = 0, SD = 1) for each scale (Rosenthal & Rosnow, 1991).

Social Goals.—Consistent with prior work (Gable, 2006; Trew & Alden, 2012), an assessment comprised of ten items was designed for this study to reflect *approach-oriented*

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[5]Administration of the SWLS, PHQ-9, and OASIS began part way through data collection (n=112).

goals, that is, goals focused on obtaining positive outcomes (e.g., "I wanted to get to know the people I interacted with") and *avoidance-oriented goals*, that is, goals focused on avoiding negative outcomes (e.g., "I did not want the people I interacted with to think negatively about me"). Items were rated on a 7-point scale with anchors of *not at all* and *very much.* Participants provided ratings based on their reactions to social situations they encountered *during the past week.* High internal consistency was observed in this sample (Cronbach's α = .84 for approach and α = .84 for avoidance goals).

Life Satisfaction.—A subsample (n=112)[5] completed the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985), a well-established measure that assesses global satisfaction with one's life. Current Cronbach's α = .83.

Procedures

The study procedures were approved by the University of California, San Diego Human Research Protections Program. The current study took place within the context of overarching treatment studies for anxiety and depressive disorders. After receiving information about the research, participants provided informed written consent to participate, and then completed the diagnostic and symptom eligibility assessment. Eligible participants then completed a battery of self-report measures as described above.

Overview of Statistical Analyses

All analyses were conducted using SPSS version 25. We first conducted a hierarchical regression analysis to determine whether perceptions of social connectedness (SCSR) contribute additional variance to life satisfaction (SWLS), above and beyond core symptoms of anxiety (OASIS) and depression (PHQ-9). Next, we examined whether individual differences in positive and negative valence temperament related to perceived social connectedness by examining zero-order Pearson's correlations between the SCSR and ATQ, followed by a hierarchical regression analysis to test main and interaction effects of positive and negative valence dispositions as unique predictors of perceived social connectedness. ATQ scores were centered at the sample mean prior to computing the interaction term (Aiken & West, 1991). Third, we examined two variables shown to be important in promoting positive social bonds, namely social approach and avoidance goals and positive and negative affect, as putative outputs of positive/negative valence dispositions that predict variance in social connectedness. We examined zero-order Pearson's correlations between social goals and affect, temperament, and perceived social connectedness. Next, we conducted separate regression models for goals and affect predicting connectedness through main effects of positive and negative valence processes simultaneously, followed by their interaction. For example, positive and negative affect were entered together in step 1 of the regression model predicting SCSR scores, followed by a positive * negative affect interaction term. Finally, we tested a model including both goals and affect simultaneously. Continuous predictor variables were mean centered prior to computing the interaction terms (Aiken & West, 1991). The assumptions underlying linear regression were tested and confirmed for each model, namely normally distributed residuals (predicted-probability plot), linear associations between the independent and dependent variables (scatterplots),

homoscedasticity (residual vs. predicted value plots), and absence of multicollinearity (variation inflation factor < 2.00).

Results

Relationship between social connectedness and life satisfaction

Descriptive information and zero-order correlations for all dependent measures are presented in Supplemental Table 1. Perceived social connectedness was significantly and positively associated with life satisfaction, $r(112) = .42$, $p < .001$. Greater anxiety and depression symptom severity was associated with lower life satisfaction, $r(111)$[6] $= -.18$, $p = .056$ and $r(112) = -.40$, $p < .001$, respectively, though the magnitude of this effect was considerably stronger for depression. Critically, results of the regression analysis revealed that social connectedness was a significant unique predictor of life satisfaction when accounting for shared variance with anxiety and depression symptoms, $\beta = .34$, $t(109) = 3.96$, $p < .001$, accounting for 11% of additional variance in life satisfaction.

Relationship between positive/negative temperament and social connectedness

Positive and negative temperament were largely orthogonal, $r(150) = -.02$, $p = .82$. Lower positive valence temperament and higher negative valence temperament were significantly associated with lower perceived connectedness, $r(150) = .32$ and $-.32$, $p < .001$. Results of the regression analysis revealed that both positive and negative valence temperament continued to explain unique (and approximately equal) variance in predicting social connectedness when considered together, $\beta = .30$, $t(148) = 4.05$, $p < .001$ (positive valence); $\beta = -.33$, $t(148) = -4.32$, $p < .001$ (negative valence). The approach*avoidance interaction term did not explain significant additional variance in SCSR scores, $\beta = -.07$, $t(148) = -.94$, $p = .35$.

