Friend or Foe?

Memory and Expectancy Biases for Faces in Social Anxiety

by

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

Abstract

Previous studies examining memory biases for threatening faces in social anxiety (SA) have yielded inconclusive results. In the present study, memory and expectancy biases were tested within the context of a novel face recognition paradigm that was designed to offset some of the methodological challenges that have hampered previous research. Undergraduates with high (n = 40) and low (n = 40) levels of SA viewed a series of neutral faces randomly paired with phrases that communicated positive or negative social feedback. Participants' recognition memory was tested for previously encountered faces, and for their categorization of each encoded face as having been associated with negative (mean) or positive (nice) interpersonal statements. For faces labelled as new, participants were asked whether the person depicted seemed mean or nice. Results provided no evidence in support of a general memory bias for threatening (mean) faces among high SA individuals, but instead suggested that high SA individuals lack a positive expectancy bias to appraise new social partners as being nice. Implications are considered for cognitive behavioural and interpersonal models of SA.

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Social Anxiety Disorder (SAD) is one of the most prevalent psychological disorders, with a lifetime prevalence rate of approximately 12% (Kessler et al., 2005). SAD is characterised by fear of one or more social situations that are avoided entirely or endured with high levels of distress (American Psychiatric Association, 2000). Individuals with SAD experience significant difficulties related to their anxiety symptoms across several life domains, including school and work, social and romantic relationships, and overall quality of life (Stein & Kean, 2000).

Due to the high prevalence of SAD and its impairing consequences, much research has focused on understanding the cognitive factors that may account for the development and persistence of social anxiety symptoms. Cognitive models of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997) have attempted to elucidate the underlying cognitive mechanisms involved in the maintenance of symptoms. According to these models, individuals with high levels of social anxiety (SA) attach "fundamental importance to being positively appraised by others" (Rapee & Heimberg, 1997, p. 742) but believe that other people are inherently critical. During a social situation, socially anxious individuals form and maintain moment-by-moment negative mental representations of themselves, as seen from the vantage point of their imagined critical evaluators (Clark & McManus, 2002; Rapee & Heimberg, 1997). High SA individuals also perceive others as having exceedingly high standards for their social performance, and believe that they lack the skills necessary to live up to these standards, due to perceived flaws in self-relevant attributes that they worry will be revealed over the course of the social interaction (e.g., Alden, Bieling, & Wallace, 1994; Moscovitch, 2009). Interestingly, there has not been consistent empirical support for the idea that high SA individuals have objective social skill deficits, with most research suggesting instead that they are inhibited in applying skills that they do possess in social contexts (Hofmann, 2007). It has been hypothesized that

reluctance to utilize these skills may also be due, in part, to their high estimation of the social costs of acting inappropriately or committing a social blunder (Hofmann, 2007; Rapee & Heimberg, 1997). Thus, it has been suggested that high SA individuals view negative social outcomes as both catastrophic and likely due to these perceived shortcomings, and become hypervigilant toward social cues signifying potential negative evaluation (Rapee & Heimberg, 1997).

Efforts in recent years to test the prominent theoretical claims of these cognitive models of SA have led to the rapid growth of an extensive body of research supporting the notion that SA is associated with attention biases toward threatening information (e.g., Buckner, Maner & Schmidt, 2010; Chen, Ehlers, Clark, & Mansell, 2002; Gilboa-Schechtman, Foa, & Amir, 1999; Mogg & Bradley, 2002; Mogg, Philippot, & Bradley, 2004; Pishyar, Harris, & Menzies, 2004). Research focused on attentional biases toward threatening information (most commonly, faces) has most often used measures of the latency to orient toward threat within the context of the *dot-probe* (e.g., Mogg & Bradley, 2002) or *face-in-the-crowd* paradigms (e.g., Gilboa-Schechtman et al., 1999). Of these studies, many have found that individuals with higher levels of SA were quicker to orient toward faces with negative expressions (e.g., anger, disgust) than were non-anxious controls (Klumpp & Amir, 2009; Mogg et al., 2004; Pishyar et al., 2004; Stevens, Rist, & Gerlach, 2009). An additional attentional mechanism that has recently been implicated in SA is difficulty disengaging from threatening faces. For example, Buckner, Maner, and Schmidt (2010) studied visual attention using eye-tracking and found that when presented with a series of happy and disgusted faces, individuals with high SA had difficulty disengaging visual attention from the disgusted faces, but did not differ from non-anxious controls in their ability to disengage from happy faces.

Interestingly, attentional biases to threat have recently become targets of a specialized computer-based treatment protocol, attention retraining, which is designed to reduce or eliminate these biases and, in turn, to reduce symptoms of social anxiety. Several studies have found evidence to suggest that this training may be able to ameliorate symptoms of anxiety and improve social performance. For example, in a randomized controlled trial, Amir and colleagues (2009) used probe-detection tasks to train patients with SAD to direct attention toward neutral and away from threatening faces, and found that attention training significantly reduced social anxiety symptoms post-treatment relative to individuals who participated in a control probe-detection task, with gains preserved in the attention training group at four-month follow-up (Amir et al., 2009). Other studies have found that, in addition to reducing SA symptoms, attention training away from threat also improves speech performance in socially anxious individuals (Amir, Weber, Beard, Bomyea, & Taylor, 2008).

Thus, there is relatively strong empirical support for the notion that attentional biases exist in SA, and the evidence suggests that these biases play an important role in the development and maintenance of anxiety symptoms. Conversely, research on memory biases for threatening information in SA has been relatively sparse and findings have been inconsistent across different methodological approaches, in which the nature of the threat stimuli used (e.g., faces, words, etc.) and the type of memory tested (e.g., recall, recognition, implicit memory, autobiographical memory) have varied greatly. For example, many studies using threatening words have failed to find a memory bias (Cloitre, Cancienne, Heimberg, Holt, & Liebowitz, 1995; Rapee, McCallum, Melville, Ravenscroft, & Rodney, 1994), whereas others that have used sentences or passages related to social threat have found memory biases, some of which showed enhanced memory for socially anxious participants (e.g., Amir, Coles, & Foa, 2000), and others

demonstrating enhanced memory for non-anxious participants (e.g., Wenzel, Jackson, & Holt, 2002).

It has been argued that verbal stimuli in studies of information processing biases in SA may be less effective in eliciting fear of social evaluation relative to face stimuli, and may thus have limited ecological validity (e.g., Pishyar et al., 2004). Indeed, for this reason, the use of faces as social threat stimuli has become popular in contemporary research on this topic (Coles & Heimberg, 2005; Foa, Gilboa-Schechtman, Amir, & Freshman, 2000; Lundh & Öst, 1996; Pérez-López & Woody, 2001). However, results of studies examining face memory biases in socially anxious participants have also been mixed (for a review of this literature, see Staugaard, 2010). For instance, several studies have failed to find any differences in the recognition and recall of threatening faces between control participants and both clinical and analog samples of participants with high levels of SA (Chen, Ehlers, Clark, & Mansell, 2002; D'Argembeau, Van der Linden, Etienne, & Comblain, 2003; Hunter, Buckner, & Schmidt, 2009; Mansell, Clark, Ehlers, & Chen, 1999; Silvia, Allan, Beauchamp, Maschauer, & Workman, 2006). A limited number of recent studies have found differences in memory between participants high and low in SA, but there still is considerable disagreement related to the nature of these differences. For example, in a study comprising two experiments, Foa et al. (2000) found, first, that participants with SAD demonstrated better overall memory for facial expressions than did controls, and second, that individuals with SAD also recognized more negative than positive faces—a difference not evident in the control group. Conversely, Pérez-López and Woody (2001) found that participants with SAD demonstrated significantly poorer memory for facial expressions than did healthy controls while anticipating a speech.

