Published in final edited form as:
J Anxiety Disord. 2010 April ; 24(3): 300–308. doi:10.1016/j.janxdis.2010.01.001.

Training Implicit Social Anxiety Associations: An Experimental Intervention

Elise M. Clerkin and **Bethany A. Teachman**
University of Virginia

Abstract

The current study investigates an experimental anxiety reduction intervention among a highly socially anxious sample (*N*=108; *n*=36 per Condition; 80 women). Using a conditioning paradigm, our goal was to modify implicit social anxiety associations to directly test the premise from cognitive models that biased cognitive processing may be causally related to anxious responding. Participants were trained to preferentially process non-threatening information through repeated pairings of self-relevant stimuli and faces indicating positive social feedback. As expected, participants in this positive training condition (relative to our two control conditions) displayed less negative implicit associations following training, and were more likely to complete an impromptu speech (though they did not report less anxiety during the speech). These findings offer partial support for cognitive models and indicate that implicit associations are not only correlated with social anxiety, they may be *causally* related to anxiety reduction as well.

Keywords

social anxiety; implicit associations; training; cognitive processing; conditioning

Training Implicit Social Anxiety Associations: An Experimental Intervention

Social phobia, also known as social anxiety disorder, is an impairing condition characterized by excessive avoidance and fear of social situations (Diagnostic and Statistical Manual of Mental Disorders; APA, 1994). Although cognitive-behavioral interventions have received a great deal of empirical support, nearly half of the patients who seek treatment for social anxiety fail to fully respond (Turner, Beidel, Wolff, Spaulding, & Jacob, 1996). Clearly, additional research is necessary in order to better understand the mechanisms underlying symptom improvement.

In the current study, we developed an experimental intervention based on cognitive models of anxiety, and tested it among a highly socially anxious sample. Using a cognitive training paradigm, we sought to modify implicit social anxiety associations, which are automatic evaluations that reside outside conscious control (see Greenwald, McGhee, & Shwartz, 1998). These associations are thought to share some similarities with anxious schemas (see Teachman, Marker, & Smith-Janik, 2008). Thus, by training implicit associations and evaluating the impact on social behavior, our goal was to more directly test the causal premise

Correspondence should be addressed to Elise M. Clerkin at the University of Illinois at Chicago Medical Center; 912 South Wood Street room 327; Chicago, IL 60612; Phone: 614-483-1004, emc2t@virginia.edu.

underlying cognitive theories of social phobia—that maladaptive self-schemas contribute to the maintenance of social anxiety and avoidance behaviors (Clark & Wells, 1995).

Cognitive Processing Models of Social Anxiety

General cognitive models of anxiety propose that maladaptive schemas (i.e., cognitive scripts or frameworks) guide cognitive processing such that anxious individuals pay attention to, interpret, and remember information that is relevant to fear and anxiety (Beck & Clark, 1997). These biases theoretically maintain social anxiety by reinforcing the idea that social situations are threatening (Clark & Wells, 1995). When giving a speech, for example, individuals with social anxiety may initially notice the only negative facial expression in a large audience, and interpret this as a sign that they are failing miserably.

There is abundant evidence that cognitive biases are *correlated* with pathological anxiety, but many researchers theorize that there is also a *causal* relationship between cognitive processing and anxious responding (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). In our earlier example, initially attending to a negative facial expression and interpreting it in a biased way (e.g., “I’m a failure”) would be expected to cause elevated levels of anxiety and future avoidance behavior. However, experimental approaches to establish this causal relationship have been limited, so the direction or existence of causality remains unclear.

More recently, researchers have begun to manipulate cognitive biases to directly test causality. For instance, Amir and colleagues found that when participants were trained to attend *away* from threatening information, this not only resulted in reduced symptoms of social anxiety as assessed by an independent rater (Amir, Weber, Beard, Bomyea, & Taylor, 2008), but the benefits of training were evident for up to a year after the study (personal communication with N. Amir; July, 2008). Similar demonstrations have been shown in interpretation bias training within the context of social anxiety (e.g., Beard & Amir, 2008; Murphy, Hirsch, Mathews, Smith, & Clark, 2007).

Implicit Social Anxiety Associations and Emotional Vulnerability

Our goal in the current study was to draw from this exciting early work to investigate another bias that may be particularly valuable for understanding cognitive models of social anxiety: implicit associations (de Jong, 2002; Tanner, Stopa, & De Houwer, 2006). Although there is no way to directly measure schemas because they constitute an abstract construct, implicit associations are thought to reflect elements of anxious schemas in that they are interconnected evaluations in memory that are relatively less amenable to conscious control or introspection (Teachman & Woody, 2004). This connection to schemas is noteworthy because although schemas have been notoriously difficult to operationalize (Fiske & Taylor, 1991), they are integral for understanding cognitive models of anxiety (e.g., Beck & Emery with Greenberg, 1985). For individuals with social anxiety, schemas related to extreme fears of negative evaluation are thought to filter information in socially-relevant situations, leading to greater anxiety and avoidance (Rapee & Heimberg, 1997). Thus, while it is not possible to directly measure anxious schemas, we may be able to alter aspects of negative schematic processing by learning to manipulate implicit associations. Moreover, schemas are theorized to influence other forms of cognitive biases (e.g., selective attention to threat stimuli), so modifying maladaptive schemas through implicit associations may promote healthier cognitive processing more broadly.

There is also evidence suggesting that implicit associations are relevant for social anxiety.. For instance, de Jong (2002) investigated implicit self-esteem among women who were high (versus low) on social anxiety symptoms. Although both groups exhibited relatively lower “other” (versus “self”-esteem), the discrepancy was much weaker among socially anxious

individuals. Further, Teachman and Allen (2007) found that implicit rejection associations were related to the emotional intensity and dependence of close peer interactions among a group of adolescents.

Finally, there is robust evidence demonstrating that implicit associations predict meaningful behavior. For example, in a meta-analysis of 86 independent populations, implicit associations predicted a variety of outcomes, including those relevant to social anxiety (e.g., social judgments; Greenwald, Poehlman, Uhlmann, & Banaji, in press). More directly tied to the clinical field, Teachman and colleagues (2008) recently found that changes in implicit associations preceded and predicted changes in panic symptoms over the course of a 12-week CBT intervention. Evidence from Teachman and Woody (2003) also suggests that implicit associations within a clinical sample (spider phobia) are sensitive to treatment.

In the current study, we sought to evaluate whether implicit rejection associations may also be *causally* related to symptom reduction in social anxiety. Specifically, following training using a conditioning paradigm, participants were asked to complete a public speaking task. Consistent with Murphy et al. (2007), we hypothesized that creating healthier implicit associations would lead to fewer social anxiety symptoms associated with the speech. In line with many prior training studies, the intervention was not expected to impact state anxiety directly, reinforcing the argument that implicit associations were being trained and training was not simply an anxiety manipulation (see Mathews & MacLeod, 2002).

