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Attentional Bias Away from Positive Social Information Mediates the Link between Social Anxiety and Anxiety Vulnerability to a Social Stressor

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Abstract

Accumulating evidence suggests that social anxiety is associated with biased processing of *positive* social information. However, it remains to be determined whether those biases are simply correlates of, or play a role in maintaining social anxiety. The current study examined whether diminished attentional allocation for positive social cues mediates the link between social anxiety and anxiety reactivity to a social-evaluative task. Forty-three undergraduate students ranging in severity of social anxiety symptoms completed a baseline measure of attentional bias for positive social cues (i.e., modified probe detection task) and subsequently delivered an impromptu videotaped speech. Mediation analyses revealed that the tendency to allocate attention *away* from positive social stimuli mediated the effect of social anxiety on change in state anxiety in response to the stressor. The current findings add to a nascent empirical literature suggesting that aberrant processing of positive social information may contribute to the persistence of excessive social anxiety.

Keywords

Social anxiety; attention; positive; anxiety vulnerability; information processing

Introduction

Research suggests that social anxiety is associated with the tendency to preferentially allocate attention toward threatening social information, including anxiety-related sensations and behaviors (e.g., Mellings & Alden, 2000; Pineles & Mineka, 2005), and signs of disapproval from others (e.g., Mogg, Philippot, & Bradley, 2004; Pishyar, Harris, & Menzies, 2004; see Bögels & Mansell, 2004 for a review). Cognitive theories of anxiety propose that selective attention to threat heightens anxiety, negatively skews judgments of social events, and interferes with the disconfirmation of fear-relevant beliefs – factors that

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together serve to perpetuate and maintain social anxiety (e.g., Clark, 2001; Clark & Wells, 1995; Hofmann, 2007; Rapee & Heimberg, 1997). In support of this hypothesis, recent research in socially anxious individuals has demonstrated that the experimental manipulation of attention *away* from negative social cues leads to attenuated anxious responses following exposure to a contrived social stressor (Amir, Weber, Beard, Bomyea, & Taylor, 2008), as well as reductions in clinical symptoms of social anxiety and avoidance (Amir et al., 2009; Schmidt, Richey, Buckner, & Timpano, 2009).

Considerably less empirical attention has been devoted to examining the link between social anxiety and attentional processing of *positive* social information. A growing body of research, however, suggests that in addition to exhibiting negative information processing biases characteristic of all anxiety disorders (see Mathews & MacLeod, 2005), social anxiety may also be characterized by biased processing of positive social information. For example, relative to healthy controls, socially anxious individuals are slower to recognize positive facial expressions (e.g., Silva et al., 2006), selectively ignore positive audience member cues during laboratory-based speech tasks (Perowne & Mansell, 2002; Veljaca & Rapee, 1998), fail to exhibit the online expectancy bias for positive outcomes when primed with a positive social cue (Garner, Mogg, & Bradley, 2006), and interpret positive social outcomes in a way that heightens anxiety and negative predictions for future social events (e.g., Alden, Taylor, Mellings, & Laposa, 2008; Wallace & Alden, 1997). Considered collectively, these findings suggest that it may be informative to examine cognitive mechanisms involved in the processing of positive social information as well as their role in maintaining pathological social fear. Thus, the goal of the current study was to examine whether diminished attentional allocation for positive social cues mediates the link between social anxiety and anxiety reactivity in response to a stress-provoking social task.

A commonly used paradigm to assess attentional bias for emotional information is the probe detection task (MacLeod, Mathews, & Tata, 1986). In the traditional probe detection task, participants are simultaneously presented with two stimuli (e.g., words or pictures), one above the other (or side by side) on a computer screen. One stimulus is neutral, and the other stimulus is emotionally evocative (e.g., threatening, positive). After the stimuli disappear, a probe appears replacing one of the two stimuli. Participants are asked to identify the probe as quickly and as accurately as possible. Faster response latencies in detecting probes in the vicinity of emotional stimuli compared to response latencies in detecting probes in the vicinity of neutral stimuli reflects an attention bias toward the target emotional information.

