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Implicit Associations in Social Anxiety Disorder: The Effects of Comorbid Depression

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Abstract

Implicit associations of the self to concepts like “calm” have been shown to be weaker in persons with social anxiety than in non-anxious healthy controls. However, other implicit self associations, such as those to acceptance or rejection, have been less studied in social anxiety, and none of this work has been conducted with clinical samples. Furthermore, the importance of depression in these relationships has not been well investigated. We addressed these issues by administering two Implicit Association Tests (IATs; Greenwald, McGhee, & Schwartz, 1998), one examining the implicit association of self/other to anxiety/calmness and the other examining the association of self/other to rejection/acceptance, to individuals with generalized social anxiety disorder (SAD, $n = 85$), individuals with generalized SAD and a current or past diagnosis of major depressive disorder or current dysthymic disorder ($n = 47$), and non-anxious, non-depressed healthy controls ($n = 44$). The SAD and SAD-depression groups showed weaker implicit self-calmness associations than healthy controls, with the comorbid group showing the weakest self-calmness associations. The SAD-depression group showed the weakest implicit self-acceptance associations; no difference was found between non-depressed individuals with SAD and healthy controls. *Post hoc* analyses revealed that differences appeared to be driven by those with current depression. The SAD-only and SAD-depression groups did not differ in self-reported (explicit)

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social anxiety. The implications of these findings for the understanding of SAD-depression comorbidity and for the treatment of SAD are considered.

Keywords

Social anxiety disorder; social phobia; depression; implicit associations; cognitive biases

Social anxiety disorder (SAD) and major depressive disorder (MDD) are two of the most common mental disorders in the US (Kessler, Chiu, Demler, Merikangas, & Walters, 2005), with 12-month prevalence rates of 6.8% and 6.7%, respectively (Kessler, Berglund, et al., 2005). SAD and MDD often occur together, and SAD precedes MDD in approximately 70% of individuals with both disorders (Kessler, Stang, Wittchen, Stein, & Walters, 1999; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). In one study, individuals with SAD were at 3.5 times higher risk than those without to have a subsequent depressive disorder (Stein et al., 2001). In another study that followed adolescents into adulthood, the risk for depression was 2-fold in individuals with SAD compared to those without SAD and almost 3-fold compared to those with no anxiety disorder (Beesdo et al., 2007). Increasing our knowledge of depression comorbidity among persons with SAD is important because anxiety-depression comorbidity is associated with more chronic distress, greater risk of relapse, and more impaired psychosocial functioning than when the disorders present independently (e.g., C. Brown, Schulberg, Madonia, Shear, & Houk, 1996; Lewinsohn, Rohde, & Seeley, 1995; Reich et al., 1993; Ruscio et al., 2008). One particular focus is understanding the role of information processing biases in SAD with and without depression.

Attentional Biases in Social Anxiety Disorder

Cognitive-behavioral models of SAD (e.g., Clark & Wells, 1995; Heimberg, Brozovich, & Rapee, 2010; Hofmann, 2007; see Wong, Gordon, & Heimberg, in press, for a review and comparison of cognitive-behavioral models of SAD) posit that dysfunctional information processing contributes to the etiology and maintenance of the disorder. In fact, a large body of research documents the occurrence of one type of dysfunctional information processing, attentional bias toward social threat stimuli, in SAD (for a review, see Morrison & Heimberg, 2013; for a review of attentional bias toward threat stimuli in the anxiety disorders more generally, see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007). However, limited research suggests that the presence of depressive symptoms among individuals with social anxiety/SAD may alter the nature of this response.