Training Implicit Social Anxiety Associations

Although directly training implicit associations is novel in psychopathology research, recent research suggests that implicit associations are malleable. For example, Dasgupta and Greenwald (2001) showed participants photographs of disliked white and admired black people. Results indicated that this simple intervention actually attenuated the biased positive implicit evaluations of white (compared to black) individuals as assessed by the Implicit Association Test (IAT; Greenwald et al., 1998). Additionally, Gregg, Seibt, and Banaji (2006) demonstrated that they could shift automatic preferences for one imaginary social group versus another through the use of a classical conditioning paradigm. Most relevant to the current proposal, Baccus, Baldwin, and Packer (2004) were able to condition implicit self-esteem in an unselected sample by using a computer game where photographs of smiling faces consistently followed self-relevant information. The conditioning resulted in more positive implicit self-esteem when measured by an IAT (Greenwald et al., 1998). Drawing from their approach, we attempted to condition positive associations between the self and socially relevant feedback. Analogous to Baccus and colleagues (2004), our primary expectation was that individuals in the positive training condition (relative to our two control conditions) would display less negative implicit associations following training. We also wanted to test the potential for this training to influence subsequent emotional vulnerability (though, given the brevity of training, we did *not* expect that training effects would be comparable to what would be seen with a more standard form of treatment for social phobia). We thus included multiple indices of emotional vulnerability to determine whether the Positive training condition (relative to the two control conditions) could reduce any anxiety markers in response to a social stressor following training.

Methods[1]

Participants

Participants were college students from the university's psychology participant pool, invited to participate based on their responses during pre-screening to the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998), the Brief Fear of Negative Evaluation (BFNE; Leary, 1983), and an additional question assessing fear of public speaking (taken from the Social Phobia Scale; Mattick & Clarke, 1998). All participants: a) scored more than a half a standard deviation above the mean SIAS score reported for a prior community sample (*M*=19.9, *SD*=14.2; Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992), b) scored within one standard deviation of the mean reported for a socially phobic sample using the BFNE (*M*=46.91; *SD*=9.27; Weeks, Heimberg, Fresco, Hart, Turk, Schneier, & Liebowitz, 2005), and c) endorsed a high level of public speaking fear (Very or Extremely) on the SPS item. This resulted in a highly socially anxious sample, with a mean SIAS score of 44.25 (*SD*=9.77; *range*: 30–80) and a mean BFNE score of 47.02 (*SD*=6.42; *range*: 36–60). Indeed, Brown et al. (1997) identified people as having social phobia if they scored greater than or equal to 34 and 24 on the SIAS and SPS, respectively. These means are consistent with or *lower* than the means reported in the current study, suggesting that our sample was highly symptomatic. The final sample in the current study (*N*=108; *n*=36 per Condition; 80 women) had a mean age of 18.63 (*SD*=1.23), and race was reported as 64% Caucasian, 25% Asian/Pacific Islander, 4% African-American, 4% Hispanic, 2% biracial, and 2% "other."[2]

Materials

Social Anxiety and Depression Symptoms—The *Social Interaction Anxiety Scale* (SIAS; Mattick & Clarke, 1998) is a 20-item scale that assesses reactions to social situations and has good psychometric properties (see Orsillo, 2001). The SIAS was used to recruit participants who scored high in social anxiety symptoms and was selected following recommendations from Cox, Ross, Swinson, and Direnfeld (1998). Notably, Rodebaugh, Woods, Heimberg, Liebowitz and Schneier (2006) note that the SIAS "may be somewhat overly conservative in selecting analogue participants from an undergraduate sample" (p. 231), further increasing our confidence that our sample was highly socially anxious. Cronbach's alpha in the current study was .84.

The Brief Fear of Negative Evaluation (BFNE; Leary, 1983) is a 12-item scale that assesses fears of negative evaluation (FNE). This measure was used to recruit participants with high fears of negative evaluation (above 37.64; Cronbach's alpha = .85), and is appropriate for use with non-clinical samples (Duke, Krishnan, Faith, & Storch, 2006).

The *Social Phobia Scale* (SPS; Mattick & Clarke, 1998) is a 20-item scale that assesses social anxiety tied to social performance. The full measure was used as a convergent indicator of social phobia symptoms during the actual experiment (Cronbach's alpha=.86).

The *Beck Depression Inventory-II* (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item inventory that assesses depressive symptoms. It has good reliability and validity (BDI-II; Beck, Steer, & Brown, 1996), and Cronbach's alpha in the current sample was .90. The BDI-II was included as an additional measure to characterize our sample because we wanted to ensure that levels of depressive symptoms were comparable across conditions given the high rates of comorbidity

[1]Only those measures relevant for the current hypotheses are listed here; for a complete listing (including methods tied to a dot-probe and interpretation bias task that participants completed), please contact the first author.

[2]One participant scored just below the cutscore for the BFNE (36) and one participant only completed six items on the SIAS. Data from both participants were retained for analyses because they met criteria for inclusion based on the other two screening measures. In addition, one participant was excluded from the final sample because this individual dropped out mid-way through the study.

between social anxiety disorder and depression (Kessler, Stang, Wittchen, Stein, & Walters, 1999), as well as evidence that depression and anxiety can differentially influence cognitive processing biases (e.g., Bradley, Mogg, Millar, & White, 1995).

Emotional Vulnerability Tied to a Social Anxiety Stressor—The *Brief State Anxiety Measure* (BSAM; Berg, Shapiro, Chambless, & Ahrens, 1998) has adequate psychometric properties and assesses state levels of anxiety. It is composed of six items taken from the State-Trait Anxiety Inventory (Spielberger, 1983; relaxed, steady, strained, comfortable, worried, and tense). In the current study, the BSAM was administered prior to and following training, and following the public speaking task (average Cronbach's alpha across the three assessment points=.76).

The *Perception of Speech Performance measure* (PSP; Rapee & Lim, 1992) is a 17-item scale measuring speech performance that has adequate psychometric properties (Rapee & Lim, 1992; Rapee & Hayman, 1996). We used this measure to examine whether training influenced perceptions of speech performance (Cronbach's alpha=.86). Note that the PSP has also been referred to as the Speech Performance Questionnaire (Rapee & Abbott, 2007).

Public Speaking Task: To assess the extent that training influenced emotional vulnerability tied to symptoms of social anxiety, participants completed an impromptu speech following training. Participants were told they could stop the speech at any point (completion of the task was our measure of avoidance), and they were given one minute to prepare for a four minute speech. To heighten performance anxiety, the speech was video recorded and participants were informed that the speech might later be rated. Further, experimenters were trained to exhibit a neutral expression throughout the speech, and they were also instructed to follow a series of prompts if participants stopped speaking prior to four minutes. Following the speech, participants were asked to rate how anxious they had felt during the most distressing point of the speech task using the BSAM, including when they were anticipating giving the speech. Thus, participants who chose not to give the speech were still asked to complete the BSAM, to reflect their peak anxiety while anticipating giving the speech. Finally, participants who attempted the speech completed the PSP.

Implicit Association Test—Implicit social anxiety associations were measured with the Implicit Association Test (IAT; Greenwald et al., 1998), which assesses automatic associations in memory in the sense that the evaluations reside outside conscious control. The IAT has adequate psychometric properties (Greenwald & Nosek, 2001), including reasonable test-retest reliability (e.g., .69 for implicit self-esteem; Bosson, Swann, & Pennebaker, 2000). Similar to many paradigms utilized by social cognition researchers (Fazio, 2001), the IAT is a reaction time task that evaluates *relative* strength of association between two concepts. Therefore, the IAT is a relative (as opposed to absolute) measure of associations. Specifically, the IAT compares the time taken to classify stimuli when paired categories match (versus contradict) one's automatic associations. When category pairings are consistent with a person's automatic associations, the expectation is that the individual will classify stimuli more quickly. This is reflected by a faster response latency for the computerized IAT and a greater number of items categorized for the paper-pencil IAT (see Figures 1a and 1b).