Several studies have found evidence for an association between social anxiety and the tendency to preferentially orient attention *away* from positive stimuli using probe detection tasks (Chen, Ehlers, Clark, & Mansell, 2002; Mansell, Clark, Ehlers, & Chen, 1999; Pishyar et al., 2004). Moreover, reduction in social anxiety symptoms following a cognitive and behavioral treatment regimen was significantly associated with an increase in attentional bias for positive information (Pishyar, Harris, & Menzies, 2008). Thus, previous research suggests that diminished attentional allocation toward positive social information may be an important correlate of social anxiety.

Similar to probe detection research on attentional bias for negative emotional information (see Amir et al., 2008), not all studies have found evidence of an attentional bias for positive social information in social anxiety (e.g., Gotlib et al., 2004). The equivocal results of previous studies may be accounted for in part by methodological differences across studies (e.g., time course of activation of attention, type of positive emotional stimuli). For example, diminished attentional allocation for positive cues associated with social anxiety is more consistently found when stimuli are presented for shorter (e.g., 500 ms, Pishyar et al., 2004) compared to longer durations (e.g., 1000 ms, Gotlib et al., 2004). Second, the stimulus materials used in previous research have not always reflected positive *social evaluative* content. For example, some studies have included words that represent social evaluative semantic content (e.g., attractive, desirable) as well as words reflecting more broad positive mood states (e.g., jubilant, festive; Pishyar et al., 2004). Moreover, although emotional faces may serve as more ecologically valid stimuli, the extent to which a smiling or laughing facial expression conveys a positive interpersonal message to individuals with heightened levels of social anxiety remains unclear because socially anxious individuals may interpret positive facial expressions more negatively (e.g., as conveying mockery or negative social evaluation; Yoon & Zinbarg, 2007). Thus, in the current study we chose stimuli that reflected positive social evaluative content in accordance with previous research in social anxiety (Dozois & Frewan, 2006).

Although previous research suggests that social anxiety may be associated with a tendency to orient attention away from positive social cues, it remains to be determined whether those biases are simply correlates of social anxiety or whether they play a role in maintaining excessive social fear. Several lines of evidence led us to hypothesize that diminished attentional allocation toward positive social cues would mediate the link between level of social anxiety and anxiety reactivity to a social stressor. First, research suggests that psychologically healthy individuals shift their attention toward positive emotional cues under conditions of heightened stress (Joormann, Talbot, & Gotlib, 2007), a tendency not displayed by socially anxious individuals (Lee & Telch, 2008). Second, recent research has demonstrated that experimentally manipulating attention *toward* positive stimuli reduces negative cognitive-emotional reactivity to stress-provoking laboratory challenges (i.e., attempting to solve insoluble anagrams; Johnson, 2009; viewing negative images; Wadlinger & Isaacowitz, 2008). Taken together, this body of research suggests that the ability to selectively orient attention toward positive stimuli may facilitate emotion regulation and offset the negative emotional effects of stress. To the extent that social anxiety is associated with a diminished tendency to orient attention toward positive cues, we predicted that such individuals would be particularly vulnerable to experiencing elevated states of anxiety during a stressful social task.

Depression is also characterized by reduced processing of positive emotional stimuli (e.g., Joormann & Gotlib, 2007; Levens & Gotlib, 2009). Moreover, there is some evidence to suggest that anhedonia (i.e., an inability to experience pleasure), a characteristic feature of depression, is uniquely and negatively associated with positive information processing biases (Dunn, Stefanovitch, Buchan, Lawrence, & Dalgleish, 2009). Anhedonia, or low positive affect, also frequently accompanies social anxiety (see Kashdan, 2007 for a review).

These findings suggest that anhedonia may also explain in part the hypothesized mediational pathway from social anxiety to anxiety reactivity through attentional bias for positive information.

In the current study, we sought to extend previous research on positive information processing biases in social anxiety by examining whether attentional bias for positive social information mediates the relationship between social anxiety and anxiety in response to social evaluative threat. To address this issue, we recruited participants displaying a range of social anxiety symptoms. This approach allowed us to exploit individual variability in response to the attentional and emotional assessments, permitting an arguably more powerful test of the empirical question under investigation (see Vogel & Awh, 2008). Participants were administered a modified probe detection task (MacLeod et al., 1986) to assess attentional bias for positive social information and then engaged in a laboratory based social stressor (i.e., impromptu speech). We conducted a mediation analysis to test the indirect effect of social anxiety on anxiety reactivity to social evaluative threat through attentional bias for positive social cues (Preacher & Hayes, 2004). We also controlled for concurrent symptoms of anhedonia as a preliminary test of the specificity of the proposed mediation pathway to social anxiety.