One study looked at the impact of depressive symptoms on attentional bias among socially anxious individuals using an emotional Stroop task (Grant & Beck, 2006). Socially anxious individuals without depressive symptoms showed greater Stroop interference for threat words relative to neutral and positive words. However, the socially anxious-dysphoric group did not exhibit this bias. To our knowledge, only two other studies have addressed this problem (LeMoult & Joormann, 2012; Musa, Lépine, Clark, Mansell, & Ehlers, 2003). Both administered a dot-probe task to individuals with SAD, SAD and a concurrent depressive disorder, and non-patient controls. Musa et al. found results largely consistent with Grant

and Beck. Patients with SAD showed the expected bias (i.e., vigilance) toward social threat words. Patients with SAD and concurrent depression showed no such bias and appeared similar to controls. In contrast to the 500ms threat cue presentation duration employed by Musa et al., LeMoult and Joormann presented threat cues for either 7ms or 1,000ms. They found evidence of attentional *avoidance* of angry faces in the depressed SAD group compared to the non-depressed SAD group for the supraliminal presentation. However, the meaning of these results is less than clear, given that neither SAD group differed from controls on these trials. In addition, no evidence of attentional bias, either vigilance or avoidance, in either SAD group was detected for subliminally presented angry face cues, nor for positive, sad, or disgust faces at either presentation time.

Taken together, the pattern of results suggests that comorbid depression may nullify, or at least dampen, attentional biases associated with social anxiety at relatively brief exposures. When more time is permitted for stimulus processing, biases may be observed in the comorbid depression group, albeit in the opposite direction. Indeed, Mathews and MacLeod (2005) have suggested that early sensitivity to threat cues apparent in anxiety may be inhibited in depression, in which biases toward mood-congruent information are more commonly observed for stimuli that are presented for longer durations, potentially due to slower, more strategically directed processes such as rumination. Therefore, it appears prudent to consider whether concurrent depressive symptoms or depressive disorder have similar effects on other automatic cognitive biases in individuals with SAD.

Implicit Associations and the Implicit Association Test (IAT)

Implicit associations are another important type of biased cognitive processing that is receiving attention in research on psychopathology. Implicit associations are thought to represent stable memory constructs developed over time that contribute to schemas about the self (Beevers, 2005; Haefl et al., 2007). The IAT, developed by Greenwald, McGhee, and Schwartz (1998), examines implicit attitudes that someone holds regarding the relationship between a concept or category (e.g., flowers) and an attribute (e.g., goodness). The IAT has been widely used to examine attitudes regarding different racial groups, genders, and sexual orientations (e.g., Devos & Banaji, 2005; Jellison, McConnell, & Gabriel, 2004; Nosek, Banaji, & Greenwald, 2002). During the typical administration of the IAT, participants make a series of response choices involving a concept discrimination (e.g., flowers/insects) and an attribute discrimination (e.g., good/bad). Participants are instructed to respond rapidly with a right key press to items representing one concept and one attribute (e.g., flowers and good) and with a left key press to items from the remaining two categories (e.g., insects and bad). Participants then complete a second task in which key assignments for one of the pairs is switched. IAT response latencies are interpreted in terms of relative association strengths.¹ It is assumed that responses are more rapid when the concept and attribute mapped onto the same key are strongly associated, whereas responses are assumed

¹As noted by Pinter and Greenwald (2005), it is important to keep in mind that “the standard interpretation of any IAT measure involves *relative* strengths of associations of the two contrasted concept categories with the two contrasted attribute categories” (p. 75, italics added). Throughout this paper, we will refer to IAT results using simplified descriptors (e.g., flowers-good) to increase readability. However, results are always referring to the relative strength of associations (e.g., flowers-good/insects-bad).

to be relatively slower when the concept and attribute mapped on the same key are less closely associated.

The use of implicit measures, such as the IAT, may be particularly relevant with socially anxious individuals. Given that individuals with SAD experience heightened self-presentational concerns and fears of others' evaluation, explicit self-report may yield an inaccurate or incomplete picture of their experiences. For example, it is a well-replicated phenomenon that persons with SAD report that they perform more poorly on behavioral tests than do other informants (e.g., Rapee & Lim, 1992; Rodebaugh, Heimberg, Schultz, & Blackmore, 2010; Rodebaugh & Rapee, 2005; Stopa & Clark, 1993). Implicit measures like the IAT may minimize — perhaps even circumvent — self-presentational biases and effects.