Relationship between temperament, social goals, affect, and social connectedness

Positive valence temperament was positively associated with approach-oriented social goals and positive affect, $r(150) = .45$ and $r(150) = .57$, both $p < .001$, but was not significantly related to avoidance goals or negative affect, $r(150) = .11$, $p = .17$ and $r(150) = -.06$, $p = .48$. Conversely, higher negative valence temperament was significantly associated with greater avoidance social goals and negative affect, $r(150) = .39$ and $r(150) = .49$, both $p < .001$, but was not significantly related to approach goals or positive affect, $r(150) = .09$, $p = .29$ and $r(150) = .01$, $p = .88$. Social approach goals and positive affect were positively associated with social connectedness, $r(150) = .34$, and $r(150) = .38$, both $p < .001$, whereas avoidance goals and negative affect were negatively associated with social connectedness, $r(150) = -.21$, $p = .01$ and $r(150) = -.18$, $p = .03$.

The regression analyses sought to clarify the unique variance accounted for by positive and negative processes (goals and affect) when considered together in the model predicting perceived connectedness. See Tables 1 and 2. Both greater avoidance goals and diminished approach goals uniquely predicted lower social connectedness. The interaction of approach

[6]Sample size differences were due to missing data because some measures were inadvertently not administered to some participants.

and avoidance goals was not significant. Lower positive affect and higher negative affect uniquely predicted diminished connectedness when considered together; however, the interaction of positive and negative affect was not significant. Finally, the model combining both goals and affect revealed the same pattern of findings; that is, greater avoidance goals and negative affect as well as lower approach goals and positive affect all uniquely predicted diminished social connectedness.

Discussion

This study used a positive and negative valence systems framework to understand why people with anxiety or depressive disorders feel socially disconnected. Four main findings emerged: First, lower perceived social connectedness was associated with diminished life satisfaction, even after accounting for variance due to core symptoms of anxiety and depression. Second, both positive and negative valence temperament were associated with perceived connectedness, each contributing unique significant variance of roughly the same magnitude. Third, positive and negative valence temperament displayed unique associations with processes shown to underpin social connections, namely social approach goals/positive affect and avoidance goals/negative affect, respectively. Finally, diminished positive valence goals and affect as well as greater negative valence goals and affect uniquely predicted social disconnectedness. Findings remained robust when examining a broader index of social functioning comprised of perceived connectedness, frequency of social initiation, and satisfaction with different types of relationships. The current findings support the heuristic value of applying positive and negative valence systems frameworks to understand the source of social disconnection and relational impairments in anxiety and depressive disorders.

The perception that participants were not connected to others in their social world explained meaningful variance in their sense of dissatisfaction with their lives, beyond symptom severity. These findings extend to a clinical treatment-seeking sample for the first time the well-established link observed in community samples between social connections and aspects of well-being (Chu et al., 2010; Lyubomirsky et al., 2005), and highlight that perceived connectedness contributes to life satisfaction to a degree on par with symptoms. To the extent that life satisfaction represents an important outcome separate from symptom remission (Keyes, 2005; World Health Organization, 1946), explicitly targeting social connections may be a worthwhile treatment goal. The modest efficacy of existing interventions in improving social functioning and well-being (Hofmann et al., 2014; McKnight & Kashdan, 2009) underscores the value of identifying processes that contribute to social disconnection in clinical samples.

Positive and negative valence temperaments were orthogonal in this treatment-seeking sample—mirroring prior clinical research (Campbell-Sills, Liverant, & Brown, 2004; Paulus et al., 2017) and supporting the relative independence of the dual valence systems framework (Elliot, 2006; Elliot & Thrash, 2010; Gable et al., 2000, 2003; Gray, 1987; Lang, 1995; Watson et al., 1988). Diminished positive valence and greater negative valence dispositions both contributed a moderate amount of unique variance to perceived social disconnection—findings consistent with research in non-clinical samples underscoring the