There are several reasons why the IAT is especially useful for anxiety research. Not only does it minimize the influence of conscious control and self-presentation concerns (Greenwald et al., 1998), the IAT also uses a within-subjects design in which the same anxiety-provoking stimuli are present across each of the conditions being compared (thus minimizing the impact of state anxiety on performance). In the present study, we used the paper-pencil version to measure pre-training implicit associations (see Lemm, Lane, Sattler, Khan, & Nosek, in press), and the computerized version post-training. The different formats were chosen to

minimize the impact of practice effects, which can be problematic for administrations of the same format of the IAT close in time (see Greenwald et al., 2003; Huijding & de Jong, 2007; Nosek, Greenwald, & Banaji, 2006), while still allowing for comparable tests of implicit associations pre- versus post-training. According to Lemm et al. (in press; p. 4), "The patterns of data obtained from paper-format IATs generally parallel those of conceptually similar computerized IATs."

In both the paper-pencil and computer versions, we used identical category labels and stimuli to measure implicit rejection associations to capture one aspect of participants' fears of negative evaluation (referred to as "implicit rejection associations"; e.g., in the task measuring implicit rejection associations, the stimuli "Liked," "Admired," "Popular," and "Accepted" corresponded to the category label "Liked"; the stimuli "Rejected," "Disliked," "Unwanted," and "Shunned" corresponded to the category label "Rejected"). Namely, an individual with extreme fears of being negatively evaluated would presumably be relatively more able to associate the self with "rejected" (compared to "liked").[3] The task involved classifying stimuli as quickly as possible while categories were placed into two opposing pairings. Specifically, there was one block where the categories paired together were "rejected + me" and "liked + not me", and another block where the categories paired together were "rejected + not me" and "liked + me." Participants were asked to correctly categorize as many stimuli as they could (e.g., the word "self" or the word "unwanted" would fit into the pairing "me + rejected"). In the paper-pencil format, category pairings were listed at the top left and right-hand side of each page, and stimuli were listed in a randomly determined order (same order used across participants) underneath the category pairings. In the computer IAT, two category labels were paired on either side of the computer screen, and stimuli appeared one at a time in the center of the screen. In general, participants who completed the "me + rejected" block first for the paper-pencil IAT completed the "me + liked" block first for the computerized IAT, and vice versa (there was no meaningful difference in block order by Condition for either the paper-pencil, $\chi^2(6)=1.88$, $p=.93$, or computerized IAT, $\chi^2(6)=.91$, $p=.99$).

The measures of implicit associations were computed by comparing response times (computerized IAT) and total responses within a given block of time (paper-pencil IAT) across the critical blocks that were compatible (versus incompatible) with socially anxious schemas. At the outset of the study, we expected that there would be no training group differences in strength of implicit rejection associations, regardless of the absolute value of the evaluations. However, following training, we hypothesized that participants in the Positive SP group (compared to the other two conditions) would have relatively more rapid "self + liked" (versus "self + rejected") associations, reflecting less implicit rejection associations.

Training of Implicit Associations—The experimental training of implicit social anxiety associations followed the method used by Baccus et al. (2004) to modify implicit self-esteem. Similar to Baccus and colleagues, we repeatedly paired self-relevant information with pictures of others' positive facial expressions in order to reduce rejection associations. However, to make the paradigm more appropriate for social phobia, photographs of the participant engaged in a socially relevant task (pretending to give a speech) were used as the self-relevant stimuli. For control stimuli, we used photographs of strangers engaged in non-socially relevant tasks (e.g., reading a book) because we did not want to prime social anxiety concerns (see Figure 2).

[3]Note that an IAT evaluating implicit self-esteem was also conducted, but this measure is not discussed in detail here because it is not central to the hypotheses of the current study. For both versions of the IAT (computerized and paper-pencil), there were two category pairing conditions, known as blocks.

Participants were instructed that photographs would randomly appear in one quadrant on the computer screen. Their task was to click on the photo as quickly as possible, which caused another image to be briefly displayed (for 400 ms) in the same quadrant. Training consisted of 720 trials, which were separated into three blocks (*n*=240 trials per block), and training lasted for approximately 30 minutes (~9–10 minutes per block). In the Positive Social Performance (Positive SP) condition, self-relevant photographs (the participant giving a speech) were always followed by an image of a positive/smiling face (*n*=340 trials), and other-relevant photographs (a stranger reading a book) were always followed by an image of a critical (disgusted) or neutral face (*n* =170 trials). In contrast, in the Neutral Social Performance (Neutral SP) condition, a random assortment of critical, neutral, and positive faces followed both self- and other-relevant pictures (*n*=240 trials each). This control condition was selected to match the Positive condition on as many dimensions as possible (e.g., exposure to self- and other-relevant stimuli). Finally, participants assigned to the No Social Performance (No SP) condition viewed photographs of non-socially relevant objects (i.e., mushrooms, flowers, and animals), which were also followed by a random selection of critical, neutral, and positive faces (*n*=240 trials each). This condition provided a rigorous, no training control condition in the sense that participants did not receive any feedback tied to their social performance, but they still viewed emotional faces. Note, there was an imbalance in the valence of facial expressions displayed across conditions, with more positive faces shown in the Positive (relative to control) conditions. This design was chosen to maximize the impact of the Positive SP training, while helping ensure that the two control conditions were not training associations in any given direction.

As noted earlier, participants were asked to click on either self-, other-, or non-socially relevant pictures. Non-socially relevant photographs were taken from the International Affective Picture System. Other-relevant pictures consisted of 5 male and 5 female photographs that were obtained via the internet using a Google search, and self-relevant pictures consisted of 10 photographs of the participant holding a microphone and pretending to give a speech. Finally, all facial photographs were taken from a standardized database (NIMSTIM; http://www.macbrain.org/).

Procedure

During informed consent participants were told that the purpose of the study was to understand people's thoughts and emotional reactions to different situations, including a series of computer tasks; social anxiety was not mentioned. Participants were sequentially assigned to one of three training conditions (either Positive SP, Neutral SP, or No SP Training), and research assistants were blind to participant condition. Following informed consent, participants completed the baseline paper-pencil IAT to help establish that participants in the three conditions did not significantly differ in implicit associations prior to training. Next, participants' photographs were taken to potentially be used as conditioning stimuli (participants were told that these photographs might be used in one of the subsequent tasks), and participants completed baseline questionnaires in random order assessing symptoms of social anxiety (SPS) and depression (BDI-II). After completing the training task, participants completed the computerized IAT to determine whether the training was effective at modifying implicit associations. The BSAM was also administered prior to and following training to help establish whether state anxiety was directly affected by the conditioning procedure. Next, participants completed the social stressor speech task. Finally, to check for awareness of the hypotheses, a funnel debriefing exit interview was conducted in which participants were asked whether they knew what hypotheses the researchers were testing, as well as what they thought the point of the training task was. Following this, all participants were fully debriefed.

Results

Data Scoring and Reduction

The paper-pencil IAT data were scored based on the algorithm developed by Lemm et al. (in press), where the square root of the difference between the number of items correctly classified across the two critical blocks is multiplied by the ratio of items correctly classified. The computer IAT data were scored according to the algorithm developed by Greenwald, Nosek, and Banaji (2003) to create a D score, which reflects the difference in mean reaction time across critical blocks divided by the standard deviations across blocks (it is conceptually similar to Cohen's d). This method is advantageous because it helps to account for overall response latency, while at the same time improving the IAT's psychometric properties (Lane, Banaji, Nosek, & Greenwald, 2007). Importantly, using these scoring algorithms maximizes the comparability of the paper-pencil and computer IAT formats as they produce conceptually similar scores (Lane et al., 2007).