Implicit Associations in Social Anxiety and Depression

Several studies have used the IAT to study implicit associations in socially anxious individuals. de Jong (2002) administered the IAT to female undergraduates high and low in social anxiety, using concept categories of self (e.g., I, self) and other (e.g., their, them) and attribute categories of low-esteem (e.g., bad, stupid) and high-esteem (e.g., smart, valuable). Both high and low socially anxious groups performed faster categorizing self with high-esteem words than the reverse category pairings, although a significant interaction effect suggested that this pattern was stronger in the low socially anxious group. Similarly, another study found that high social anxiety participants did not exhibit negative implicit self-esteem; they responded more quickly to self-positive pairings than to self-negative pairings (Tanner, Stopa, & De Houwer, 2006). However, they did respond more slowly to self-positive pairings than those low in social anxiety. Notably, depressive symptoms did not impact IAT performance.

Some researchers have also examined responses to an IAT in which self or other is paired with rejection or acceptance, an area of clear concern to persons with social anxiety. A self-rejection IAT was used by Teachman and Allen (2007) in their study of perceived peer acceptance/rejection and its relationship to implicit and explicit fear of negative evaluation in adolescents. Adolescents more easily associated the self with acceptance than with rejection. Clerkin and Teachman (2010) examined the responses to the same IAT of socially anxious undergraduates to whom they provided training to modify implicit associations. Because all participants were socially anxious, it was not possible to compare their responses to those of a non-anxious sample, but similar to the adolescent sample of Teachman and Allen (2007), they more easily associated the self with acceptance than rejection. However, trained participants demonstrated strengthened self-acceptance associations and were more likely to complete an impromptu speech than students who had not received the implicit association training.

Few studies of implicit attitudes in social anxiety have examined clinical samples. Gamer, Schmukle, Luka-Krausgrill, and Egloff (2008) took a step in this direction when they recruited socially anxious students who completed four weeks of cognitive-behavioral group therapy at a university counseling center and were administered the IAT before and after treatment. Their responses were compared to non-anxious students who received no

treatment. Participants were asked to categorize self-other words and anxiety-calmness words. Consistent with previous findings, socially anxious participants and non-anxious controls were faster in the self-calm pairings than in the self-anxiety pairings on both IAT administrations. However, socially anxious participants had weaker self-calm implicit associations than non-anxious controls at baseline. In addition, self-calm implicit associations had strengthened following treatment, as socially anxious participants no longer differed from controls.

To date, only one study has used the IAT to examine comorbid anxiety and depression in a diagnosed sample. Glashouwer and de Jong (2010) compared implicit beliefs in a mixed anxiety disorder group, those with a current diagnosis of MDD, those with an anxiety disorder and comorbid MDD, and a healthy control group. Participants were part of the Netherlands Study of Depression and Anxiety (Penninx et al., 2008). An IAT measured implicit self-anxiety associations. As with previous IAT studies, all groups exhibited faster reaction times on self-calm trials than on self-anxiety trials. The anxious group showed weaker self-calm associations than the depressed and control groups. The authors made no hypotheses regarding the effect of comorbidity on IAT scores, but the comorbid group had the weakest self-calm associations, although not significantly different from the anxious group (after Bonferroni correction).