Some researchers have attempted to reduce the focus on generic threat stimuli (e.g., negative faces) in favor of incorporating personally-relevant threatening information into studies of face processing biases in SA. In a seminal study by Lundh and Öst (1996), participants with SAD and non-anxious controls were exposed to a series of neutral faces and asked to rate each of them as being either critical or accepting before subsequently engaging in a recognition task for previously labelled and novel faces. Individuals with SAD were more likely to categorize those faces that they labelled as being critical as having been previously encountered, whereas controls exhibited the opposite type of bias. A follow-up study by Coles and Heimberg (2005) replicated these findings, but also extended Lundh and Öst's (1996) original study by obtaining external ratings (from a different set of participants) of the face stimuli as being accepting or critical. Using these ratings, Coles and Heimberg demonstrated that the difference between participants with and without SAD was more likely reflective of a response bias than of a bona fide memory bias. Specifically, their findings suggested that rather than the two groups differing in their recognition accuracy for threatening faces, which would indicate a true memory bias, they differed instead in the ways that they responded to faces perceived as critical versus accepting, regardless of whether they were seen before. Thus, they argued that this group difference is more accurately conceptualized as a response bias for faces with various characteristics (i.e., seeming critical or accepting), rather than as a memory accuracy bias. In particular, Coles and Heimberg (2005) found that non-anxious controls tended to categorize accepting faces (both old and new) as having been previously seen, whereas individuals SAD trended toward categorizing critical faces (both old and new) as having been previously seen.

Another recent study examined the impact of personally relevant threat on memory for social information among groups of high and low SA participants (Cody & Teachman, 2010).

Participants in both groups delivered a laboratory-based speech, and received standardized feedback both on their own speech performance and on that of a confederate. Results indicated that, relative to low SA participants, high SA individuals remembered the feedback that they received as being more negative and the feedback that confederates received as being more positive, suggesting a bias among high SA individuals for remembering negative self-relevant social information. However, because this study used standardized feedback across participants, researchers were not able to examine whether and how participants' own idiosyncratic self-relevant concerns might have played a role in affecting their memory performance.
Thus, preliminary evidence supports the notion that memory biases may emerge among high SA individuals for personally threatening social information, but additional studies are needed to further investigate this claim, and to elucidate the cognitive processes involved.

The present study examines memory and expectancy biases in the processing of personally relevant social threat among high and low SA participants using a novel face–phrase association paradigm adapted from research in the emerging field of social neuroscience (Todorov, Gobbini, Evans, & Haxby, 2009). In this paradigm, objectively neutral faces are paired with socially threatening (negative: critical) and non-threatening (positive: accepting) phrases, and presented to participants one at a time. Following encoding, participants' recognition and recall are tested for faces, their associated valence, and the phrases themselves. This study seeks to counteract two methodological concerns about the approaches previously used to address face memory biases in SA. First, the vast majority of previous studies have used face stimuli with objectively valenced (e.g., angry) facial expressions. Such stimuli are inherently more distinctive and memorable than neutral faces, implying that attentional shift toward or superior memory for these faces may not reflect a threat bias per se, but rather a

natural preference for unusual stimuli (e.g., Hunt & Lamb, 2001). Moreover, objectively valenced threat such as negative facial expressions is likely to elicit a variety of subjective interpretations from participants, such that each type of expression may be meaningful to each participant for different reasons (e.g., viewing a disgusted face may be associated for one participant with the thought, "He thinks that I am ugly," and for another person with the thought, "He thinks that I am incompetent," and so on). Indeed, as we have argued elsewhere (e.g., Moscovitch, 2009), high SA individuals are fundamentally concerned about revealing perceived flaws in social behaviours, signs of anxiety, and physical appearance, but the nature and strength of specific self-portrayal concerns tend to vary idiosyncratically across people (Moscovitch & Huyder, 2011). Because negative facial expressions might trigger heterogeneous subjective interpretations depending upon each participant's specific self-portrayal concerns, it is difficult, if not impossible, for researchers whose studies successfully detect information processing biases among high SA individuals in response to viewing such faces to determine why, exactly, this might be occurring. Thus, by using neutral faces that are valenced by virtue of their pairings with explicitly negative or positive social feedback, the paradigm we used in the present study was designed explicitly to control both for potential response bias associated with the elevated distinctiveness of valenced faces, and for the interpretations that participants might make in response to the faces they view. In addition, by virtue of embedding a series of new faces within the recognition phase and examining the pattern of high versus low SA participants' responding to these unfamiliar faces as threatening ("mean") or non-threatening ("nice"), our study is unique in being able to investigate both the potential presence of a memory bias towards previously-encountered threat, and the potential presence of response and/or expectancy biases towards novel, ambiguous social stimuli.

Method

Participants

Several standardized prescreening questionnaires, including the Social Phobia Inventory (SPIN; Connor et al., 2000), were administered to all potentially eligible participants in the undergraduate Psychology research pool at the University of Waterloo in Canada. High and low SA individuals from that pool were invited to participate if their scores on the SPIN met a cutoff of above 30 or below 12, respectively (see Additional measures, below). Eighty individuals (40 high and 40 low in SA) were recruited to participate in the present study. All participants provided informed consent and received course credit for their participation.

Measures

Development and selection of experimental stimuli. Fifty-four neutral Caucasian and Asian faces were selected from the NIMSTIM standardized face set (Tottenham et al., 2009) and the Japanese and Caucasian Neutral Faces standardized face set (JACNeuF; Matsumoto & Ekman, 1988). Given the large minority of students within the University of Waterloo undergraduate participant pool who typically identify their ethnic background as being Asian (with the majority typically identifying themselves as Caucasian), approximately 40% of the faces selected were Asian, and 60% were Caucasian. All faces were presented on a white background, and were sized to 300 x 400 (±10) pixels. Thirty-six faces were randomly assigned to three face-phrase association sets of 12 faces each. Each set was equally divided into males and females, and within each gender, 40% were Asian faces. During the recognition phase of the study, an additional 18 faces (six in each set) were presented, maintaining the aforementioned proportions of gender and ethnicity within each set. The order of face presentation in both the encoding and retrieval phases was randomized across participants.

Fifty-four phrases (half positively valenced, half negatively valenced) were developed as pairings for the faces. The negative phrases were based on items from the Negative Self-Portrayal Scale (NSPS; Moscovitch & Huyder, 2011). As described below (see Additional measures), the NSPS evaluates concerns related to displaying self-perceived flaws related to: (a) social competence, (b) signs of anxiety, and (c) physical appearance. The positive phrases were designed to mirror the negative ones. Prior to using the stimuli in the present study, we completed a pilot study, in which all phrases were rated for valence and memorability by a sample of 19 pilot participants, who were asked to rate the valence of each phrase on a 7-point scale (-3 = very negative; 0 = neutral; 3 = very positive). All ratings conformed to a priori

groupings, with a mean rating of 1.83 (SD = .41) for positive phrases, and -1.60 (SD = .72) for negative phrases. Outlier analysis was conducted for both valences and there were no outliers. Following the rating task, pilot participants were confronted with an unexpected free recall task in which they were asked to recall as many of the previously presented phrases as possible. The number of times each word was recalled across participants was divided by the total number of participants (n = 19) to obtain the memorability proportion score for each word. Positively-valenced phrases obtained a mean memorability score of .24 (SD = .20), and negatively-valenced phrases a mean of .20 (SD = .17). Outlier analysis was conducted for both valences, and two words ("fat" and "attractive") were excluded as outliers. The authors selected 36 of the remaining 52 phrases for the study. These phrases were selected because they were judged as being most representative of each NSPS domain. The complete list of phrases and their memorability and valence scores from the pilot study are provided in Appendix E.