For both versions of the paper-pencil and computer IAT tasks, data were cut if participants' error rate was greater than 30% overall (averaged across blocks; see Teachman and Woody, 2003). Additionally, for the computer IAT tasks, data were cut if greater than 10% of trials were quicker than 300 ms (based on recommendations by Greenwald et al., 2003). Using these methods, we cut three participants' computer IAT data and two participants' paper-pencil IAT data. Additionally, for the pre-training implicit rejection associations task, data were cut from one participant due to an experimenter administration error and from one other participant due to a participant error in following instructions.

Sample Characteristics and Comparison of Groups at Baseline

We first examined baseline group differences to ensure that the training conditions were comparable after random assignment. Chi-square tests indicated that groups did not differ significantly by gender ($\chi^2(2)=2.70$, $p=.26$) or race ($\chi^2(10)=5.74$, $p=.84$). Additionally, univariate analysis of variance (ANOVA) tests revealed that there were no significant group differences in age ($F_{(2,105)}=.55$, $p=.58$, $\eta_p^2=01$), baseline implicit rejection associations ($F_{(2,101)}=1.24$, $p=.29$, $\eta_p^2=.02$), or baseline state anxiety (Pre-training BSAM: $F_{(2,105)}=.05$, $p=.96$, $\eta_p^2=.001$). Finally, a multivariate analysis of variance (MANOVA) indicated that there were no significant group differences at baseline in symptoms of social anxiety and depression (SIAS, SPS, BFNE, BDI-II; $F_{(8,206)}=1.36$, $p=.21$, $\eta_p^2=.05$; See Table 1).

Effects of Training

To evaluate the effects of training, we conducted a series of planned weighted contrasts based on the hypothesis that the Positive SP group would show more adaptive outcomes following training relative to the two control conditions, which were not expected to differ from one another (Positive SP: +2; Neutral SP: −1; No SP: −1).

Effects of Training Implicit Social Anxiety Associations

Implicit associations: We hypothesized that individuals in the Positive SP condition, relative to individuals in the two control conditions, would display healthier implicit rejection associations following training. Consistent with hypotheses, the contrast analysis revealed that there was a significant between groups difference in post-training implicit rejection associations ($t_{102}=2.38$, $p=.02$, d=0.47), with individuals in the Positive SP group ($M=-.62$, $SD=.26$) associating the self with liked (versus rejected) more readily than individuals in the two control groups (Neutral SP: $M=-.42$, $SD=.34$; No SP: $M=-.50$, $SD=.34$). This effect held even when controlling for baseline implicit rejection associations ($p=.03$), indicating that it was possible to modify implicit rejection associations through a conditioning task.[4]

Anxiety due to training task: As predicted, the planned weighted contrast revealed that there was no significant effect of Condition on state anxiety immediately following training but before the social anxiety stressor (Post-training BSAM: t_{101}=.18, p=.86, d=0.04), even when controlling for baseline state anxiety (p=.95). Together, these findings increase our confidence that training effects were not merely the result of an anxiety manipulation.

Subsequent emotional vulnerability: We expected that individuals in the Positive SP group would display less emotional vulnerability to the social stressor task, relative to the other two conditions. For each of the outcome measures (Avoidance, Anxiety, and Perception of Performance), we conducted separate tests because different numbers of participants were included for the analyses, depending on whether they chose to give the speech. There were no between-group differences in likelihood of giving the speech ($\chi^2(2)$=.16, p=.92), with four individuals refusing to give a speech in the Neutral SP training group, and five individuals refusing to give a speech in each of the other two groups. For Avoidance and Perception of Performance, we examined only those individuals who chose to give the speech; for Anxiety, we included all participants who completed the BSAM following the public speaking task, including those who chose not to give the speech. Among these participants, scores on the BSAM reflected peak anxiety while *anticipating* giving the speech (as opposed to peak anxiety throughout the entire task). Notably, the three indicators of emotional vulnerability were all significantly inter-related (r range=.25–.49; all p<.05).

The Avoidance variable was negatively skewed, so we conducted a weighted chi-square test to determine whether there were training group differences in the number of participants who completed the speech (versus those who did not). As expected, there were significantly more people in the Positive SP group who spoke for the full four minutes, as compared to the two control conditions. Namely, there were 18 “completers” in the Positive SP group (versus only 11 completers in the No SP group and 11 completers in the Neutral SP group; $\chi^2(1)$=4.55, p=.03). In fact, when collapsing across control conditions, participants in the Positive SP condition spoke for approximately 28 seconds longer than participants in the two control conditions; see Figure 3).

Contrary to expectations, the contrasts examining Anxiety and Perception of Performance revealed that there were no significant main effects for Condition (Anxiety: t_{102}=1.22, p=.23, d=0.24; PSP: t_{91}=.84, p=.40, d=0.18). Therefore, while individuals in the Positive SP group (relative to the other two conditions) were more likely to complete the public speaking task, they did not experience less anxiety or more positive perceptions of their public speaking performance.

Checking for knowledge of hypotheses: To investigate participants’ knowledge of hypotheses, we evaluated responses on the funnel debriefing exit interview to determine whether participants were aware that the training task was designed to minimize anxiety and/or influence implicit social anxiety associations. A total of eight participants expressed knowledge regarding these specific hypotheses. Not surprisingly (given the fixed feedback pairing contingency in this condition), all were in the Positive SP group. However, when we re-ran our primary between-group analyses excluding these eight participants, the basic pattern of findings was similar to our original results, though the weighted chi-square analysis evaluating the effect of Condition on Avoidance (whether speech completed or not) was slightly weaker ($\chi^2(1)$=2.68, p=.10).

[4]A planned weighted contrast revealed that there was no significant effect of Condition on a post-training implicit self-esteem task (t_{102}=1.21, p=.23, d=0.24). This suggests that the effects of training did not generalize beyond the rejection associations. However, as previously mentioned, the effect of training on implicit self-esteem will not be discussed in further detail given that it was not central to the current hypotheses.

Discussion

The current study was designed to evaluate whether implicit rejection associations contribute to symptoms of social anxiety and avoidance behavior. Specifically, we sought to modify implicit associations, which share some conceptual overlap with anxious schemas (Teachman & Woody, 2004). Participants were trained to have more positive implicit associations through repeatedly pairing self-relevant stimuli with positive social feedback (Positive SP group), or they participated in one of two control conditions (Neutral and No SP training). Our expectation was that individuals trained to make healthier implicit associations, relative to participants in the control conditions, would display less emotional vulnerability to a subsequent social anxiety stressor. In general, results indicated that it was possible to manipulate implicit rejection associations in a highly anxious sample through a conditioning paradigm. Evidence regarding the influence of implicit association training on subsequent emotional vulnerability was more mixed, though participants in the positive training condition (relative to our two control conditions) were significantly more likely to complete an impromptu speech.

Implications of Shifting Implicit Associations: Implicit Associations

As expected, there were no significant group differences in baseline implicit rejection associations. However, participants in the Positive SP group (relative to the control groups) displayed less implicit rejection associations following training. Additionally, state anxiety was not directly influenced by the training task, suggesting that post-training outcomes were not simply the result of an anxiety manipulation. This provides the first evidence that it is possible to target implicit rejection associations through a conditioning task, which is meaningful given that implicit associations and self-schemas are both thought to capture interconnected associations in memory that are difficult to consciously control. Furthermore, cognitive models posit that self-schemas tied to rejection fears are integral for understanding social anxiety and avoidance behavior (Clark & Wells, 1995).