importance of both systems to positive social functioning (Gable & Berkman, 2008; Keltner & Kring, 1998; Ramsey & Gentzler, 2015) and especially relevant for depressive disorders, and some anxiety disorders characterized by dysregulation of both systems (Aupperle & Paulus, 2010; Barlow et al., 2014; Brown et al., 1998; Carl et al., 2013; Dillon et al., 2014). Knowing where a given individual lies along both positive and negative valence dimensions may therefore facilitate an understanding of the source of social disconnection and point to targets for treatment. Although evidence suggests that the negative valence system may be particularly characteristic of anxiety and depressive disorders (Struijs et al., 2017) and their chronicity (Struijs et al., 2018), the current findings suggest that the positive valence system is at least as important to understanding the source of impairments in the social domain (cf. symptoms per se). Positive and negative valence temperament did not interact, suggesting that each dimension was sufficiently robust to independently account for perceptions of connectedness and social functioning.

Positive and negative valence temperament correlated in predicted ways with corresponding motivational and affective processes previously shown to underpin social relationship functioning. Lower positive valence temperament was associated with diminished positive affect and social approach goals, but not negative affect and avoidance goals. In contrast, greater negative valence temperament was associated with higher negative affect and social avoidance goals, but not positive affect and approach goals. This unique pattern of associations supports the relative independence of motivational and affective processes regulated by positive and negative valence systems, and underscores the potential value of measuring both systems within anxiety and depressive disorder samples (e.g., Campbell-Sills et al., 2004; Paulus et al., 2017).

Central to the present aims were results of the regression models testing whether positive/negative valence motivational and affective processes were associated with perceived social disconnection. Positive and negative valence goals and affect were all significantly associated with perceived connectedness. Lower perceived connectedness was accounted for by both lower social approach goals and positive affect—findings consistent with the non-clinical literature underscoring the importance of positive affect and approach-oriented motivation to positive relational outcomes (Gable, 2006; Elliot et al., 2006; Gable & Berkman, 2008; Ramsey & Gentzler, 2015). Higher avoidance goals were also significantly associated with perceived social disconnection—consistent with the notion that motivation to avoid negative social outcomes may limit opportunities for, and reduce engagement within social encounters. Higher negative affect was significantly, albeit modestly associated with perceived disconnectedness, yet was not significantly related to the broader social functioning index (see Supplemental Results). Those findings converge with prior studies finding a weak (e.g., Taylor, Pearlstein, & Stein, 2017) or non-existent link (Clark & Watson, 1988; Watson, Clark, McIntyre, & Hamaker, 1992) between negative affect and sociability and connectedness. Considered together, the current findings suggest that motivational and affective processes underlying both positive and negative valence dispositions may be important contributors to social relationship impairments in anxiety and depression, and that to downplay the role of either system would be to risk missing out on a key piece of the social-functional picture.

Bivariate models of motivation and behavior (Elliot, 2006; Elliot et al., 2006; Elliot & Thrash, 2010; Gable, 2006; Gable & Berkman, 2008; Gray, 1987) conceptualize and measure motivational processes in a way that is conflated with valence-based outcomes. That is, approach motivation is tied to positive valence (reward-related) stimuli and avoidance motivation is tied to negative valence (aversive) stimuli. There is now compelling evidence, however, to suggest a more complex conceptualization of motivation and valence-based processing in relation to anxiety and depression (Winer & Salem, 2016; Winer et al., 2017). For example, rather than simply showing diminished approach, depressed individuals demonstrate active avoidance in response to stimuli that were once rewarding. One implication of those findings is that approach motivation and behavior cannot be assumed to be associated only with rewarding stimuli, and avoidance motivation and behavior cannot be assumed to only be associated with aversive/punishing stimuli. It is therefore possible that social disconnection for some individuals may be driven by avoidance of positively valenced social cues or outcomes. Future research is needed to dissociate motivation and valence-based processes in relation to social functioning in clinical samples.

