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## What Good are Positive Emotions for Treatment? Trait Positive Emotionality Predicts Response to Cognitive Behavioral Therapy for Anxiety

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### Abstract

**Objective**—Cognitive behavioral therapy (CBT) is empirically supported for the treatment of anxiety disorders; however, not all individuals achieve recovery following CBT. Positive emotions serve a number of functions that theoretically should facilitate response to CBT – they promote flexible patterns of information processing and assimilation of new information, encourage approach-oriented behavior, and speed physiological recovery from negative emotions. We conducted a secondary analysis of an existing clinical trial dataset to test the a priori hypothesis that individual differences in trait positive emotions would predict CBT response for anxiety.

**Method**—Participants meeting diagnostic criteria for panic disorder (n=28) or generalized anxiety disorder (n=31) completed 10 weekly individual CBT sessions. Trait positive emotionality was assessed at pre-treatment, and severity of anxiety symptoms and associated impairment was assessed throughout treatment.

**Results**—Participants who reported a greater propensity to experience positive emotions at pre-treatment displayed the largest reduction in anxiety symptoms as well as fewer symptoms

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All procedures performed involving human participants were in accordance with the ethical standards of the University of California San Diego Human Research Protection Program and with the Code of Ethics of the World Medical Association (Declaration of Helsinki).

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following treatment. Positive emotions remained a robust predictor of change in symptoms when controlling for baseline depression severity.

**Conclusions**—Initial evidence supports the predictive value of trait positive emotions as a prognostic indicator for CBT outcome in a GAD and PD sample.

### Keywords

Cognitive behavioral therapy; anxiety; positive emotions; prediction; treatment response

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Cognitive Behavioral Therapy (CBT) is an empirically supported and widely used treatment for anxiety disorders (Hofmann & Smits, 2008; Norton & Price, 2007; Olatunji, Cisler, & Deacon, 2010). A fundamental assumption underlying CBT is that anxiety is maintained by maladaptive cognitive and behavioral factors (Barlow, 2004; Beck, Emery, & Greenberg, 2005), including exaggerated appraisals of danger and the use of avoidance behaviors intended to minimize the occurrence of perceived threat. Accordingly, CBT involves identifying and tolerating negative thoughts and emotions with the goal of reducing avoidance, modifying threat-related cognitions, and facilitating new, fear-inconsistent learning (Craske et al., 2008). Despite the efficacy of CBT for anxiety disorders (Hofmann & Smits, 2008; Norton & Price, 2007; Olatunji et al., 2010), not all individuals display adequate treatment response and a significant portion continue to experience residual symptoms that impair functioning and quality of life (Loerinc et al., 2015; Pollack et al., 2008). Examining factors that predict response to CBT may (1) identify new intervention targets that have the potential to increase treatment efficacy; (2) identify individuals who may not need a long-term course of CBT, i.e., those who show rapid response; and/or (3) identify individuals who may demonstrate superior response to CBT compared to other interventions.

The search for predictors of response to CBT for anxiety is not new (for a comprehensive review see Schneider, Arch, & Wolitzky-Taylor, 2015). Consistent with the historical focus of anxiety disorder assessment and treatment on negative emotions, cognitions, and behaviors, prior investigations into predictors of treatment response focused almost exclusively on variables along the negative affect dimension (e.g., presence of depression or other comorbid disorders, symptom severity, threat-related cognitive biases; see Schneider et al., 2015 for a review of findings). However, there is growing recognition that the positive affect system may play an important yet underexplored role in the pathophysiology of anxiety (Kashdan, Weeks, & Savostyanova, 2011; Nawijn, van Zuiden, Frijling, Koch, Veltman, & Olf, 2015). Although low positive affect was initially hypothesized to distinguish depression from anxiety (i.e., tripartite model; Clark & Watson, 1991), numerous studies found that at least some forms of anxiety are characterized by dysregulation of biobehavioral systems governing the experience and regulation of positive emotions, in addition to heightened negative emotions (e.g., Brown, Chorpita, & Barlow, 1998; Eisner, Johnson, & Carver, 2009; Kashdan, 2007; Rosellini, Lawrence, Meyer, & Brown, 2010; Watson & Naragon-Gainey, 2010). Research also suggests that positive and negative emotions are not merely opposite ends of a single continuum, but rather fall along separate, partially orthogonal, dimensions (Davidson, Jackson, & Kalin, 2000; Diener & Emmons, 1984). Thus, a given individual experiencing high levels of negative affect (e.g., anxiety)

may simultaneously experience high or low levels of positive affect, and considerable individual variability in positive emotions may occur within clinically anxious individuals.