Social threat induction. Previous studies have shown that information processing biases may emerge among high SA individuals only under conditions of social threat (e.g. Leber, Heidenreich, Stangier, & Hofmann, 2009). Thus, prior to the computer tasks, participants were instructed to anticipate giving a short speech that would occur at the end of the study session. Specifically, the experimenter delivered the following script as part of the instructions to all participants at the start of the experiment: "You will first complete three tasks on the computer. Following the computer tasks, you will be asked to give a short speech. Another researcher will come in and rate your speech performance and their first impressions of you. I will give you more information about the speech following the computer tasks."

Valence, arousal, and distress ratings. As a manipulation check for the social threat induction, immediately before and after the induction, participants were asked to rate their current level of anxiety on a subjective units of distress (SUDS) scale from 0 to 100. In addition, using the Self Assessment Manikin (SAM; Bradley & Lang, 1994), participants rated their arousal level and the valence of their emotional state on a 9-point scale (1 = low arousal and positive valence; and 9 = high arousal and negative valence).

Additional measures. All participants completed the following self-report measures immediately after the administration of the computer tasks:

The Social Phobia Inventory (SPIN; Connor et al., 2000) is a 17-item self-report instrument that measures fear, avoidance, and physiological discomfort in social situations (e.g., fear of people in authority; avoids parties; distressed by sweating). Each item is rated on a scale from 0 ("not at all") to 4 ("extremely"), with higher scores representing greater levels of distress; thus, the full scale score ranges from 0 to 68. The SPIN has been shown to be an excellent measure of social anxiety, with good test-retest reliability, strong convergent and divergent validity, good construct validity, and high levels of internal consistency (Antony, Coons, McCabe, Ashbaugh, & Swinson, 2006; Connor et al., 2000). Although Connor and colleagues (2000) proposed a cut-off score of 19 and higher to select participants likely to have social anxiety disorder, we followed the suggestion of others (e.g., Moser, Hajcak, Huppert, Foa, & Simons, 2008) who have expressed a preference for using a more stringent cut-off score of 30. We selected a cut-off score of 12 or below for controls because Connor et al. (2000) reported that their non-psychiatric control group had a mean SPIN total score of 12.1. This cut-off score resembles the score of 10 or below that has been used by Moser et al. (2008) to identify low anxious controls. The reliability (internal consistency) of the SPIN total score in the present study was estimated using Cronbach's alpha, and was .93.

The DASS-21 is a 21-item self-report measure divided into three subscales designed to assess anxiety, depression, and stress. It is a condensed version of the DASS-41 (Lovibond & Lovibond, 1995), a commonly-used measure of these three constructs. The Depression Scale assesses dysphoric mood states, including self-deprecation, lack of interest/ involvement, hopelessness, and anhedonia. The Anxiety Scale assesses arousal states, including autonomic

arousal, muscular tension, and anxious affect. Finally, the Stress Scale is reported to assess negative emotional reactions to stressors as well as general tension. The reliabilities (internal consistencies) of the DASS-21 Anxiety, Depression, Stress, and Total Scales in the present study were estimated using Cronbach's alpha, and were .86 for the Depression Scale, .79 for the Anxiety Scale, .85 for the Stress Scale, and .92 for the Total Scale.

The NSPS (Moscovitch & Huyder, 2011) is a newly-developed questionnaire designed to assess participant concerns that specific self-attributes that they view as flawed or deficient will be exposed to scrutiny and evaluation by critical others in social situations. Across two large samples of North American undergraduate students with normally distributed symptoms of social anxiety, exploratory and confirmatory factor analyses supported a (non-orthogonal) 3-factor solution representing concerns about (a) social competence, (b) physical appearance, and (c) signs of anxiety (Moscovitch & Huyder, 2011). The scale demonstrated good internal consistency (α =.95 for full scale and α =.87-.92 for the 3 subscales) and test-retest reliability (r =.75). The NSPS also demonstrated adequate convergent and discriminant validity (r =.63-.70 with symptom measures of social anxiety and r =.47-.62 with measures of OCD and depression). Crohnbach's alpha coefficients for the NSPS in the present study were .90 for the social competence subscale, .83 for the signs of anxiety subscale, .91 for the physical appearance subscale, and .95 for the total score.

Procedure

Face learning and recognition tasks. For the duration of the study, participants were seated alone in a room at a computer desk on which a 22-inch monitor was mounted. The experimenter left the room after delivering the instructions and allowing participants to ask any clarifying questions. The experimenter entered the room following each learning-recognition set to set up the next part of the experiment on the computer. As shown in Figure 1, during the encoding task, participants were presented with three sets of 12 face-phrase pairs (six 'mean' and six 'nice'; see below) for a total of 36 face-phrase associates. Prior to each face, a blank screen appeared for 1000 ms, followed by a fixation cross, which appeared for 500 ms. Following the fixation cross, an image of a neutral face appeared centered on the computer screen. Each face appeared simultaneously with a phrase immediately below it, which was typed in Courier font size 14. Each phrase consisted of the target word(s) (Appendix E) preceded by the word stem "I can see that you are/have…" Each face-phrase pair was presented for 5000 ms. Participants were asked to label each face as 'mean' or 'nice', a rating made using the "M" and "N" keyboard keys. Participants were also instructed to try and remember who was mean and who was nice for later in the study.

The recognition phase was comprised of three sets of 18 faces, and each set immediately followed an encoding phase. In each recognition set, participants viewed three sets of 18 faces, 12 of which were presented in the encoding task ('old' faces), as well as 6 faces not previously encountered ('new' faces). Participants were instructed to indicate whether they recognized the face from the learning phase by pressing '"O" for 'old' and '"N" for 'new'. For faces labelled as 'old', participants were then asked to indicate whether the face was mean or nice (previously associated with a mean or nice comment) by pressing "M" for 'mean' and "N" for 'nice'. For

faces labelled as new, participants were asked to indicate whether the person seemed mean or nice, also by pressing "M" or "N", respectively. Participants had unlimited time to complete these ratings as accurately as they could. Participants were prohibited from backtracking to correct any perceived response errors.

Immediately after each encoding and recognition set, participants completed the recall phase, in which they were asked to write down as many of the phrases from the preceding set as they could recall. The stem "I can see that" was provided, followed by 36 blank lines for participants to complete. Following the recall task, participants were debriefed and compensated for their participation.