Learning how to manipulate implicit associations is also notable because although current empirically supported treatments focus on altering explicit cognition, little is known about how to directly modify processing in psychopathology that occurs outside conscious control. Yet, according to McNally (1995), “it is the inability of the patient to terminate fear-generating processing once it starts that is the hallmark of pathological anxiety” (p. 752). For instance, individuals with social anxiety may involuntarily worry about being negatively evaluated while socializing at a party, even when they know that the likelihood of being rejected is quite low. Thus, it is possible that strategies to counteract automatic processing of threatening information could potentially serve as a useful therapeutic tool.

Implications of Shifting Implicit Associations: Emotional Vulnerability

Evidence from the current study suggested that modifying implicit rejection associations directly influenced aspects of emotional vulnerability, although the evidence here was more mixed. Supporting our hypotheses, participants in the Positive SP group, compared to both control groups, were significantly more likely to speak for the full time during the public speaking task. This suggests that not only are implicit associations *correlated* with symptoms of social anxiety (de Jong, 2002), they may be *causally* related to some aspects of anxiety reduction as well.

These findings also raise a number of intriguing clinical implications. For instance, contrary to Foa and Kozak (1986), these results indicate that it is not necessary to directly activate fear or anxiety in order to modify the fear network (recall that state anxiety was not elevated following training in the current study). Furthermore, our conditioning paradigm suggests that it may be possible to influence cognition and behavior without relying upon verbal mediation.

This is significant given Beck and Clark's (1997) contention that verbally mediated interventions are a "necessary but not sufficient component of any anxiety treatment" (p. 55). Meanwhile, McNally (1995) contends that automatic biases in anxiety may be unaffected by traditional, verbally-mediated techniques. Instead, he suggests that behavioral strategies should be applied. While there are insufficient data to determine whether explicit verbal mediation is necessary to achieve substantial symptom improvement, data from the current study suggest that under certain circumstances it may be possible to alleviate some aspects of anxious responding without traditional forms of "talk therapy."

Enhancing Training Effects

It will be important for future researchers to establish how best to maximize the effects of implicit association training on emotional vulnerability because there were no significant between-group differences in our Anxiety or Perception of Performance post-training outcome measures. While this is problematic from a treatment perspective, it is worth highlighting that training in the current study was limited to one very brief session (~30 minutes). Thus, it is not entirely surprising that training effects on emotional vulnerability were somewhat weak. It is likely that showing change on multiple aspects of emotional vulnerability would require additional practice trials and/or increased time in order for individuals to incorporate the new associations into their existing self-concepts. Support for the idea that increased time may lead to a greater correspondence between healthier implicit rejection associations and explicit symptom change comes from recent research in the implicit social cognition field. Specifically, researchers found that implicit attitude generalization toward an imaginary social group occurred immediately, while explicit attitude generalization occurred over the course of time (M = 10 days between sessions; Ranganath & Nosek, 2008). On the other hand, the null findings in the current study are consistent with some past training studies, which found little evidence to support the expected impact of training on subsequent emotional vulnerability (e.g., Harris & Menzies, 1998). For example, although Baccus et al. (2004) were able to classically condition implicit self-esteem using a similar training paradigm, they found minimal support that the conditioning task actually influenced social behavior.

Nevertheless, although the effect was relatively modest, Positive training appeared to influence participants' willingness to engage in the impromptu speech, as evidenced by their greater propensity to complete the full speech (although they were not more likely to *initially* engage in the public speaking task). We speculate that longer speaking times would eventually lead to decreased anxiety and less negative self-perceptions as greater exposure led to enhanced feelings of self-efficacy and habituation to anxiety over time. Making adjustments to the training procedure may also be necessary to more effectively influence anxious responding. For instance, in the current study individuals in the Positive SP group consistently saw pictures of other people paired with critical faces during the training task. While this design was chosen to maximize our ability to see group differences on the IAT, it may have inadvertently primed the notion that others are *rejecting*. Therefore, this could have weakened our ability to see training group differences in subsequent emotional vulnerability. It is also notable that for both post-training implicit rejection associations and the amount of time participants spoke during the speech task (Time as a continuous measure), outcomes for individuals in the No SP training group were intermediary between outcomes for individuals in the Positive and Neutral SP groups. In light of this, it is possible that Neutral SP training inadvertently strengthened *negative* associations between the self and social rejection. Further, this intervention was designed to impact public speaking concerns specifically. In the future, it will be critical to evaluate interventions with various modules focused on altering other clusters of social anxiety symptoms (e.g., training implicit associations tied to positive reactions from authority figures or romantic partners).

A final possibility is that implicit association training may be better able to influence certain features of the social anxiety response. For instance, Teachman and Allen (2007) found that implicit rejection associations were *unrelated* to a self-report measure of social anxiety, but they were significantly related to a behavioral measure of social interactions. Similarly, McConnell and Leibold (2001) found that judges' ratings of five social behaviors (including shorter speaking time) were significantly related to an implicit, but not explicit, measure of prejudice. Asendorpf, Banse, and Mucke (2002) demonstrated that implicit shyness was a better predictor of relatively 'automatic' manifestations tied to shyness (e.g., tense body posture) compared to more explicit forms of shyness (e.g., based on self-report). Thus, it is possible that implicit association training may be best suited to impact those attitudes or behaviors that are less obviously amenable to conscious control (see Nosek, 2005, for potential moderators of the relationship between implicit and explicit attitudes).

Limitations and Conclusions

The results from the current study must be interpreted in light of several limitations. First, although our sample was highly socially anxious, it is unclear whether these findings will generalize to a diagnosed sample of individuals with social phobia. Second, the stability of longer-term outcomes associated with training is unknown because no follow-up assessment was included, and the impact of training on emotional vulnerability in this study was relatively modest. Additionally, training was brief so we utilized two different IAT formats to minimize practice effects; however, this design made it difficult to directly evaluate changes in implicit associations. Furthermore, speaking time was not an ideal measure of emotional vulnerability given the skewed nature of the data, as well as the fact that this kind of measure can be susceptible to minor experimenter error (e.g., in recording times). Finally, knowledge of researchers' hypotheses may have had a small influence on public speaking outcomes, although the evidence here was not conclusive.

Notwithstanding, this study provides the first evidence that it is possible in a highly socially anxious sample to experimentally manipulate implicit associations tied to rejection fears. These findings offer some support for cognitive models and suggest that implicit associations are not only correlated with symptoms of social anxiety, they may be *causally* related to anxiety reduction as well. In particular, individuals trained to make healthier implicit associations (relative to participants in control conditions) were more likely to complete an impromptu speech. However, given the relatively modest impact of training on subsequent emotional vulnerability, establishing how best to create healthier implicit associations, as well as determining the parameters under which implicit association training will influence various symptoms of social anxiety, will be essential next steps.

Acknowledgments

The authors would like to thank the Program for Anxiety Cognition & Treatment (PACT) Lab for their helpful feedback. For research assistance, thanks to Emily Cumming, Timothy Aikens, and Sarah Siodmok. Finally, this research was supported in part by an F31 MH083337-01 grant and APA Dissertation Research Award to Elise Clerkin and by an NIH RO1MH075781-01A2 grant to Bethany Teachman.

References

American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington, DC: American Psychiatric Association; 1994.