The Broaden and Build theory of positive emotions (Fredrickson, 2001, 2013) is a conceptual framework that may facilitate understanding of how positive emotions could support better response to CBT. According to this theory, positive emotions, including subjective experiences such as joy, contentment, and interest, expand one's awareness and repertoire of thoughts and action urges – encouraging novel, varied, and exploratory patterns of thinking and behavior. In support of this perspective, research demonstrates that positive emotions widen attentional scope (Fredrickson & Branigan, 2005; Johnson, Waugh, & Fredrickson, 2010; Wadlinger & Isaacowitz, 2006), increase cognitive flexibility (Isen & Daubman, 1984), promote openness to new information and patterns of information processing (Estrada, Isen, & Young, 1997; Isen, Daubman, & Nowicki, 1987; Johnson & Fredrickson, 2005), speed cardiovascular recovery during negative affective experiences (Fredrickson, Tugade, Waugh, & Larkin, 2003; Tugade & Fredrickson, 2004), and increase behavioral exploration and curiosity (Kahn & Isen, 1993; Kashdan, Rose, & Fincham, 2004). Those findings suggest that positive emotions may facilitate some of the core processes implicated in recovery from anxiety via CBT, for example, helping the individual to tolerate negative emotions during exposure exercises and promoting the assimilation of new, threat-inconsistent information in memory (Craske et al., 2008). Thus, variability in the propensity to experience positive emotions across individuals with clinically elevated anxiety symptoms may predict who is most likely to benefit from cognitive and behavioral interventions.

Emotions can be conceptualized and measured along dimensions of activation (low vs. high) as well as according to whether they reflect transient fluctuations in mood (i.e., state) versus a more stable individual difference in the propensity to experience certain types of affect (i.e., trait/personality). The current study used a measure of positive emotions subsumed within the extraversion domain of personality, which reflects positive activation (i.e., positive valence and high activation; Smillie, DeYoung, & Hall, 2015). While other measures exist that assess a broader array of discrete positive emotions (Fredrickson et al., 2003) or were created to examine positive affect within structural models of anxiety and depression (e.g., tripartite model; Watson & Clark, 1991), few extant treatment studies for anxiety included sensitive measures of positive emotion. Thus, examining positive emotions measured as a facet of personality (cf. other assessment approaches) represents an initial step toward elucidating the predictive power of positive emotions for CBT response for anxiety.

Several studies examined the broad personality dimension of extraversion as a predictor of response to CBT for anxiety (see Schneider et al., 2015 for a comprehensive review of personality traits as predictors of CBT outcomes). Extraversion predicted better treatment response to both CBT and acceptance and commitment therapy (ACT) for social anxiety disorder (SAD), but did not moderate response across interventions (Craske et al., 2014). In contrast, low extraversion predicted superior response to CBT augmented with d-cycloserine (DCS) relative to CBT plus placebo for PTSD (de Kleine, Hendriks, Smits, Broekman, & van Minnen, 2014); however, extraversion did not predict nor moderate response to CBT

with or without DCS for SAD (Smits et al., 2013). In contrast to extant studies that examined extraversion as a broad, atheoretical predictor of response to CBT for anxiety, the current study examined positive emotionality, a specific facet of extraversion, as an a priori predictor of treatment outcomes informed by theory and prior research (e.g., Fredrickson, 2013).

To our knowledge, only one study has examined the role of positive emotions in predicting CBT response for anxiety (Niles, Mesri, Burklund, Lieberman, & Craske, 2013). In a sample of individuals meeting diagnostic criteria for social anxiety disorder (SAD), state positive emotional reactivity measured in response to viewing positively valenced emotional images did not predict treatment outcomes. It is notable that positive emotional reactivity differences were not found between the SAD group and non-anxious control subjects, which stands in contrast to prior studies supporting a link between low positive affect and social anxiety (see Kashdan, 2007).