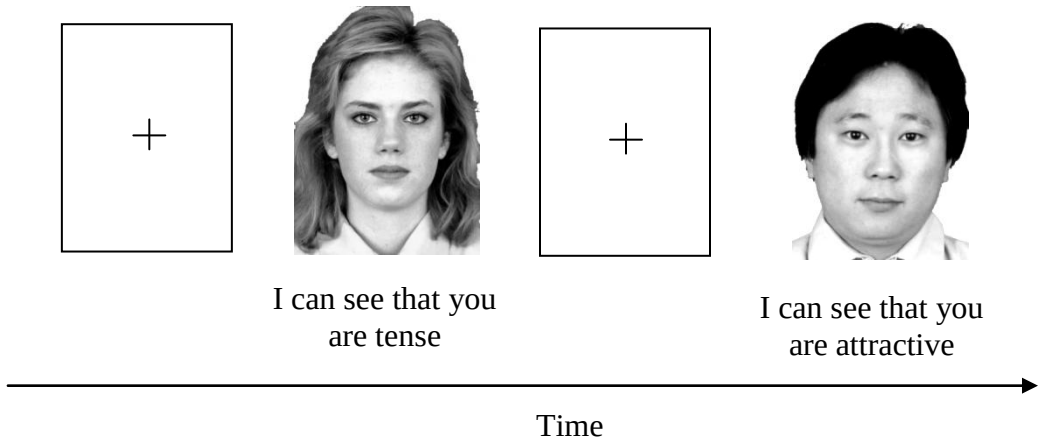

Figure 1. Participants encountered a total of 36 face-phrase pairs. Each pair was presented for 5000 ms. Between pairs, participants viewed a blank screen for 1000 ms, followed by a fixation cross presented for 500 ms. The specific pairings of neutral faces and phrases were randomized across participants.

Preparation of data and analytic procedure. In preparation for analysis, responses for each participant across the 54 trials were organized into different categories according to: (a) whether the face encountered was actually old or new, (b) whether the face was categorized as being old or new, (c) whether the face (if old) was previously associated with a nice or mean comment, and (d) whether the associated valence was correctly identified, thus yielding various combinations of hits and misses for both the initial old/new and subsequent mean/nice decisions (e.g., old faces correctly categorized as being old and correctly labelled as mean/nice, old faces incorrectly categorized as being new and correctly labelled as mean/nice, new faces correctly categorized as being new and then labelled as mean/nice, etc.). These combinations represent various important distinctions in how faces were encoded and recalled. The number of times that each participant labelled a face in each way was tallied across trials, and the mean tallies for high vs. low SA participants were examined in a series of analyses, as outlined below.

Results

Preliminary Analyses

Descriptive group characteristics. Descriptive characteristics of participants in both groups are presented in Table 1. Groups did not differ significantly in age, $t(74) = 1.35$, $p = .18$, or gender composition, $X^2(1) = 0.0$, $p = 1.00$. Groups did differ on ethnic composition (Caucasian, Asian, Other), $X^2(2) = 10.03$, $p < .01$, with a higher proportion of Asian participants represented in the high SA group. To examine the role of ethnicity in our findings, we repeated the primary analyses with ethnicity entered as a covariate (see Footnote 1).

As displayed in Table 2, high and low SA participants differed significantly in the expected direction across the self-report measures, including the SPIN, DASS, and NSPS (all *ts* > 3.99, all *ps* < .001).

Table 1

Characteristics of Participant Groups

	Low SA (n = 40)	High SA (n = 40)
Mean age in years (*SD*)	18.44 (1.38)	19.30 (3.56)
Gender (% female)	62.5%	62.5%
Ethnicity		
Caucasian	42.5%	22.5%
Asian	25.0%	60.0%
Other	32.5%	17.5%

Table 2

Comparison of Participant Group Scores on Self-Report Measures

	High SA *M* (*SD*)	Low SA *M* (*SD*)	*t*-test
SPIN	38.1 (6.9)	6.4 (3.3)	t(78) = 8.12*
DASS Total	24.72 (11.5)	10.03 (8.06)	t(68) =6.54*
Depression	15.1 (10.2)	7.3 (6.9)	t(77) = 4.00*
Anxiety	7.43 (4.6)	2.10 (2.84)	t(65) = 6.18*
Stress	9.72 (4.1)	4.28 (4.12)	t(76) = 5.86*
NSPS Total	78.53 (16.5)	53.89 (18.5)	t(77) = 6.17*
Social competence	33.95 (6.4)	22.81 (8.7)	t(66) = 6.40*
Signs of anxiety	22.10 (6.1)	15.54 (5.9)	t(77) = 4.88*
Physical appearance	22.48 (6.8)	15.90 (7.3)	t(77) = 4.14*

Note. Differences in degrees of freedom across t-tests reflect differences in missing values across measures; SPIN = Social Phobia Inventory; DASS = Depression Anxiety and Stress Scale, Depression Subscale; NSPS = Negative Self-Portrayal Scale (Concern Subscale); *$p < 0.01$.

Subjective Distress Prior to and Following Social Threat Induction

High relative to low SA participants provided higher SUDS and SAM ratings (valence and arousal) prior to and following the social threat induction (all *ts* > 2.43, all *ps* < .02). Pre-to-post changes in SUDS and SAM ratings were examined across the two groups in three separate 2 x 2 mixed-design analyses of variance (ANOVA). For each analysis, the between-subjects variable was group (low vs. high SA) and the within-subjects variable was SUDS or SAM ratings across the two assessment points (pre-induction vs. post-induction). As expected, there were significant or marginally significant main effects of time for SUDS and SAM arousal and valence ratings, indicating that across both anxiety groups, the threat induction resulted in significant or near-significant increases in SUDS (distress), and SAM valence and arousal ratings (all *Fs* > 3.45, *ps* <.07, partial η^2s > .04). A marginally significant group by time interaction emerged for the SUDS ratings, $F(1,78) = 2.93$, $p = .09$, partial $\eta^2 = .04$, indicating that the high SA group experienced a higher increase in perceived distress after the threat induction. There were no significant group by time interactions for SAM arousal or valence ratings (*Fs* < 1.17, *ps* > .28, partial η^2s < .02).

Accuracy

Independent-samples *t*-tests were conducted to examine group differences in accuracy. The two groups did not differ in their rates of correctly categorizing old faces as being old, *t(*78) =.16, *p* =.87. For rates of correctly categorizing novel faces as being new, a significant group difference emerged, with high SA participants showing enhanced recognition of novel faces overall relative to low SA participants, *t*(78) = 2.60, *p* =.01, indicating that high SA participants were more accurate at identifying faces they had not previously encountered. Finally, the two groups did not differ in their rates of correctly labeling previously-seen faces as being mean, *t*(78) =.95, *p* =.35, or nice, *t*(78) = 1.90, *p* =.66.

Recognition Memory for Mean and Nice Faces: Old vs. New Decision

A 2 x 2 mixed-design analysis of variance (ANOVA) was conducted to examine the effects of group (between-subjects variable: low vs. high SA) and encoding valence (within-subjects variable: mean vs. nice) on the number of old faces correctly identified as being old (i.e., hits). There were no significant main or interaction effects (all $Fs \leq 2.04$, all $ps \geq .15$, all partial η^2s $< .03$), indicating that there was no memory bias to better recognize faces accompanied by mean or nice phrases in high versus low SA participants. Results are displayed in Table 3.