Method

Participants

Participants were 43 individuals (13 men, 30 women) drawn from a pool of undergraduate students at a large university (mean age = 19.19, *SD* = 3.45; mean years of education = 13.07, *SD* = 1.06). These individuals responded to an advertisement for “individuals with difficulty giving speeches.” We expected that although this recruitment strategy would yield a sample of individuals scoring higher than non-anxious samples on mean levels of social anxiety, it would also allow for a wide range of social anxiety symptoms. See Table 1. Participants were offered course credit for their participation. Data from these individuals were collected as part of a larger study examining positive emotional processes in social anxiety.

Measures

Social Anxiety—The Liebowitz Social Anxiety Scale–Self-report version (LSAS-SR; Liebowitz, 1987) was used to assess level of social anxiety. The LSAS-SR consists of 24 social situations (e.g., public speaking, going to parties, meeting strangers) and asks the individual to rate their level of *Fear* and *Avoidance* for each situation on a 4-point scale (where 0 is ‘none/never’ and 3 is ‘severe/usually’). Items are summed to create a total score reflecting level of social anxiety symptoms. The self-report and interviewer versions of the LSAS have been shown to correlate highly and demonstrate strong psychometric properties (Fresco et al., 2001). Internal consistency of this scale was adequate in this sample (Cronbach’s α = .95).

Anhedonia—To assess current level of anhedonia, participants completed the Mood and Anxiety Symptom Questionnaire-Anhedonic Depression scale (MASQ-AD; Watson &

Clark, 1991). The MASQ-AD is a 22-item subscale that comprises 8 items written to reflect loss of interest and pleasure believed to be characteristics of depression (*Sample item:* felt like nothing was very enjoyable) and 14 reverse scored items that assess positive emotional experiences (*Sample item:* felt cheerful). Participants indicated the extent to which they experienced each symptom during the past week from 1 (*not at all*) to 5 (*extremely*). Higher scores reflected greater severity of anhedonia. Internal consistency of this scale was high in this sample (Cronbach's α = .92).

Anxiety Reactivity—To assess change in participant anxiety following exposure to the social stressor, participants completed the Spielberger State-Trait Anxiety Inventory – State scale (STAI-S; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) immediately before (baseline-STAI-S) and after the speech task (stressor-STAI-S). The STAI-S comprises 20 items assessing state symptoms of general anxiety and participants were asked to rate the items according to how they *currently feel*. Each item is rated on a 4-point Likert-type scale ranging from "almost never" to "almost always". Higher scores reflect higher levels of anxiety. The STAI-S has strong psychometric properties (Spielberger et al., 1983). Internal consistency of this scale was high in this sample (Cronbach's α = .91 and .92 for baseline and stressor ratings, respectively).

Attention Bias Assessment Task—To measure attentional allocation for positive social information, participants completed a modified probe detection task (MacLeod et al., 1986). The stimuli comprised two sets of word-pairs (Set A and Set B) containing 12 word-pairs each. Each word-pair contained one positive social word (e.g., likeable) and one neutral word (e.g., couch). The socially relevant words were selected to reflect positive social evaluative content and were taken from previous information processing studies in social anxiety (Dozois & Frewen, 2006). Neutral words were selected to represent a common category (i.e., household items). Words were matched for length and frequency (Francis & Kucera, 1982), and participants were randomly assigned to either Set A or B.

A subset of participants (n = 27) rated the emotionality of the words using a scale with anchors of -3 (*Negative*) to +3 (*Positive*). As expected, positive words were rated as significantly more positive (M = 2.20) than the neutral words (M = .27), $t(26) = 16.49$ p < .001. Emotionality ratings for positive and neutral words did not differ across the two word sets, (i.e., the Word Set (A, B) × Word Type (positive, neutral) interaction was not significant, $F(1, 25) < 1$, $p > .9$). Moreover, level of social anxiety was not associated with perceived emotional valence of the positive stimuli, $r(27) = .10$, $p = .61$ or neutral stimuli, $r(27) = .10$, $p = .63$.