## Current Study

We drew on prior literature regarding the function of positive emotions (Fredrickson, 2013) to test the a priori, theory-driven hypothesis that individual differences in trait positive emotions would predict response to a cognitive and behavioral treatment program for anxiety disorders. Our research question was examined through a secondary analysis of treatment outcomes in the context of a CBT clinical trial for generalized anxiety disorder (GAD) and panic disorder (PD; [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT00947570) Identifier: NCT00947570; Ball, Stein, Ramsawh, Campbell-Sills, & Paulus, 2014). Participants completed pre-treatment measures of trait positive emotions (subsumed within a larger personality assessment inventory), depression, and transdiagnostic anxiety severity and impairment. Assessment of anxiety symptoms was also conducted following every other treatment session through the end of treatment. Longitudinal analytic models were used to test the hypothesis that greater trait positive emotions would be associated with a larger reduction in symptoms and lower symptom levels at the end of treatment. Given that depression often co-occurs with anxiety (Kessler, Chiu, Demler, Merikangas, & Walters, 2005) and is characterized by blunted positive affect (Brown et al., 1998), a supplemental sensitivity analysis was also conducted by re-analyzing the models while controlling for baseline symptoms of depression.

## Method and Materials

### Participants

Participants were 61 adults aged 18–55 recruited from the San Diego community via public flyers and online advertisements, as well as from mental health outpatient clinics and primary care centers. Subsequent to receiving information about the study and providing informed written consent, 107 participants were screened by trained doctoral-level clinicians or doctoral-supervised masters-level clinicians using the Mini International Neuropsychiatric Interview (Sheehan et al., 1998). Among those screened, 61 were eligible and met DSM-IV criteria (American Psychiatric Association, 2000) for a primary diagnosis of either panic disorder (n=28; PD) (26 of those with agoraphobia), or generalized anxiety disorder (n=33; GAD). Exclusions were made for substance dependence (past year), substance abuse (past

month), psychotic disorders, bipolar, neurologic and organic disorders. Additionally, participants were excluded for psychopharmacological treatment within the last 6 weeks (2 weeks for benzodiazepines). Presence of other anxiety disorders were permitted, as were co-occurring diagnoses of GAD or PD (12.9% percent [ $n=4$ ] of the GAD sample had comorbid PD; 14.3% [ $n=4$ ] of the PD sample had comorbid GAD); however, one disorder was selected as the focus of CBT treatment (i.e. primary diagnosis). Twenty-seven participants (46%) met criteria for major depressive disorder (MDD); 11 current MDD and 16 lifetime but not current MDD. As this study was part of a larger study utilizing brain imaging pre- and post-CBT treatment, all participants met fMRI safety criteria including absence of ferrous metals, pregnancy, unstable medical conditions and claustrophobia. Two individuals did not complete any assessments following baseline; thus, the final intent-to-treat sample reported in all analyses comprised  $N=59$  participants. This study was approved by the University of California San Diego Human Research Protections Program and conducted in accordance with the provisions of the World Medical Association Declaration of Helsinki.

## Procedure

Participants were informed that the purpose of the study was to examine the effects of CBT on brain functioning in people with anxiety disorders. Eligible participants were given medical examinations, including a physical, medical history, EKG, drug and pregnancy screenings and a clinical laboratory evaluation. Additionally, participants completed a battery of self-report measures assessing demographic characteristics, symptoms, and personality traits. Following an fMRI scan, participants received 10 one-hour individual CBT sessions over 10–12 weeks, using a CBT protocol adapted from the Coordinated Anxiety and Management Learning (CALM) program (see Craske et al., 2009). The treatment utilized computer-based modules including generic psychoeducation, breathing retraining and relapse prevention, as well as additional modules, such as cognitive restructuring and exposure, that were tailored directly to the treatment of the primary anxiety disorder.

## Self-Report Measures

**Positive emotions**—Trait positive emotions were assessed using the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992). The NEO-PI-R is a 240-item self-rated measure designed to assess five personality domains: neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience. Facets within each domain describe lower-level groups of personality characteristics. Within the domain of extraversion is an 8-item Positive Emotions scale (NEO-PE), which measures levels of happiness, joy, excitement and optimism characteristic to one's personality<sup>1</sup>. The NEO-PI-R is both reliable