Recognition Memory: Mean vs. Nice Decision for Remembered Faces

A series of mixed-design ANOVAs were conducted. First, we examined the number of correct mean vs. nice decisions for old faces that were correctly recognized as old (i.e., hits). The between-subjects variable was group (low vs. high SA) and the within-subjects variable was number of correct valence labels (2 levels: number of mean faces labelled as being mean and number of nice faces labelled as being nice). Results indicated a main effect of valence, whereby more previously seen nice faces were labelled as such, $F(1,78) = 5.44$, $p = .02$, partial $\eta^2 = .07$. However, there was no significant group by valence interaction, indicating no bias for remembering the valence of threatening faces among high relative to low SA participants, $F(1,78) = 1.72$, $p = .19$, partial $\eta^2 = .02$.

Second, we examined the number of incorrect mean vs. nice decisions for old faces that were hits. The between-subjects variable was group (low vs. high SA) and the within-subjects variable was number of incorrect valence labels (2 levels: number of mean faces labelled as being nice and number of nice faces labelled as being mean). Results indicated no significant effects (all $Fs \leq 1.68$, all $ps \geq .20$, all partial η^2s $\leq .02$).

Last, we examined the number of mean vs. nice responses for novel faces that were incorrectly categorized as being old (i.e., false alarms). The between-subjects variable was group (low vs. high SA) and the within-subjects variable was number of mean vs. nice responses (2 levels: number of faces labelled as being mean and number of faces labelled as being nice). Results indicated no significant effects (all $Fs \leq 2.17$, all $ps \geq .14$, all partial η^2s $\leq .03$).

Mean vs. Nice Labels for Faces Categorized as Being New

A series of mixed-design ANOVAs was conducted to examine mean versus nice labels for faces that were categorized as being new. The first ANOVA examined the effects of group on mean vs. nice responses for novel faces that were correctly labelled as being new (i.e., not previously encountered). The between-subjects variable was group (low vs. high SA) and the within-subjects variable was number of mean vs. nice responses (2 levels: number of faces labelled as being mean and number of faces labelled as being nice). Results revealed a significant effect of valence, $F(1,78) = 5.21$, $p = .03$, partial $\eta^2 = .06$, as well as a significant group by valence interaction, $F(1,78) = 15.26$, $p < .001$, partial $\eta^2 = .16$. A series of follow-up paired and independent-samples *t*-tests were conducted to further examine the nature of the significant interaction. These indicated that low SA participants labelled fewer new faces as being mean than nice, $t(79) = 2.11$, $p < .001$, and that high SA participants labelled more faces than low SA participants as being mean, $t(78) = 4.52$, $p < .001$ and fewer faces than low SA participants as being nice, $t(78) = 2.10$, $p = .04$. Proportions of new faces labelled mean and nice were computed for each group by dividing the mean numbers of faces labelled mean vs. nice by the total numbers of new faces correctly labelled as new in each group. ANOVA analyses were repeated and the overall pattern of results remained unchanged, with a main effect of valence emerging, $F(1,78) = 7.26$, $p < .01$, partial $\eta^2 = .09$, as well as a significant group by valence interaction, $F(1,78) = 14.32$, $p < .001$, partial $\eta^2 = .16$. The latter interaction is displayed in Figure 2.

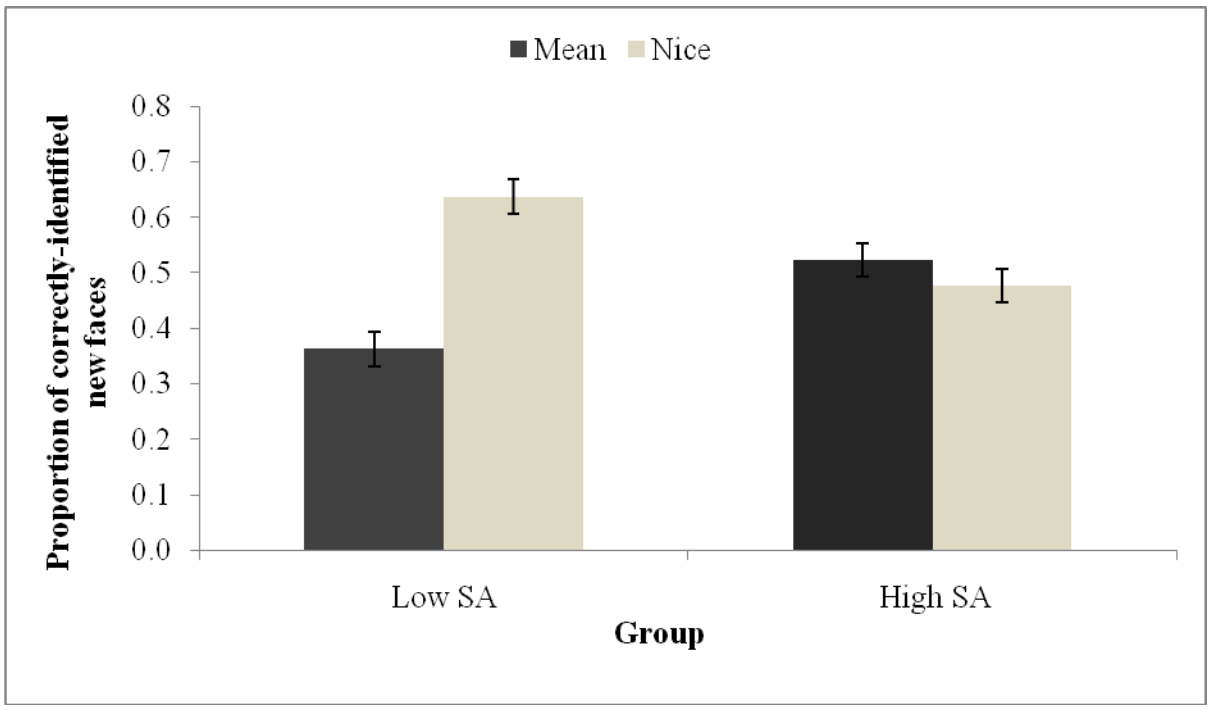

Figure 2. Proportions of correctly-identified new faces subsequently labelled as mean vs. nice. A group-by-valence interaction indicated that low SA participants were less likely to label new faces as being mean than nice, while high SA did not differ in their proportion of labels across the two categories. High SA participants were also more likely than low SA participants to label new faces as being mean and less likely than low SA participants to label new faces as being nice. Error bars represent standard error of the mean.

Table 3

Mean Number of Faces Labelled as Being Mean or Nice Across Groups

	High SA *M* (*SD*)	Low SA *M* (*SD*)	*p*	Partial η^2
Old Faces Labelled Old				
Mean labelled Mean	9.58 (3.30)	9.33 (3.16)	0.19	0.02
Nice labelled Nice	9.93 (3.08	9.58 (3.30)		
Nice labelled Mean	4.08 (2.06)	4.15 (2.06)	0.29	0.01
Mean labelled Nice	3.58 (2.41)	4.35 (2.03)		
New Faces Labelled Old				
Mean	2.23 (1.80)	2.88 (2.28)	0.63	< 0.01
Nice	1.68 (1.67)	2.60 (1.55)		
Old Faces Labelled New				
Mean labelled Mean	2.10 (1.85)	1.70 (1.74)	0.14	0.03
Nice labelled Nice	2.03 (1.80)	2.43 (1.96)		
Nice labelled Mean	1.98 (1.97)	1.40 (1.65)	0.06	0.04
Mean labelled Nice	2.18 (1.87)	2.58 (2.22)		
New Faces Labelled New				
Mean	7.48 (3.06)	4.53 (2.76)	< 0.001	0.16
Nice	6.63 (2.55)	8.00 (3.15)		

The second ANOVA examined the effect of group on the number of correct mean vs. nice responses for old faces that were incorrectly labelled as being new (i.e., old faces that had been previously seen but were subsequently forgotten). The between-subjects variable was group (low vs. high SA) and the within-subjects variable was number of correct valence labels (2 levels: number of mean faces labelled as being mean and number of nice faces labelled as being nice). There were no significant main effects or interactions (all $Fs < 2.27$, all $ps > .1$, all partial η^2s $< .03$).