Each attention bias assessment trial began with a fixation cross presented on the computer screen for 500ms. Next, this cross was replaced by a word-pair presented in the center of the screen for 500ms, one word 3cm above the other. The words then disappeared and a probe (i.e., the letter "E" or "F") appeared immediately in the location of one of the two words. Participants were instructed to indicate whether the letter was an E or an F by pressing corresponding mouse button. The letter probe remained on the screen until participants responded. Response latencies to identify the probe were recorded from the onset of the letter probe to the button press. Trials were separated by 500ms intervals of blank screen,

and then the subsequent trials began with a fixation cross. Assessment consisted of 96 trials which contained positive-neutral word-pairs, and comprised all combinations of Probe Type (E or F), Probe Location (Top or Bottom), and Positive Word Location (Top or Bottom): 2 (Probe Type) × 2 (Probe Location) × 2 (Positive Word Location) × 12 Positive-Neutral Word-Pairs. The first five trials were considered practice trials and were therefore excluded from the analysis. Trials were presented in a new random order to each participant. Participants were seated approximately 30cm from the computer screen, and stimuli were presented in 12-point Arial font in black on a grey background. The computer program was written in Delphi (Borland, Inc.).

Procedure

Participants began the experiment by providing informed written consent and completing self-report questionnaires (i.e., demographics questionnaire, LSAS-SR, and MASQ-AD). Participants then completed the probe detection task to assess attentional bias for positive social cues. Next, participants completed a baseline measure of state anxiety (STAI-S). They were then informed that they would deliver an impromptu 5-minute speech that would be video recorded so that it could be rated by a graduate student for its quality. They were provided with a list of five topic options (abortion, corporal punishment, seatbelt laws, nuclear power, and the American health care system; Hofmann, Newman, Ehlers, & Roth, 1995), and were given two minutes to prepare for the speech. Participants were permitted to write notes during the preparation period, but could not use these notes during the speech. After the preparation period, participants were directed to stand in front of the camera, and the experimenter began recording. The experimenter terminated the speech after five minutes, or when the participant indicated that they wanted to stop. Participants then completed the post-stressor STAI-S.

Results

Preliminary Analyses and Data Preparation

To create an index of anxiety reactivity to the social stressor, we computed standardized residual scores in which participant ratings of state anxiety completed prior to the speech (baseline-STAI-S) were regressed onto participant state anxiety ratings completed immediately following the speech (stressor-STAI-S). Residualized change scores were used instead of simple difference scores (i.e., subtracting baseline STAI-S from stressor STAI-S) to control for initial differences between individuals and measurement error inherent in the use of repeated measures of the same instrument (e.g., Steketee & Chambless, 1992). That is, because simple difference scores remove substantial variance due to the assessment instrument's reliability, a large proportion of mean error variance remains in the subsequent estimate. Residual gain scores are also justifiable given the propensity of extreme scores to drift toward the general mean during subsequent assessment periods (see Beutler & Hamblin, 1986). In the current study, larger residual scores reflect larger changes in anxiety from before to after the speech and can be seen as a measure of anxiety reactivity. The resultant index of anxiety reactivity was used as the dependent variable in the mediational analyses.

Prior to computing an index of attentional bias for positive social stimuli, response latency data from the attention bias assessment were prepared in keeping with recommendations from Ratcliff (1993). First, trials with incorrect responses were removed (2.25%). Response latencies less than 200ms or greater than 2000ms (< 1.00% of trials with correct responses) and ±2.0 SD from each participant's mean response latency were also eliminated from analysis of attention bias assessment (4.22% of remaining trials).

We computed an index of attentional bias for positive social information by subtracting participants' mean response latencies to correctly identify probes following in the position of the positive words from their mean response latency to correctly identify probes following in the position of the neutral words (see MacLeod & Mathews, 1988). As a result, a positive attentional bias score reflected speeded latencies for probes in the vicinity of positive words, indicating greater attentional bias toward positive information. A negative bias score indicated faster response latencies to respond to a probe following neutral words, or an attentional avoidance of positive information.