<sup>1</sup>Following the suggestion of an anonymous reviewer, we conducted a sensitivity analysis including the other facets of the NEO Extraversion scale (composite of warmth, gregariousness, assertiveness, activity, and excitement seeking) and their interaction with Time in the statistical model examining positive emotions as a predictor of treatment response. The NEO-PE and composite of the other NEO extraversion facets were significantly and moderately correlated at baseline  $r = .60, p < .001$ . Results of the multilevel model revealed that the other facets of extraversion did not significantly predict change in symptoms over time,  $\beta = .001, SE = .01, t = .11, p = .91$ , or post-treatment severity,  $\beta = -.09, SE = .08, t = -1.19, p = .24$ . Positive emotions remained a significant predictor of change in symptoms over time,  $\beta = .02, SE = .007, t = 2.12, p = .035$ , and a marginally significant predictor of post-treatment anxiety symptoms,  $\beta = -.09, SE = .05, t = -1.81, p = .075$ . See Supplemental Figure 3. Those findings, albeit exploratory, suggest that it was not extraversion per se, but rather the specific positive emotionality facet that was predictive of CBT response.

and valid, and the NEO-PE specifically has been shown to correlate to a moderate degree with other measures of trait positive affect (Watson, 2002). The positive emotion index used in the current study was based on participant T-scores obtained using gender- and age-matched norms (Costa & McCrae, 1992). Thus, any predictive relationship between positive emotions and treatment outcomes should be interpreted in relation to a given participant's own gender- and age-referenced normative group.

**Depression**—Depressive symptoms were assessed using the Quick Inventory of Depressive Symptomatology self-report measure (QIDS; Rush et al., 2003). The QIDS is a 16-item reliable and valid inventory of depressive symptoms that addresses the core criterion of major depressive disorder as set forth by the DSM-IV. QIDS scores were utilized in the analysis that controlled for level of baseline depression.

**Treatment response**—The Overall Anxiety Severity and Impairment Scale (OASIS; Norman, Hami Cissell, Means-Christensen, & Stein, 2006) was administered at the baseline session and subsequently every other session throughout treatment. The OASIS is a 5-item measure of anxiety severity and impairment with excellent psychometric properties including strong 1-month test-retest reliability and divergent and convergent validity (Norman et al., 2006). The OASIS was used as the primary measurement of treatment response in this study because it is transdiagnostic and thus relevant for both GAD and PD (Campbell-Sills et al., 2009).

## Data Analysis

Evaluation of the effect of positive emotions on symptom change used a multilevel modeling approach, which accounts for the repeated measures of symptom outcomes (Level 1) nested within individual participants (i.e., Level 2; Hayes, 2006). Symptom outcomes were OASIS scores collected for each individual over the course of treatment (i.e., scores at baseline, session 2, 4, 6, 8, and 10). An intent-to-treat (ITT) approach was taken such that any individual with at least one post-baseline assessment was included ( $N = 59$ ). All models used restricted maximum likelihood estimation procedures and an unstructured covariance matrix for the errors of repeated measures, with random effects of intercept modeled. Time was treated as a continuous variable representing weeks in treatment, centered such that the intercept represented the post-treatment outcome score. Following recommendations of Schneider et al. (2015), we also tested whether the predictive relationship of positive emotions on treatment outcome was non-linear by including quadratic terms for the NEO-PE and its interaction with time (i.e.,  $\text{NEO-PE}^2$ ,  $\text{Time} \times \text{NEO-PE}^2$ ). Supplemental sensitivity analyses were also conducted to establish the predictive power of positive emotions above and beyond baseline symptoms of depression, a clinical condition characterized by low positive emotions that frequently co-occurs with anxiety. All analyses were conducted using the linear mixed effects procedure in SPSS version 19.

## Results

### Demographic and clinical variables

Demographic data on participants is presented in Table 1. Clinical variables, including anxiety and depression severity, are also presented in this table. Table 2 represents correlations between symptom outcomes at baseline. Correlations revealed that baseline anxiety and depression were significantly associated,  $r = .45$ ,  $p < .001$ . Trait positive emotion scores were significantly inversely associated with baseline depression,  $r = -.32$ ,  $p = .01$ , but were not significantly associated with baseline anxiety severity,  $r = -.09$ ,  $p = .52$ . The average total number of sessions for the ITT sample was 9.2 ( $SD = 1.9$ ), and baseline positive emotions, depression, or OASIS severity did not predict number of sessions completed ( $ps > .2$ ).