The last ANOVA examined the effects of group on the number of incorrect mean vs. nice responses for old faces that were incorrectly labelled as being new. The between-subjects variable was group (low vs. high SA) and the within-subjects variable was number of incorrect valence labels (2 levels: number of mean faces labelled as being nice and number of nice faces labelled as being mean). Results revealed a main effect of valence, $F(1,78) = 7.02$, $p = .01$, partial $\eta^2 = .08$, and a marginally significant group by valence interaction, $F(1,78) = 3.53$, $p = .06$, partial $\eta^2 = .04$. A series of follow-up paired and independent-samples *t*-tests were conducted to further examine the nature of the marginally significant interaction. Paired-samples *t*-tests indicated that low SA participants were more likely to label mean faces erroneously as being nice than nice faces erroneously as being mean $t(79) = 3.01$, $p < .001$. No other comparisons were significant (*t*s < 1.13, *p*s $> .26$).

Recall Memory and Subjective Domains of Concern

An additional aim of the present study was to examine whether participants' idiosyncratic social concerns were associated with specific memory biases for threatening phrases relevant to particular participants' self-portrayal concerns. A series of bivariate correlations was conducted including all 80 participants collapsed across both groups. Correlations were computed between the three NSPS subscale scores representing the three dimensions of concerns, namely: (a) signs of anxiety, (b) social competence, and (c) physical appearance, and the total number of freely recalled positive and negative phrases related to these domains. NSPS signs of anxiety scores were modestly correlated with higher recall of negative (r = .19, p = .10) than positive (r = .10, p = .39) phrases related to this domain, but the difference in strength between the correlations was nonsignificant, z = .57, p = .57. NSPS social competence scores were also modestly associated with higher recall of negative (r = .21, p = .07) than positive (r = -.12. p = .31) phrases related to this domain, with a significant difference between the strengths of these two correlations, z = 2.08, p =.04. Finally, NSPS physical appearance scores were not associated with recall of negative (r = 0.0. p = .99) phrases and were modestly correlated with positive phrases related to this domain (r = -.15. p = .19), with a nonsignificant difference in strength between the two correlations, z = .94, p = .35.

Discussion

The present study utilized a novel approach to investigate threat processing and memory biases in SA, in which high and low socially anxious participants viewed neutral faces associated at random with explicitly valenced phrases that represented positive or negative social feedback. Through the development of this paradigm, we attempted to improve upon the methodological shortcomings of previous work in this area of research by: (a) controlling for the distinctiveness of facial expressions across experimental stimuli; (b) directly manipulating the nature of the threat content of the social stimuli that participants encountered; and (c) measuring the extent to which idiosyncratic social concerns accounted for individual differences in the memorability of threatening versus non-threatening stimuli.

Like numerous previous studies, we failed to find support for the presence of a general memory bias among high SA participants, neither toward nor away from threat. However, our results did provide clear evidence in support of a positive expectancy bias for novel faces among low SA individuals, which high SA individuals appear to lack. Specifically, whereas low SA participants in our study appeared to give new social partners the benefit of the doubt, perceiving them as nice unless compelled otherwise, high SA participants did not. Thus, high SA individuals may enter novel social interactions with more negative and less positive expectancies, deciding a priori that potential interaction partners are about as likely to be mean as they are to be nice. Operating through the lens of this bias would clearly highlight the perceived likelihood and costs of negative social experiences for high SA individuals, thereby fueling symptoms of social anxiety.

Our findings can be understood in the context of contemporary interpersonal and cognitive-behavioural models of SA. Interpersonal models (e.g., Alden & Taylor, 2004) stress

the centrality of maladaptive interpersonal cycles that become established between high SA individuals and their interaction partners, which ultimately perpetuate the likelihood of negative social outcomes. According to interpersonal models, high SA individuals, particularly those with negative early social experiences, possess more negative relational schemas (Taylor & Alden, 2005), and may be more likely to view other people as being more critical, and less friendly, warm, and courteous than those without SA (e.g., Jones & Briggs, 1984; Leary, Kowalski, & Campbell, 1988). Moreover, according to cognitive-behavioral models (e.g., Clark & Well, 1995; Rapee & Heimberg, 1997), one important factor in the maintenance of social anxiety symptoms is high SA individuals' tendency to overestimate the probability of negative social and interpersonal outcomes, a theoretical claim that has now been supported by several experimental studies (e.g., Foa, Franklin, Perry, & Herbert, 1996; McManus, Clark, & Hackmann, 2000; Smits, Rosenfield, McDonald, & Telch, 2006; Taylor & Alden, 2008). Thus, the present study complements these previous findings by suggesting that high SA individuals tend to interpret novel, ambiguous faces as being mean, and to overestimate (when compared to low SA individuals) the likelihood of negative social outcomes when interacting with unfamiliar individuals.

An additional contribution of our study, and one that has not been adequately addressed in past research, is the potential role of individuals' idiosyncratic self-relevant concerns in the processing and memory of social threat. A very limited number of previous studies have explored personal salience of threat stimuli. As described above, for example, Cody and Teachman (2010) compared memory for feedback provided to participants and to others following a speech task, and found that the way feedback was remembered varied as a function of whether the feedback was related to one's own versus another person's speech performance.

One important form of idiosyncratic threat that has yet to be explored as a possible contributing factor to information processing biases in SA is that of perceived personal flaws. According to Moscovitch (2009), socially anxious individuals' self-portrayal concerns are generally focused on visible signs of anxiety, perceived social competence, and physical appearance, with concerns across these three non-orthogonal dimensions potentially accounting for individual differences in social anxiety symptoms across high SA individuals.

The NSPS (Moscovitch & Huyder, 2011) was recently designed to measure these self-portrayal concerns. In the present study, the social feedback that participants received corresponded with NSPS items that measure characteristics across these three dimensions. Our findings do provide tentative support for the role of personal salience of threatening information in memory biases to threat, indicating marginally significant relations between signs of anxiety and social competence concerns (as measured on the NSPS) and subsequent recall of negative (but not positive) feedback related to these domains. While ours was the first study to examine the role of personally relevant self-portrayal concerns in memory for threatening social information, our ability to test the personal relevance hypothesis was constrained by the small number of negative and positive stimuli per NSPS dimension (n = 6 for each) that participants encountered and were thus able to later recall. Future studies focusing on this hypothesis should include more experimental stimuli to ensure that analyses are adequately powered.