The current findings highlight the importance of assessing, and potentially targeting both positive and negative valence processes in treatment in the service of enhancing social connections. The relative independence of each system supported here and in prior clinical research (e.g., Campbell-Sills et al., 2004; Paulus et al., 2017) suggests that knowledge about an individual's functioning on one dimension may not be sufficient. Current evidence-based treatments for anxiety and depression primarily target negative valence thoughts, emotions, and behaviors (Craske et al., 2008; Cuijpers et al, 2013; Hofman & Smits, 2008; Norton & Price, 2007). Because depressive disorders and some forms of anxiety are also characterized by positive valence deficits (Carl et al., 2013; Craske et al., 2016; Dillon et al., 2014), upregulating the positive valence system may offer a complementary approach to improving positive social functioning. Several existing (e.g., mindfulness-based interventions; Strege, Swain, Bochicchio, Valdespino, & Richey, 2018) and newer positive valence targeted treatments show promise in increasing positive emotions and associated outcomes (e.g., relationship satisfaction, psychological well-being) in people with elevated anxiety or depression (e.g., Alden & Trew, 2013; Craske et al., 2019; Taylor, Lyubomirsky, & Stein, 2017).

Several limitations of the current study should be addressed in future work. The cross-sectional data collection limits inferences about causality. Although goals and affect are ostensibly downstream effects of temperamental dispositions, there are likely bi-directional relationships between goals and affect that unfold over time. Future experimental and longitudinal studies are therefore needed to clarify the direction of the observed relationships and to disentangle potential interactions between the positive and negative systems in influencing social relationship outcomes over time. The regression models tested herein separately evaluated components of a hierarchical model wherein positive and negative valence temperament are hypothesized to relate to more proximal affective and motivational processes that influence social outcomes and perceptions of connectedness (e.g., Elliot et al., 2006; Gable, 2006). Larger samples are needed to implement multivariate approaches (e.g., structural equation modeling) that would offer a more integrated test of the proposed framework. Another limitation is that all constructs were assessed via self-report. While

perceptions of one's goals for social encounters and sense of connection with others are important contributors to social health and overall well-being (Cacioppo & Cacioppo, 2018; Gable & Berkman, 2008; Lee et al., 2001), research is needed to investigate other facets of social functioning, including size and cohesiveness of one's social network, as well as rate of engagement in activities with others (Saris et al., 2017). Measures of positive and negative valence dimensions are also needed at other units of analysis (e.g., behavior, neural circuit function) to offer a more comprehensive understanding of the biobehavioral processes that influence the development and maintenance of positive social connections (Fareri & Delgado, 2014; Vrticka, 2012). Finally, social anxiety and major depression diagnoses were disproportionately represented in the current sample. Although these are two of the most prevalent conditions that individuals who seek treatment in outpatient settings experience (Zimmerman & Mattia, 2000), it would be beneficial to test the current framework within a more heterogeneous sample, including individuals with principal symptoms other than anxiety or depression. These limitations notwithstanding, the current findings support the potential transdiagnostic value of using a dual valence systems framework to understand, and possibly identify treatment targets underlying social disconnection across the anxiety and depression spectrum.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

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Table 1

Multiple Regression Analyses of (a) Approach and Avoidance Social Goals and (b) Positive and Negative Affect Predicting Perceived Connectedness.

Predictor	(a) Social Goals						(b) Affect					
	B	*SE B*	*B*	*t*	*p*	*R²*	*B*	*SE B*	*B*	*t*	*p*	*R²*
Positive Valence	1.09	0.18	.46	6.05	<001	.23	2.75	0.56	.37	4.95	<.001	.17
Negative Valence	2.75	0.56	.37	−4.70	<001		−1.19	0.55	−.16	−2.17	.03	
Positive x Negative	−0.01	0.03	−.03	−0.39	.69	.001	−0.10	0.32	.02	0.30	.76	.001

Note. Because no interaction effects emerged, the main effects statistics are reported from models that did not include interaction terms.

Table 2

Multiple Regression Analysis of Positive Valence (Social Approach Goals and Positive Affect) and Negative Valence Processes (Social Avoidance Goals and Negative Affect) Combined in Predicting Social Connectedness.

Predictor

	B	SE B	B	t	p	R²
Approach Goals	0.81	0.19	.35	4.26	<.001	.31
Positive Affect	1.92	0.57	.26	3.37	.001	
Avoidance Goals	−0.85	0.19	−.33	−4.51	<.001	
Negative Affect	−1.00	0.51	−.14	−1.98	.049	
Approach x Avoidance Goals	−0.02	0.03	−.05	−0.65	.52	.002
Positive x Negative Affect	0.07	0.29	.02	0.24	.81	

Note. Because no interaction effects emerged, the main effects statistics are reported from the model that did not include interaction terms.