### Positive emotions as a predictor of treatment outcome

A baseline unconditional growth model was tested first predicting anxiety outcomes from time (i.e., session). Results revealed that time significantly predicted OASIS scores, such that anxiety decreased across sessions,  $\beta = .91$ ,  $SE = .07$ ,  $t = 13.21$ ,  $p < .001$ . Second, a model testing the effect of adding baseline positive emotions (NEO-PE) on the symptom trajectory and post-treatment outcomes was tested. Quadratic terms of NEO-PE<sup>2</sup> and Time  $\times$  NEO-PE<sup>2</sup> were initially tested and found to be non-significant ( $ps > .11$ ); therefore, only linear effects were retained in the models. See Table 3. Results revealed a significant interaction of NEO-PE by time ( $p = .01$ ), indicating that baseline positive emotions predicted differential slope of change in anxiety symptoms over time. Specifically, greater levels of trait positive emotions predicted a larger reduction of anxiety symptoms. Moreover, the effect of NEO-PE on post-treatment OASIS scores was significant ( $p < .01$ ), indicating that participants with higher baseline positive emotions demonstrated lower anxiety symptom severity at post-treatment.

**Responder status**—We also examined whether trait positive emotionality predicted responder status, defined as OASIS scores  $\leq 5$  at the end of treatment (Ball et al., 2014). Responder status for participants who did not complete the full course of treatment was estimated using predicted outcomes from the multilevel modeling analysis, thereby honoring the intent-to-treat principle. Overall, 53% of participants were classified as responders. We divided the sample into participants who scored below (NEO-PE  $< 50$ ) vs. above (NEO-PE  $\geq 50$ ) the normative sample mean (T-score = 50) on the NEO-PE, which provides a well-established benchmark point of reference. A chi-square analysis conducted on the NEO-PE groups revealed that a significantly greater proportion of participants were classified as responders in the above average positive emotion group (NEO-PE  $\geq 50$ ; 17/24 or 71%) compared to the below average positive emotion group (NEO-PE  $< 50$ ; 14/35 or 40%),  $\chi^2(1) = 5.43$ ,  $p = .020^2$ .

<sup>2</sup>We conducted a binary logistic regression analysis predicting response status from continuous NEO-PE scores. Results mirrored the NEO-PE group analysis findings such that trait positive emotions were a significant predictor of responder status,  $\chi^2(1) = 5.11$ ,  $p = .024$  (Wald test = 4.53,  $p = .033$ ).



**Covariates: Baseline Depression Severity**—A model controlling for the effect of depression symptoms was examined by including baseline QIDS severity scores as a predictor of symptom change and post-treatment outcomes. Results revealed that NEO-PE scores remained a significant predictor of the amount of symptom change over time,  $\beta = .02$ ,  $SE = .006$ ,  $t = 2.59$ ,  $p = .010$ , as well as post-treatment anxiety severity,  $\beta = -.08$ ,  $SE = .04$ ,  $t = -2.11$ ,  $p = .038^3$ ,  $^4$ .

## Discussion

Consistent with our prediction, individual differences in pre-treatment trait positive emotions predicted response to CBT for anxiety. Participants with higher levels of baseline positive emotions displayed the greatest amount of change in anxiety symptoms following treatment, even after statistically accounting for pre-treatment depression severity. The proportion of treatment responders was significantly higher for participants with trait positive emotion scores above the normative sample mean (71%) compared to below the mean (40%). The current findings extend prior research on the beneficial role of positive emotions to a treatment context (Fredrickson, 2013), and are consistent with a nascent empirical literature on positive affective predictors of CBT response for depression (Forbes et al., 2010; McMakin et al., 2012). Although conceptual models initially hypothesized that positive emotions distinguished depression from anxiety (Clark & Watson, 1991), the current findings suggest that positive emotions may serve as an indicator of the potential to benefit from CBT for anxiety above and beyond symptoms of depression, and may potentiate the effects of cognitive and exposure-based interventions for anxiety (Ehrenreich, Fairholme, Buzzella, Ellard, & Barlow, 2007; Zbozinek, Holmes, & Craske, 2015). Future research is needed to examine whether augmenting existing CBT protocols to directly target positive emotion deficits improves clinical outcomes for anxiety (Dunn, 2012; Kashdan et al., 2011; Layous, Chancellor, Lyubomirsky, 2014; Taylor, Lyubomirsky, & Stein, in press).