Amir N, Weber G, Beard C, Bomyea J, Taylor CT. The effect of a single session attention modification program on response to a public speaking challenge in socially anxious individuals. Journal of Abnormal Psychology 2008;117:860–868. [PubMed: 19025232]

Asendorpf JB, Banse R, Mucke D. Double dissociation between implicit and explicit personality self-concept: The case of shy behavior. Journal of Personality and Social Psychology 2002;83:380–393. [PubMed: 12150235]

Baccus JR, Baldwin MW, Packer DJ. Increasing implicit self-esteem through classical conditioning. Psychological Science 2004;15:498–502. [PubMed: 15200636]

Beard C, Amir N. A multisession interpretation modification program: changes in interpretation and social anxiety symptoms. Behaviour Research and Therapy 2008;46:1135–1141. [PubMed: 18675400]

Beck, AT.; Emery, G.; Greenberg, RI. Anxiety disorders and phobias. New York: Basic Books; 1985.

Beck, AT.; Steer, RA.; Brown, GK. Beck Depression Inventory—II Manual. San Antoino, TX: The Psychological Corporation; 1996.

Beck AT, Clark DA. An information processing model of anxiety: Automatic and strategic processes. Behavior Research and Therapy 1997;35:49–58.

Berg CZ, Shapiro N, Chambless DL, Ahrens AH. Are emotions frightening? II: An analogue study of fear of emotion, interpersonal conflict, and panic onset. Behaviour Research and Therapy 1998;36:3–15. [PubMed: 9613013]

Bosson JK, Swann WBJ, Pennebaker JW. Stalking the perfect measure of implicit self-esteem: The blind men and the elephant revisited? Journal of Personality and Social Psychology 2000;79:631–643. [PubMed: 11045743]

Bradley BP, Mogg K, Millar N, White J. Selective processing of negative information: Effects of clinical anxiety, concurrent depression, and awareness. Journal of Abnormal Psychology 1995;104:532–536. [PubMed: 7673577]

Brown EJ, Turovsky J, Heimberg RG, Juster HR, Brown TA, Barlow DH. Validation of the Social Interaction Anxiety Scale and Social Phobia Scale across the anxiety disorders. Psychological Assessment 1997;9:21–27.

Clark, DM.; Wells, A. A cognitive model of social phobia. In: Heimberg, R.; Liebowitz, M.; Hope, DA.; Schneier, FR., editors. Social Phobia: Diagnosis, Assessment and Treatment. New York: Guildford Press; 1995. p. 69-93.

Cox BJ, Ross L, Swinson RP, Direnfeld DM. A comparison of social phobia outcome measures in cognitive-behavioral group therapy. Behavior Modification 1998;22:285–297. [PubMed: 9670801]

Dasgupta N, Greenwald AG. On the malleability of automatic attitudes: Combating automatic prejudice with images of admired and disliked individuals. Journal of Personality and Social Psychology 2001;81:800–814. [PubMed: 11708558]

de Jong PJ. Implicit self-esteem and social anxiety: Differential self-favouring effects in high and low anxious individuals. Behavior Research and Therapy 2002;40:501–508.

Duke D, Krishnan M, Faith M, Storch EA. The psychometric properties of the Brief Fear of Negative Evaluation Scale. Journal of Anxiety Disorders 2006;20:807–817. [PubMed: 16368221]

Fazio RH. On the automatic activation of associated evaluations: An overview. Cognition and Emotion 2001;15:115–141.

Fiske, ST.; Taylor, SE. Social cognition. 2nd ed. New York: McGraw-Hill; 1991.

Foa EB, Kozak MJ. Emotional processing of fear: Exposure to corrective information. Psychological Bulletin 1986;99:20–35. [PubMed: 2871574]

Gregg AP, Seibt B, Banaji MR. Easier done than undone: Asymmetry in the malleability of implicit preferences. Journal of Personality and Social Psychology 2006;90:1–20. [PubMed: 16448307]

Greenwald AG, Poehlman A, Uhlmann E, Banaji MR. Understanding and using the Implicit Association Test III: Meta-Analysis of predictive validity. Journal of Personality and Social Psychology. (in press).

Greenwald AG, McGhee DE, Schwartz JLK. Measuring individual differences in implicit cognition: The implicit association test. Journal of Personality and Social Psychology 1998;74:1464–1480. [PubMed: 9654756]

Greenwald AG, Nosek BA. Health of the Implicit Association Test at Age 3. Zeitschrift für Experimentelle Psychologie 2001;48:85–93.

Greenwald AG, Nosek BA, Banaji MR. Understanding and using the Implicit Association Test: I. An improved scoring algorithm. Journal of Personality and Social Psychology 2003;85:197–216. [PubMed: 12916565]

Harris LM, Menzies RG. Changing attentional bias: Can it effect self-reported anxiety? Anxiety, Stress, and Coping 1998;11:167–179.

Heimberg RG, Mueller GP, Holt CS, Hope DA, Liebowitz MR. Assessment of anxiety in social interaction and being observed by others: the Social Interaction Anxiety Scale and the Social Phobia Scale. Behavior Therapy 1992;23:53–73.

Huijding J, de Jong PJ. Beyond fear and disgust: The role of (automatic) contamination-related associations in spider phobia. Journal of Behavior Therapy and Experimental Psychiatry 2007;38(2): 200–211. [PubMed: 17125734]

Kessler RC, Stang P, Wittchen H-U, Stein M, Walters EE. Lifetime comorbidities between social phobia and mood disorders in the U.S. National Comorbidity Survey. Psychological Medicine 1999;29:555–567. [PubMed: 10405077]

Lane, KA.; Banaji, MR.; Nosek, BA.; Greenwald, AG. Understanding and using the Implicit Association Test: IV – What we know (so far) about the method. In: Wittenbrink, B.; Scwarz, N., editors. Implicit Measures of Attitudes. New York: Guilford Press; 2007. p. 59-102.

Leary MR. A brief version of the Fear of Negative Evaluation Scale. Personality and Social Psychology Bulletin 1983;9:371–375.

Lemm, KM.; Lane, KA.; Sattler, DN.; Kahn, SR.; Nosek, BA. Assessing implicit attitudes with a paper-format Implicit Association Test. In: Morrison, TG.; Morrison, MA., editors. The psychology of modern prejudice. Hauppauge, NY: Nova Science Publishers; (in press).

MacLeod C, Rutherford EC, Campbell E, Ebsworthy G, Holker L. Selective attention and emotional vulnerability: Assessing the causal basis of their association through the experimental manipulation of attentional bias. Journal of Abnormal Psychology 2002;111:107–123. [PubMed: 11866165]

Mathews A, MacLeod C. Induced processing biases have causal effects on anxiety. Cognition and Emotion 2002;16:331–354.

Mattick RP, Clarke JC. Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. Behaviour Research and Therapy 1998;36:455–470. [PubMed: 9670605]

McConnell AR, Leibold JM. Relations among the implicit association test, discriminatory behavior, and explicit measures of racial attitudes. Journal of Experimental Social Psychology 2001;37:435–442.

McNally RJ. Automaticity and the anxiety disorders. Behaviour Research and therapy 1995;33:747–754. [PubMed: 7677712]

Murphy R, Hirsch C, Mathews A, Smith K, Clark DM. Facilitating a benign interpretation bias in a high socially anxious population. Behavior Research and Therapy 2007;45:1517–1529.