Overall, the present study had several important strengths and a number of limitations. In terms of strengths, the methodological features of our paradigm (i.e., using neutral faces paired with explicit, rather than implicit, social feedback) enabled a stringent test of the memory bias hypothesis without the need to disentangle the effects of a possible memory bias from those of a response bias. Indeed, although some previous studies (Coles & Heimberg, 2005; Lundh & Öst,

1996) found that individuals with social anxiety disorder were more likely than non-anxious controls to recognize faces they had previously appraised as being threatening, Coles and Heimberg (2005) concluded that this pattern of results was primarily driven by a response bias to negative faces rather than by a memory bias per se, as described above. The use of neutral faces eliminates this important potential confound, and our results complement the conclusion reached by Coles and Heimberg. Specifically, Coles and Heimberg demonstrated that individuals high in SA, as compared to those low in SA, are biased to believe that critical faces have been previously encountered. Our findings suggest that similar biases in individuals high in SA also extend to future social interactions with new partners. Moreover, although the encoding task in the present study differs in many ways from real life social interaction, it was designed to enhance ecological validity by incorporating some of the features of genuine social encounters, which are arguably absent from the commonly used tasks that have relied on objectively valenced facial expressions. Indeed, as others have argued previously (e.g., Coles & Heimberg, 2005), strongly and overtly negative facial expressions are rarely encountered outside the experimental setting and are even uncommon in expressions of negative social evaluation, in which ambiguous or, perhaps, subtly negative expressions are likely to predominate. Thus, results of the present study may be more generalizable to the way social information may be processed and remembered by socially anxious individuals who encounter familiar or unfamiliar neutral faces in real social contexts outside the laboratory, and must acquire positive or negative interpersonal associations. In this way, our findings complement other studies that have shown that high SA individuals tend to interpret ambiguous information in a negative manner, even when alternate, positive interpretations are available (e.g., Amir et al., 1998).

In terms of limitations, this study investigated an analog sample of socially anxious university students and it will be important to replicate our findings in a clinical sample of community outpatients with social anxiety disorder. It would also have been informative to have included an anxious control group of participants with symptoms other than social anxiety to examine whether the differences between groups were due to differences in trait anxiety more generally or specific to social anxiety. In addition, the interesting and unexpected findings regarding the role of ethnicity in our primary findings raise new questions. Cross-cultural differences in the expression of social anxiety between Western and Eastern cultures is a small but growing area of research with intriguing implications, with some preliminary studies suggesting that cultural factors may play an important role in the prevalence, experience and expression of social anxiety. In particular, there is some suggestion indicating that individuals of ethnic minorities (e.g., East Asians) exhibit higher rates of social anxiety than Caucasians. However, certain behaviours commonly conceptualized as features of social anxiety, such as a pervasive desire to conform to social encounters and compromise one's own desires for the purpose of maintaining harmony, reflect Western values of autonomy and independence, and may be culturally valued tendencies in other cultures (e.g., Hong & Woody, 2007; Schreier et al., 2010). Future hypothesis-driven studies are needed to better understand how and why Caucasian and Asian participants may differ in their expectancies of threat associated with novel social partners. Finally, while our study paradigm is more akin to social threat than those used in previous face processing studies, the use of a computerized task to assess biases related to social interactions is inevitably limited in ecological validity, as it lacks the dynamic interactions that characterize real-life social situations. To determine more conclusively what, if any, face processing biases exist in SA, future studies should employ methodological approaches that both

replicate social interaction as closely as experimentally possible and ensure that potential social costs of negative social outcomes (e.g., negative evaluation, rejection, etc.) are as realistic and threatening to participants as they are in normative social interactions.

Footnotes

[1] In the present study, ethnicity was coded into three categories: Caucasian, Asian and Other. Given that our high SA and low SA groups represented different proportions of participants of different ethnicities, with a higher number of Asian participants in the high SA group, we wished to further investigate whether our main findings of interest - specifically, the lack of a positive expectancy bias in high SA participants - generalized across ethnicities. First, we re-ran our primary analysis of interest, examining the rates of participants rating correctly-identified novel faces as mean vs. nice as a 2 (Group [low SA, high SA]) x 2 (Valence [Mean, Nice]) mixed-design analysis of covariance (ANCOVA), with ethnicity entered as a covariate. This analysis yielded no significant main effects for valence, group, or ethnicity ($Fs \leq 3.69$, $ps \geq .59$). There were also no significant 2-way or 3-way interactions involving ethnicity ($Fs \leq 1.46$, $ps \geq .21$). However, once ethnicity was controlled for, the group x valence interaction previously outlined was no longer significant $F(1,76) = 2.0$, $p = .16$, indicating that ethnic differences were contributing substantially to the group x valence interaction.

In order to better understand the role of ethnicity in moderating our findings of interest, we compared our two largest ethnic groups within the participant sample - Caucasians and Asians - in order to determine how to characterize the pattern of results within each group. We conducted two separate 2 (Group [low SA, high SA]) x 2 (Valence [Mean, Nice]) mixed-design ANOVAs on for the numbers of correctly-identified novel faces labelled mean vs. nice, first in Caucasian participants only and then in Asian participants only. Results indicated that the expectancy bias discussed above was driven primarily by the response patterns of Caucasian participants. For participants who identified as Caucasian, there was main effect of valence $F(1,24) = 7.0$, $p = .01$, as well as a marginally significant group by valence interaction in the

expected direction, $F(1,24) = 3.37$, $p = .08$. In contrast, for the Asian participants, neither effect was significant ($Fs \leq 2.41$, $p \geq .13$). This finding indicates that high and low socially anxious individuals of different ethnic backgrounds may differ substantially in the ways they approach novel social contacts. However, due to the varying numbers of Caucasian and Asian low and high SA participants in our study, we were underpowered in determining the nature of these differences. Future studies can address these differences by recruiting equal number of Asian and Caucasian participants into the high and low SA groups.

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Appendix A

Depression Anxiety and Stress Scale (DASS-21)

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

0 = Did not apply to me at all
1 = Applied to me to some degree, or some of the time
2 = Applied to me to a considerable degree, or a good part of time
3 = Applied to me very much, or most of the time

1.	I found it hard to wind down	0	1	2	3
2.	I was aware of dryness of my mouth	0	1	2	3
3.	I couldn't seem to experience any positive feeling at all	0	1	2	3
4.	I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5.	I found it difficult to work up the initiative to do things	0	1	2	3
6.	I tended to over-react to situations	0	1	2	3
7.	I experienced trembling (e.g., in the hands)	0	1	2	3
8.	I felt that I was using a lot of nervous energy	0	1	2	3
9.	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10.	I felt that I had nothing to look forward to	0	1	2	3
11.	I found myself getting agitated	0	1	2	3
12.	I found it difficult to relax	0	1	2	3
13.	I felt down-hearted and blue	0	1	2	3
14.	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15.	I felt I was close to panic	0	1	2	3
16.	I was unable to become enthusiastic about anything	0	1	2	3

17.	I felt I wasn't worth much as a person	0	1	2	3
18.	I felt that I was rather touchy	0	1	2	3
19.	I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)	0	1	2	3
20.	I felt scared without any good reason	0	1	2	3
21.	I felt that life was meaningless	0	1	2	3

Appendix B

Negative Self-Portrayal Scale

According to the scale provided below, please write the number in the blank space beside each item to indicate the degree to which you are concerned about the following aspects of yourself when you are in **anxiety-provoking social situations** (e.g. talking to someone who is a stranger; giving a speech in front of an audience; answering a question in class; etc.).