The means, standard deviations, and ranges of the measures are presented in Table 1. Bivariate correlations between measures are presented in Table 2. Prior to conducting the main analyses, we screened for univariate outliers by identifying raw scores ±3.0 SD from the sample mean and multivariate outliers by examining leverage and Cook's distance values. This procedure did not identify any univariate or multivariate outliers.

Mediation Analyses

We used bootstrapping methods to test the hypothesis that attentional bias for positive social information mediates the association between social anxiety and anxiety reactivity (see Preacher & Hayes, 2004). Bootstrapping procedures test the indirect effect of the independent (predictor) variable (LSAS-SR) on the dependent variable (anxiety reactivity) through the mediator (attentional bias for positive social cues). Unlike the Sobel test (1982), bootstrapping tests the indirect effect through the construction of confidence intervals and makes no assumptions about the shape of the sampling distribution of the indirect effect, which tends to be asymmetric (e.g., MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2004; Shrout & Bolger, 2002). Figure 1 presents results of these analyses for the 95% confidence interval of the indirect path (*ab*). Significant indirect effects are revealed when confidence intervals do not overlap with zero. We report bias-corrected and accelerated boostrapped confidence intervals obtained using 5000 resamples.

Social anxiety and attentional bias for positive information accounted for significant variance in anxiety reactivity to the speech, $R^2 = .20$, $F(2, 40) = 5.04$, $p = .01$. Higher levels of social anxiety were associated with greater anxiety reactivity to the speech when social anxiety was entered alone in the regression model, $\beta = .35$, $t(42) = 2.36$, $p = .02$ (path *c*) and were negatively associated with attentional bias for positive social cues, $\beta = -.40$, $t(42) = -2.80$, $p = .008$ (path *a*). Moreover, greater attentional bias for positive information predicted lower anxiety reactivity to the speech while controlling for level of social anxiety, $\beta = -.31$, $t(42) = -2.02$, $p = .05$ (path *b*). The indirect effect (*ab*) of social anxiety through attentional bias for positive social information was significant such that the 95% confidence interval did not overlap with zero (lower limit = .0139, upper limit = .3030)[1]. The direct effect of social

anxiety on anxiety reactivity was no longer significant when controlling for attentional bias for positive cues supporting full mediation, $\beta = .22$, $t(42) = 1.43$, $p = .16$ (path c'). See Figure 1.

Mediation Analyses Controlling for Anhedonia

To examine whether concurrent symptoms of anhedonia accounted for the previous mediation model, the analyses were repeated entering MASQ-AD scores as a covariate[2]. Anhedonia was not a significant predictor in the regression model, $\beta = .26$, $t(39) = 1.59$, $p = .12$. Moreover, the indirect effect of social anxiety on anxiety reactivity to the speech task through attentional bias for positive social cues remained significant when anhedonia was entered as a covariate (95% confidence intervals: lower limit = .0030, upper limit = .3652).

Discussion

Cognitive theories of social anxiety posit that attentional bias for negative social information confers heightened vulnerability to anxiety during exposure to stress-provoking social encounters (Clark, 2001; Clark & Wells, 1995; Hofmann, 2007; Rapee & Heimberg, 1997; see also Mathews & MacLeod, 2005). The current study examined whether these theories could be extended to evaluate whether attentional processing of *positive* social information mediates the link between social anxiety and anxiety reactivity to social evaluative threat. We found that attentional bias *away* from positive social cues fully mediated the link between social anxiety and state anxiety in response to the speech task. Moreover, these effects were not accounted for by co-occurring symptoms of anhedonia. This study adds to a small but growing empirical literature documenting an association between aberrant positive social emotional processing and social anxiety (e.g., Alden et al., 2008; Garner et al., 2006; Pishyar et al., 2004; Silvia et al., 2006). The current results expand the extant literature, however, in suggesting that diminished processing of positive social information may contribute to the maintenance of pathological social fear.