Nosek BA. Moderators of the relationship between implicit and explicit evaluation. Journal of Experimental Psychology: General 2005;134(4):565–584. [PubMed: 16316292]

Nosek, BA.; Greenwald, AG.; Banaji, MR. The Implicit Association Test at age 7: A methodological and conceptual review. In: Bargh, JA., editor. Social Psychology and the Unconscious: The Automaticity of Higher Mental Processes. New York: Psychology Press; 2006. p. 265-292.

Orsillo, SM. Measures for social phobia. In: Antony, MM.; Orsillo, SM.; Roemer, L., editors. Practitioner's Guide to Empirically Supported Based Measures of Anxiety. New York: Kluwer Academic/Plenum; 2001. p. 165-187.

Ranganath KA, Nosek BA. Implicit attitude generalization occurs immediately; Explicit attitude generalization takes time. Psychological Science 2008;19:249–254. [PubMed: 18315797]

Rapee RM, Lim L. Discrepancy between self- and observer ratings of performance in social phobics. Journal of Abnormal Psychology 1992;101:728–731. [PubMed: 1430614]

Rapee RM, Hayman K. The effects of video feedback on the self-evaluation of performance in socially anxious subjects. Behaviour Research and Therapy 1996;34:315–322. [PubMed: 8871363]

Rapee RM, Heimberg RG. A cognitive-behavioral model of anxiety in social phobia. Behaviour Research and Therapy 1997;35:741–756. [PubMed: 9256517]

Rapee RM, Abbott MJ. Modelling relationships between cognitive variables during and following public speaking in participants with social phobia. Behaviour Research and Therapy 2007;45(12):2977–2989. [PubMed: 17850761]

Rodebaugh TL, Woods CM, Heimberg RG, Liebowitz MR, Schneier FR. The factor structure and screening utility of the Social Interaction Anxiety Scale. Psychological Assessment 2006;18:231–237. [PubMed: 16768601]

Spielberger, CD. Manual for the State-Trait Anxiety Inventory (STAI). Palo Alto, CA: Consulting Psychologists Press; 1983.

Tanner RJ, Stopa L, De Houwer J. Implicit views of the self in social anxiety. Behaviour Research and Therapy 2006;44:1397–1409. [PubMed: 16337924]

Teachman BA, Woody S. Automatic processing among individuals with spider phobia: Change in implicit fear associations following treatment. Journal of Abnormal Psychology 2003;112:100–109. [PubMed: 12653418]

Teachman B, Woody S. Staying tuned to research in implicit cognition: Relevance for clinical practice with anxiety disorders. Cognitive and Behavioral Practice 2004;11:149–159.

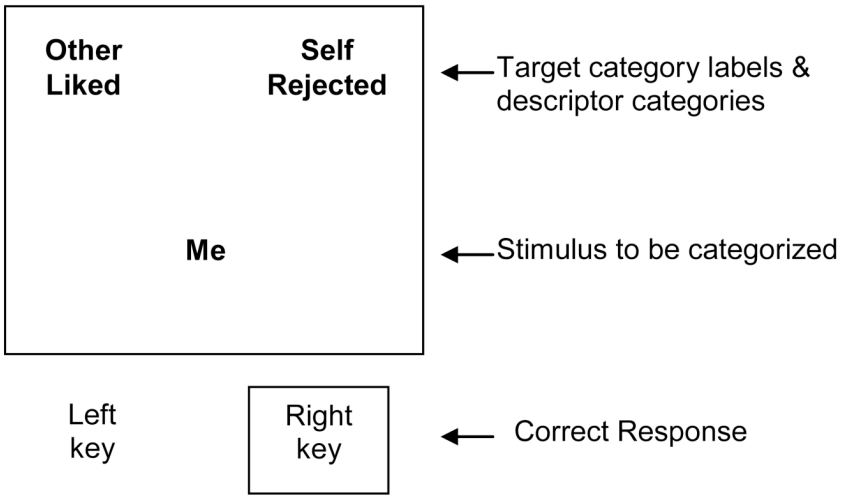
Teachman BA, Allen JP. Development of social anxiety: Social interaction predictors of implicit and explicit fear of negative evaluation. Journal of Abnormal Child Psychology 2007;35:63–78. [PubMed: 17171538]

Teachman BA, Marker CD, Smith-Janik SB. Automatic associations and panic disorder: Trajectories of change over the course of treatment. Journal of Consulting and Clinical Psychology 2008;76:988–1002. [PubMed: 19045967]

Turner SM, Beidel DC, Wolff PL, Spaulding S, Jacob RG. Clinical features affecting treatment outcome in social phobia. Behaviour Research and Therapy 1996;34:795–804. [PubMed: 8952122]

Weeks JW, Heimberg RG, Fresco DM, Hart TA, Turk CL, Schneier FR, Liebowitz MR. Empirical validation and psychometric evaluation of the Brief Fear of Negative Evaluation Scale in patients with social anxiety disorder. Psychological Assessment 2005;17:179–190. [PubMed: 16029105]

1a) Computerized Implicit Association Test procedure



1b) Paper-Pencil Implicit Association Test procedure

Me Rejected		Not Me Liked
O	not me	☑
☑	disliked	O
☑	myself	O
O	popular	☑
O	they	☑
☑	shunned	O
☑	self	O
☑	rejected	O
☑	I	O
O	accepted	☑
☑	me	O
☑	unwanted	O

Figure 1.
Pictures depicting 1a) the computerized Implicit Association Test (IAT) procedure, and 1b) the paper-pencil IAT procedure. In the computerized IAT, participants high (versus low) in social anxiety symptoms would be expected to classify stimuli *relatively* more quickly in this classification trial, compared to a classification trial in which "Self" is paired with "Liked." In this example, the participant would press the right computer key in order to correctly categorize the stimuli "Me" into the category label "Self." Similarly, in the paper-pencil IAT, participants high (versus low) in social anxiety symptoms would be expected to categorize stimuli *relatively* more quickly in this classification block.