1 ----------	2 ----------	3 ----------	4 ----------	5
Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned

In social situations (in which I feel anxious), it will become obvious to other people that I am:

_____ 1. stuttering

_____ 2. poorly dressed

_____ 3. boring

_____ 4. sweating

_____ 5. physically unattractive

_____ 6. losing control of my emotions

_____ 7. blushing

_____ 8. speaking with a trembling voice

_____ 9. blemished (i.e., my appearance)

_____ 10. interpersonally ineffective

_____ 11. weird-looking

_____ 12. lacking personality

_____ 13. fat

_____ 14. unable to express myself

_____ 15. twitching (i.e. my facial muscles)

_____ 16. frozen

_____ 17. humourless

_____ 18. reserved

_____ 19. aloof

_____ 20. stupid

_____ 21. socially awkward

_____ 22. having a bad hair day

_____ 23. speaking incoherently

_____ 24. lacking social skills

_____ 25. fidgeting

_____ 26. unfashionable

_____ 27. ugly

Appendix C

Social Phobia Inventory (SPIN)

Please check how much the following problems have bothered you during the past week. Mark only one box for each problem, and be sure to answer all items.

		Not at all	A little bit	Somewhat	Very much	Extremely
1.	I am afraid of people in authority.	☐	☐	☐	☐	☐
2.	I am bothered by blushing in front of people.	☐	☐	☐	☐	☐
3.	Parties and social events scare me.	☐	☐	☐	☐	☐
4.	I avoid talking to people I don't know.	☐	☐	☐	☐	☐
5.	Being criticized scares me a lot.	☐	☐	☐	☐	☐
6.	Fear of embarrassment causes me to avoid doing things or speaking to people.	☐	☐	☐	☐	☐
7.	Sweating in front of people causes me distress.	☐	☐	☐	☐	☐
8.	I avoid going to parties.	☐	☐	☐	☐	☐
9.	I avoid activities in which I am the centre of attention.	☐	☐	☐	☐	☐
10.	Talking to strangers scares me.	☐	☐	☐	☐	☐
11.	I avoid having to give speeches.	☐	☐	☐	☐	☐
12.	I would do anything to avoid being criticized.	☐	☐	☐	☐	☐
13.	Heart palpitations bother me when I am around people.	☐	☐	☐	☐	☐
14.	I am afraid of doing things when people might be watching.	☐	☐	☐	☐	☐
15.	Being embarrassed or looking stupid are among my worst fears.	☐	☐	☐	☐	☐
16.	I avoid speaking to anyone in authority.	☐	☐	☐	☐	☐
17.	Trembling or shaking in front of others is distressing to me.	☐	☐	☐	☐	☐

Appendix D

Free Recall Record Form

SET 1: Please list as many of the comments that you can remember here from the preceding set:

I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____

SET 2: Please list as many of the comments that you can remember here from the preceding set:

I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____

SET 3: Please list as many of the comments that you can remember here from the preceding set:

I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____
I can see that _____

Appendix E

Pilot data for social judgement phrase set based on the NSPS

Descriptor	Mean Valence Rating	Memorability Proportion Score	Valence (Mean/ Nice)	NSPS Category
Loner	**-2.37**	**0.11**	**Mean**	**Social Competence**
(Absentminded)	-1.58	0.00	Mean	Social Competence
Anxious	**-0.89**	**0.42**	**Mean**	**Signs of Anxiety**
Apprehensive	-0.47	0.05	Mean	Signs of Anxiety
Awkward	**-1.79**	**0.00**	**Mean**	**Social Competence**
(Blemished)	-2.05	0.05	Mean	Physical Appearance
Boring	**-2.68**	**0.11**	**Mean**	**Social Competence**
Chubby	**-1.63**	**0.11**	**Mean**	**Physical Appearance**
(Clumsy)	-1.26	0.11	Mean	Social Competence
(Distant)	-1.05	0.00	Mean	Social Competence
(Fat)	-2.47	0.63	Mean	Physical Appearance
(Frumpy)	-1.26	0.53	Mean	Physical Appearance
(Indifferent)	-0.63	0.05	Mean	Social Competence
Introverted	**-0.21**	**0.21**	**Mean**	**Social Competence**
Nervous	**-1.00**	**0.32**	**Mean**	**Signs of Anxiety**
On edge	**-1.26**	**0.05**	**Mean**	**Signs of Anxiety**
Overweight	**-2.11**	**0.37**	**Mean**	**Physical Appearance**
Plain	**-1.74**	**0.00**	**Mean**	**Physical Appearance**
(Restless)	-0.79	0.32	Mean	Signs of Anxiety

Tense	**-0.89**	**0.16**	**Mean**	**Signs of Anxiety**
Ugly	**-2.74**	**0.32**	**Mean**	**Physical Appearance**
Unattractive	**-2.53**	**0.26**	**Mean**	**Physical Appearance**
Uneasy	**-1.21**	**0.37**	**Mean**	**Signs of Anxiety**
Unfriendly	**-2.42**	**0.21**	**Mean**	**Social Competence**
Uptight	**-1.89**	**0.16**	**Mean**	**Signs of Anxiety**
Big nose	**-1.95**	**0.32**	**Mean**	**Physical Appearance**
Lack charisma	**-2.26**	**0.16**	**Mean**	**Social Competence**
(Handsome)	2.21	0.00	Nice	Physical Appearance
Articulate	**2.21**	**0.11**	**Nice**	**Social Competence**
(At ease)	1.53	0.26	Nice	Signs of Anxiety
(At peace)	1.68	0.05	Nice	Signs of Anxiety
(Attractive)	2.32	0.84	Nice	Physical Appearance
Calm	**1.16**	**0.32**	**Nice**	**Signs of Anxiety**
(Charismatic)	2.16	0.37	Nice	Social Competence
(Clear skin)	1.32	0.00	Nice	Physical Appearance
(Comfortable)	1.58	0.16	Nice	Signs of Anxiety
Composed	**1.37**	**0.05**	**Nice**	**Signs of Anxiety**
Confident	**2.21**	**0.42**	**Nice**	**Signs of Anxiety**
Fit	**2.16**	**0.32**	**Nice**	**Physical Appearance**
Friendly	**2.16**	**0.53**	**Nice**	**Social Competence**
Good-looking	**2.16**	**0.11**	**Nice**	**Physical Appearance**
Interesting	**1.68**	**0.11**	**Nice**	**Social Competence**

(Kind)	2.11	0.05	Nice	Social Competence
Likeable	**1.89**	**0.16**	**Nice**	**Social Competence**
(Motivated)	2.00	0.05	Nice	Social Competence
Pleasant	**1.58**	**0.11**	**Nice**	**Social Competence**
Poised	**1.53**	**0.37**	**Nice**	**Signs of Anxiety**
Relaxed	**1.21**	**0.42**	**Nice**	**Signs of Anxiety**
Self-assured	**1.32**	**0.16**	**Nice**	**Signs of Anxiety**
Slim	**1.21**	**0.42**	**Nice**	**Physical Appearance**
Sociable	**1.84**	**0.26**	**Nice**	**Social Competence**
Attractive face	**2.05**	**0.05**	**Nice**	**Physical Appearance**
Beautiful eyes	**2.53**	**0.37**	**Nice**	**Physical Appearance**
Great hair	**2.32**	**0.42**	**Nice**	**Physical Appearance**

Note. Bolded descriptors were ultimately chosen as the stimuli for the present study, while those in parentheses were the stimuli that were piloted but not used in this study.