The current data offer initial evidence for the unique role of positive emotions in predicting treatment course, but cannot address the question of *how* positive emotions might facilitate response to CBT for anxiety. A number of hypotheses are plausible. First, positive emotions have been shown to speed physiological recovery from negative affective states (Bostock, Hamer, Wawrzyniak, Mitchell, & Steptoe, 2011; Fredrickson & Levenson, 1998; Papousek et al., 2010; Tugade & Fredrickson, 2004) and to increase heart rate variability (HRV; McCraty, Atkinson, Tiller, Rein, & Watkins, 1995). In the context of treatment, positive emotions might help regulate the cardiovascular sequelae of negative emotions experienced during exposure and thought-challenging exercises, or lead to more adaptive emotion

<sup>3</sup>We conducted a supplemental analysis in which depression diagnostic status (presence vs. absence of current or lifetime MDD) was included as a covariate in the model. Results revealed that positive emotions remained a significant predictor of change in anxiety symptoms,  $\beta = .02$ ,  $SE = .01$ ,  $t = 2.58$ ,  $p = .01$ , as well as post-treatment anxiety symptoms,  $\beta = -.10$ ,  $SE = .04$ ,  $t = -2.64$ ,  $p = .01$ . A nearly identical pattern of findings emerged when controlling for current MDD diagnostic status only.

<sup>4</sup>Following the suggestion of an anonymous reviewer, we conducted a supplemental analysis controlling for baseline anxiety severity by including disorder-specific anxiety severity indicators in the multilevel model (i.e., Anxiety Sensitivity Index [ASI; Reiss, Peterson, Gursky, & McNally, 1986] and Penn State Worry Questionnaire [PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990]). Correlations between the NEO-PE and baseline ASI and PSWQ were  $r = -.10$ ,  $p = .47$  and  $r = -.28$ ,  $p = .04$ , respectively. Results from the multilevel model revealed that positive emotions remained a significant predictor of change in OASIS scores,  $\beta = .02$ ,  $SE = .01$ ,  $t = 2.61$ ,  $p = .01$ , as well as post-treatment OASIS scores,  $\beta = -.09$ ,  $SE = .04$ ,  $t = -2.29$ ,  $p = .025$ , controlling for anxiety sensitivity and worry at baseline. See Supplemental Figure 4.

regulation by allowing for easier transitions between physiological states of arousal and recovery (Appelhans & Luecken, 2006).

A related possibility is that positive emotions promote distress tolerance. The ability to tolerate distress induced by negative thoughts, memories, and emotions is proposed to be important for successfully undergoing cognitive and exposure-based therapies (e.g., fear toleration; Craske et al., 2008). Distress tolerance theoretically would allow individuals to engage more fully in treatment exercises while experiencing discomfort. Previous research has demonstrated that positive emotions are correlated with one's ability to tolerate emotional (Simons & Gaher, 2005) and physical distress (de Wied & Verbaten, 2001). Whether positive emotions facilitate distress tolerance through down-regulating physiological effects of negative emotions (Fredrickson, 2001), encouraging adaptive coping (Folkman & Moskowitz, 2000), promoting curiosity, exploration, and openness to new experiences in the face of distress (Kashdan et al., 2004), or positive framing of negative affect-inducing treatment activities (Tugade & Fredrickson, 2004) remains an important question for future research.

Third, a central aspect of successful CBT is the ability to challenge maladaptive cognitive schemas and facilitate assimilation of new information. Anxiety disorders are characterized by narrow, inflexible, and negatively biased patterns of cognition and behavior hypothesized to maintain symptoms (e.g., Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007). Positive emotions have been shown to facilitate learning (Bryan, Mathur, & Sullivan, 1996), global information processing (Rowe, Hirsh, & Anderson, 2007), openness to new information and patterns of information processing (Estrada et al., 1997; Isen et al., 1987; Johnson & Fredrickson, 2005), and flexible thinking (Isen & Daubman, 1984). These processes may increase the efficacy of CBT by aiding one's capacity to assimilate new information learned during therapy, generate alternatives to currently held negative beliefs, and by allowing for the integration of disconfirmatory (threat-inconsistent) information learned during behavioral exercises.

Finally, positive emotions may inhibit the return of fear following exposure-based therapy (Zbozinek & Craske, 2016; Zbozinek et al., 2015). For example, individuals who completed a positive mood induction procedure prior to extinction training of an aversively conditioned (previously neutral) stimulus displayed greater decreases in the negative valence of the conditioned stimulus at post-extinction, and experienced less return of fear when tested during reinstatement one week later (Zbozinek et al., 2015). Although we did not measure *state* positive emotions throughout treatment, people characterized by higher trait positive emotions are theorized to draw on positive emotions during stress-provoking situations (Tugade & Fredrickson, 2004), which may promote inhibition of return of fear throughout treatment. Explicitly increasing state positive emotions prior to exposure exercises may potentiate treatment response, an effect that may be most pronounced for individuals who enter treatment with low trait positive emotionality. Research is needed to examine those possibilities.