Social anxiety negatively predicted attentional bias for positive social cues. Thus, higher levels of social anxiety were associated with a diminished processing of positive social information relative to neutral information. These findings are consistent with previous probe detection studies documenting that socially anxious individuals tended to avoid positive emotional stimuli relative to healthy controls (Chen et al., 2002; Mansell et al., 1999; Pishyar et al., 2004; see also Veljaca & Rapee, 1998). They also converge with research demonstrating that reduction in social anxiety symptoms following effective treatment was significantly associated with an increase in attentional bias for positive social cues (Pishyar et al., 2008). Results of the current mediation analyses go one step further in suggesting that attentional bias away from positive social information may have implications for the maintenance of social anxiety.

[1]We also repeated the mediation analysis using the distribution of products approach (MacKinnon, Fritz, Williams, & Lockwood, 2007). This procedure accounts for the non-normal distribution of the indirect (*ab*) path through the construction of asymmetric confidence intervals. Consistent with the bootstrapping procedure, results revealed that the 95% confidence interval for the indirect path of social anxiety to anxiety reactivity through attentional bias for positive social information did not overlap with zero (lower limit = -.1944, upper limit = -.0069).

[2]Three participants failed to complete the MASQ-AD. The same pattern of findings emerged when excluding these participants from all analyses.

Despite growing recognition that social anxiety is associated with biased processing of positive social emotional information, previous research has not examined whether those deficiencies played a role in perpetuating social anxiety. To our knowledge, only one study has examined the relationship between biased processing of positive social information and response to a social evaluative situation. In a sample of patients diagnosed with social anxiety disorder (SAD), Alden et al. (2008) found that participants who displayed the strongest tendency to interpret positive social events negatively made the most negative predictions (i.e., expected to perform poorly) about future interactions with a person who had previously displayed warmth and friendliness toward them. The current study adds to this nascent literature by using a validated behavioral measure of attentional bias (cf. self-report) and evaluating emotional responses to an *in vivo* social stressor (cf. predictions pertaining to an ostensible future social event). Current results are particularly compelling given that the mediator (attentional bias) and outcome variable (anxiety reactivity) were measured using distinct methods of assessment (i.e., behavioral response latencies vs. self-report).

Why would possessing an attentional bias away from positive social cues heighten anxiety vulnerability to a social stressor? Accumulating evidence suggests that preferentially allocating attention toward positive emotional stimuli may promote emotion regulation under conditions of stress. For example, psychologically healthy individuals have been shown to shift their attention toward positive emotional cues under laboratory conditions designed to induce negative mood states (e.g., Joormann et al., 2006; Lee & Telch, 2008). Moreover, the experimental manipulation of attention toward positive stimuli has been shown to reduce negative cognitive-emotional reactivity to artificially contrived stressors (Johnson, 2009; Wadlinger & Isaacowitz, 2008). In contrast, the tendency to direct attention away from positive emotional information associated with social anxiety would be expected to confer heightened susceptibility to experiencing elevated states of anxiety during exposure to stress-provoking social events.

Dysregulation of positive emotional processing has also been implicated in the pathophysiology of a number of other psychiatric conditions, most notably depression (e.g., Joormann & Gotlib, 2007; Levens & Gotlib, 2009). Given the high co-occurrence between social anxiety and depression (e.g., Schneier et al., 1992), it is important to establish whether the current findings could be accounted for by co-occurring features of depression. We repeated the mediation analyses controlling for anhedonia, rather than symptoms of depression more broadly, given research suggesting that anhedonic features of depression are more distinctively related to diminished positive emotional experiences and information processing deficits (e.g., Dunn et al., 2009). Results revealed that current levels of anhedonia did not significantly affect the mediation model. These findings support a specific pathway from social anxiety to anxiety reactivity through attentional bias away from positive social information. They are also consistent with earlier work finding evidence for a distinct relationship between social anxiety and aberrant processing of positive social information beyond variance accounted for by co-occurring symptoms of depression (Alden et al., 2008; Pishyar et al., 2004). Future research in carefully diagnosed samples of individuals with pure and comorbid SAD and major depressive disorder is needed to clarify this issue.