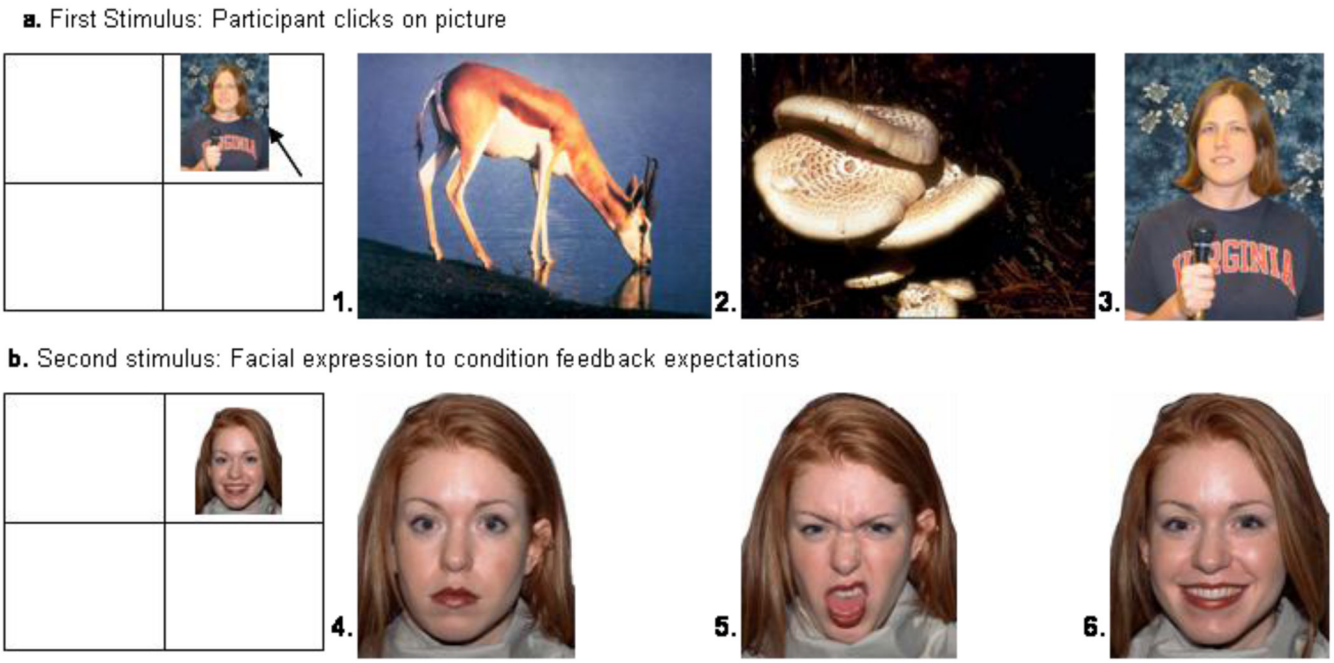


Figure 2.

Picture depicting the Implicit Association Training task. As depicted in the grids, in the Positive SP condition, photographs of the self giving a speech (e.g., picture 3) are paired with positive expressions (e.g., picture 6), while photographs of a stranger reading a book (e.g., picture 2) are paired with neutral/critical expressions (e.g., pictures 4–5). In the Neutral SP condition, self- and other-relevant photographs are paired with a random selection of expressions (e.g., from 4–6). In the No SP condition, photographs of flowers, animals, and mushrooms (e.g., picture 1) are paired with a random selection of facial expressions (e.g., from 4–6).

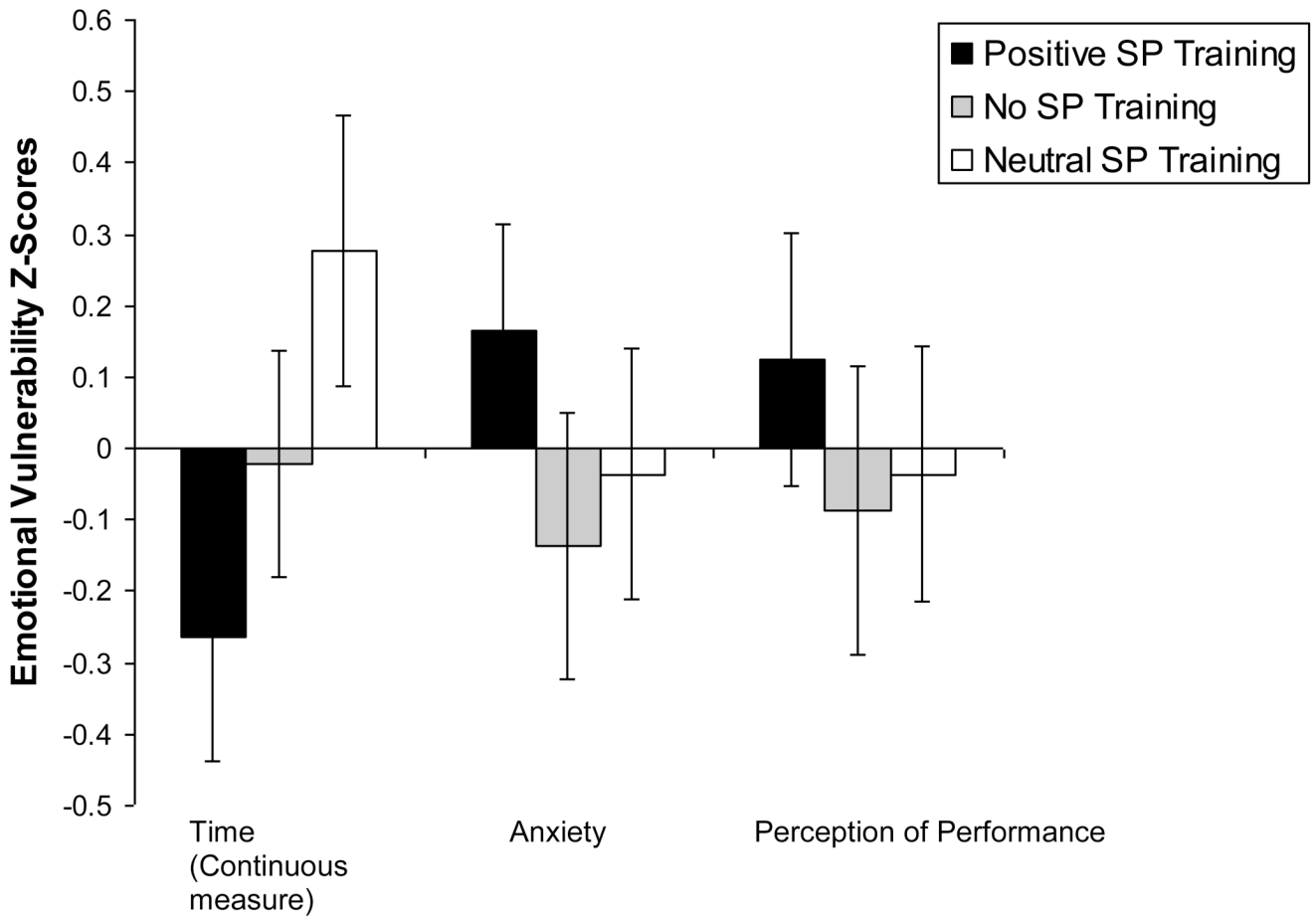


Figure 3.
Training group means (and SE bars) in emotional vulnerability tied to the social anxiety stressor (public speaking task). All measures were converted to z-scores for ease of presentation. However, it is important to note that the scales use different metrics so are not directly comparable. Higher scores indicate greater avoidance (Time spent speaking as a continuous measure), greater anxiety, and more negative perceptions of their speech performance.

Table 1

Descriptive statistics (Means and SDs) for baseline measures

Baseline Implicit Associations	**Full Sample**		**Positive SP**		**No SP**		**Neutral SP**	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Pre-testing implicit rejection associations	−4.42	3.65	−5.20	4.47	−3.83	3.27	−4.30	3.12
Baseline Social Anxiety Symptoms	**Full Sample**		**Positive SP**		**No SP**		**Neutral SP**	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Social Interaction Anxiety Scale (SIAS)	44.25	9.77	46.26	10.08	42.60	7.87	43.89	11.02
Brief Fear of Negative Evaluation (BFNE)	47.02	6.42	47.33	6.94	46.36	5.81	47.38	6.59
Social Phobia Scale (SPS)	24.64	9.87	27.22	8.55	21.86	9.70	24.82	10.75
Baseline Depression and General Anxiety Symptoms	**Full Sample**		**Positive SP**		**No SP**		**Neutral SP**	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Brief State Anxiety Measure (BSAM)	11.57	2.95	11.69	3.28	11.53	2.81	11.50	2.80
Beck Depression Inventory – II (BDI-II)	11.14	7.94	13.11	9.48	11.24	8.24	9.08	5.15

Note. Positive SP = Positive Social Performance Training; Negative SP = Negative Social Performance Training. The implicit association variable was scored so that higher numbers reflect relatively greater self + rejected (versus liked) evaluations.