Our study has limitations. First, we measured trait positive emotions at baseline rather than positive emotions throughout treatment or state positive emotions prior to exposure

exercises, and therefore can only speak to the effect of initial trait positivity. Moreover, positive emotions were not manipulated in this study, and thus, causality cannot be inferred. Second, our sample consisted only of participants diagnosed with panic disorder and generalized anxiety disorder; therefore, we cannot generalize the outcome to other anxiety disorder groups. Third, positive emotionality was measured broadly. Some types of positive emotions (e.g. amusement, contentment) may better predict treatment response than others. Fourth, in the absence of a comparison treatment condition, it is not possible to account for naturally occurring fluctuations in symptoms, non-specific treatment effects, or to examine whether positive emotions predict differential response to CBT compared to other anxiety-focused interventions.

Finally, the hypothesis under investigation was tested using an existing dataset comprised of study participants drawn from a trial with specific inclusion and exclusion criteria intended to address a different research question, and using a positive emotion measure of convenience that was subsumed within a larger personality assessment inventory. Thus, it remains to be established whether the current findings generalize to other anxious populations, or to other well-established measures of positive emotions (e.g., Watson, Clark, & Tellegan, 1988; Watson & Clark, 1991). Accordingly, replication of the current findings is needed. Those limitations notwithstanding, trait positive affect may be a promising prognostic indicator of CBT efficacy for anxiety. Research is needed to determine whether treatments aimed at enhancing positive emotions can lead to improved outcomes for anxiety disorders.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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### Highlights

- Trait positive emotionality was examined as a predictor of CBT response for anxiety
- 59 individuals with panic disorder or GAD completed up to 10 sessions of CBT
- Higher pre-treatment trait positive emotions predicted superior treatment response
- Positive emotions predicted response even when controlling for depression symptoms
- Dispositional positive emotions may be a prognostic indicator of CBT response



**Table 1**

## Demographic and Clinical Variables (N = 59)

<b>Variable</b>	
Mean Age ( <i>SD</i> )	32.03 (9.5)
Gender (% female)	74.6
Race (% per category)	
Asian	8.5
White	69.5
Black	3.4
Native American	5.1
Other or mixed race	13.6
Hispanic Ethnicity (%)	15.3
Mean Years Education ( <i>SD</i> )	15.15 (2.05)
Mean QIDS score	8.2 (4.2)
Mean NEO-PE score	46.2 (11.4)
Mean OASIS score	
Baseline	9.4 (3.9)
Session 2	9.3 (3.6)
Session 4	8.1 (3.8)
Session 6	6.6 (3.5)
Session 8	6.1 (4.1)
Session 10	5.3 (3.7)

*Note.* QIDS = Quick Inventory of Depression Symptomology; NEO-PE = positive emotion facet of the NEO Personality Inventory; OASIS = Overall Anxiety and Severity and Impairment Scale.

**Table 2**

Bivariate correlations between baseline positive emotions, anxiety and depression, and number of CBT sessions completed.

Measure	1	2	3	4
1. NEO-PE	1.00			
2. OASIS	-.09	1.00		
3. QIDS	-.32*	.45*	1.00	
4. Sessions	.14	-.02	-.003	1.00

*Note.* NEO-PE = positive emotion facet of the NEO Personality Inventory; OASIS = Overall Anxiety and Severity and Impairment Scale; QIDS = Quick Inventory of Depression Symptomology; Sessions = number of CBT sessions completed;

\*  
 $p < .05$ ,

\*\*  
 $p < .01$ .

**Table 3**

Hierarchical regression analyses predicting anxiety scores from baseline positive emotions.

Predictor	$\beta$	SE	<i>t</i>
Intercept	5.26	0.45	11.65***
Session	.90	0.07	13.18***
NEO-PE	-.12	0.04	-3.08**
Session * NEO-PE	0.02	0.01	2.61*

Note. NEO-PE = positive emotion facet of the NEO Personality Inventory.

\*  
 $p < .05$ .

\*\*  
 $p < .01$ .

\*\*\*  
 $p < .001$