Future research could build upon the current study in several ways. First, the present sample comprised undergraduate students and generalizability to community and clinical samples is needed. Second, assessment of social anxiety relied on participants' self-report. Although the LSAS-SR has been shown to correlate highly with the interviewer-administered LSAS (Fresco et al., 2001), a clinician-administered interview may provide a more objective assessment of social anxiety symptoms. Similarly, although anxiety reactivity was assessed using a validated instrument, it relied on subjective emotional responses. Future research should assess emotional responses to social stressors using more objective measures (e.g., cardiovascular recovery) as well as examine emotional reactivity throughout the course of the stressor (e.g., anticipation, peak anxiety, etc.). This study also tested the positive attentional mediation model in the context of a structured impromptu speech task, and generalizability to naturalistic settings and other social situations needs to be established.

Another limitation of the present investigation is that without a concurrent assessment of attentional bias for negative social information, we were unable to establish the unique contribution of positive and negative attentional bias to the social anxiety-anxiety reactivity relationship. One might argue that attentional allocation toward positive emotional cues simply reflects the bipolar opposite of attentional bias for negative information. However, there is compelling evidence for the independence of positive and negative emotional functioning (e.g., Davidson et al., 2000; Diener & Emmons, 1985; Gable & Berkman, 2008), which suggests that attentional processing of positive and negative social cues may be at least partially distinct. One avenue for future research will be to examine whether individuals who are prone to displaying prominent attentional biases both toward negative social information and away from positive information are at greatest risk for experiencing adverse emotional effects of stressful social encounters. One final caveat involves the cross-sectional design of the current study. Although we successfully demonstrated statistical mediation, future research using longitudinal or randomized experimental designs (e.g., Amir et al., 2008) is needed before more definitive casual inferences can be made.

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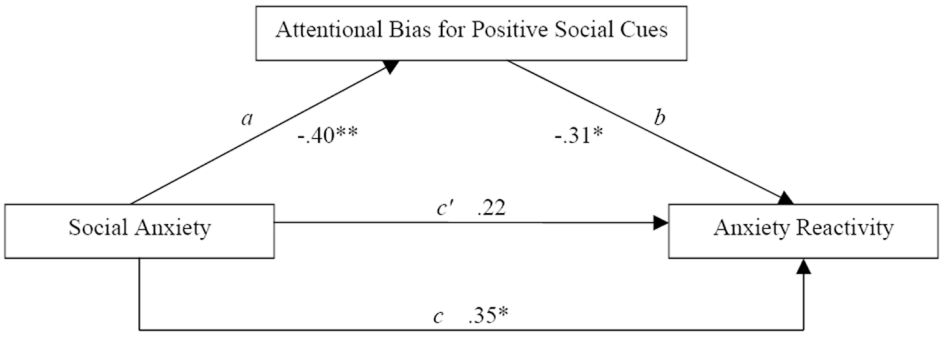

Figure 1.

Mediation model for attentional bias for positive social cues as a mediator between social anxiety and anxiety reactivity to the speech with standardized regression coefficients (*$p < .05$. **$p < .01$). The indirect effect (*ab*) was significant at the 95% confidence interval (lower limit = .0139, upper limit = .3030).

Table 1

Means, standard deviations, and range of scores for the primary measures.

Measure	Mean	*SD*	Minimum	Maximum
LSAS-SR	52.53	25.74	5	101
Positive Attentional Bias	.35	27.26	-73.15	99.83
STAI-S (baseline)	41.63	10.77	20	71
STAI-S (stressor)	49.28	11.45	25	71
MASQ-AD[1]	56.45	14.79	31	96

Note. LSAS-SR = Liebowitz Social Anxiety Scale – Self-report; MASQ-AD = Mood and Anxiety Symptom Questionnaire – Anhedonic Depression scale; STAI-S = Spielberger Trait and State Anxiety Inventory – State version.

Table 2

Bivariate correlations between social anxiety, attentional bias for positive social cues, anxiety reactivity and anhedonia.

Measure	1	2	3	4	5	6
1. LSAS-SR	1.00					
2. Positive Attentional Bias	-.41**	1.00				
3. Anxiety Reactivity	.35*	-.40**	1.00			
4. STAI-S (baseline)	.35*	-.31*	.00	1.00		
5. STAI-S (stressor)	.49***	-.51***	.77***	.64***	1.00	
6. MASQ-AD[1]	.38*	-16	.35*	.28	.45**	1.00

Note. STAI-S = Spielberger Trait and State Anxiety Inventory – State version.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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