Implicit associations have also been studied in relation to depression. For example, in the study by Glashouwer and de Jong (2010), an IAT was also administered in which self versus other words were paired with words representing depression or elation. Although depressed participants exhibited faster reaction times on self-elation trials than on self-depression trials, they also demonstrated weaker self-elation associations than the anxiety and control groups. Several additional studies have examined the implicit associations of persons at cognitive risk for depression (e.g., Haefffel et al., 2007; Steinberg, Karpinski, & Alloy, 2007) or previously depressed persons in reaction to a negative mood induction (e.g., Gamar, Segal, Sagrati, & Kennedy, 2001; Meites, Deveney, Steele, Holmes, & Pizzagalli, 2008). A full review of this literature is beyond the scope of this paper, but see a meta-analysis of implicit cognition in depression by Phillips, Hine, and Thorsteinsson (2010). The general conclusion to be drawn from these studies is that the implicit associations of self to positive attributes of depressed/formerly depressed/at-risk-for-depression persons are weaker than those of non-depressed persons. This is important to the current research because it supports the idea that comorbid depression may confer additional risk for cognitive bias in socially anxious persons, unlike the somewhat mixed findings for attentional bias toward social threat.

Present Study

Research has demonstrated the utility of the IAT and provided the groundwork for understanding implicit associations in SAD. However, little is known about implicit associations in those with SAD and comorbid depression. Furthermore, no studies have examined implicit attitudes in a sample of clinically diagnosed, treatment-seeking individuals with SAD and depression. Of the studies reviewed above, the majority have been conducted with analogue samples, and only two have examined the impact of depressive

symptoms. Tanner et al. (2006) found no effect of depression on the implicit associations of socially anxious persons. Glashouwer and de Jong (2010) examined a mixed anxiety group and did not focus specifically on SAD. Given the high comorbidity of SAD and MDD, and the impairment associated with this comorbidity, it is crucial that we increase our understanding of the associated cognitive processes so that we can expand our theoretical models and enhance our treatment approaches.

One step towards this, and a goal of the current study, was to examine implicit associations among treatment-seeking patients with SAD and comorbid depression (i.e., MDD or dysthymia), compared to patients with SAD but no history of depression, and to healthy controls. We used two IATs, one measuring associations of self/other with anxiety/calmness and the other measuring associations of self/other with rejection/acceptance.

Based on results from previous studies, we hypothesized that individuals with SAD would exhibit weaker self-calm associations than healthy controls. We also hypothesized that the comorbid group would exhibit weaker self-calm associations than healthy controls. Studies on implicit associations in depression suggest that the comorbid group might have even weaker self-calm associations than the SAD group, but the empirical support for this hypothesis is not strong.

The self-rejection IAT used here was similar to the one used by Teachman and colleagues (Clerkin & Teachman, 2010; Teachman & Allen, 2007) and has yet to be studied in a clinical sample of persons with SAD. Our interest in this IAT comes in part from the literature on interpersonal rejection sensitivity (e.g., Downey & Feldman, 1996; Leary, 2006). Those with high levels of interpersonal rejection sensitivity are thought to have high expectations for rejection by others and to place high value on being accepted (Downey & Feldman, 1996). Rejection sensitivity has been primarily studied as a risk factor for depression (e.g., Ayduk, Downey, & Kim, 2001; Boyce & Parker, 1989), but it may be an underlying personality trait in those with social anxiety as well (Harb, Heimberg, Fresco, Schneier, & Liebowitz, 2002). We sought to explore how a clinical sample would perform on the self-rejection IAT, and whether there would be differences between the SAD and SAD-depression groups, given the potential importance of rejection sensitivity in both social anxiety and depression.

Method

Participants

Participants were 136 individuals with a primary diagnosis of generalized SAD and 44 healthy controls (HC group). Among those with SAD, 47 individuals had a current or past diagnosis of major depressive disorder (MDD) or current dysthymic disorder (SAD+Dep group), and 85 individuals had no current or past diagnosis of depression (SAD group). Four individuals with SAD who met criteria for a diagnosis of past dysthymic disorder were not included in the current study due to poor inter-rater reliability on the diagnostic measure (see Materials section). All participants with SAD were enrolled in one of two randomized controlled trials for the treatment of SAD. In one trial, participants ($n = 74$) were randomly allocated to receive individually administered cognitive-behavioral therapy (CBT) for SAD

or to a waitlist control condition (see Goldin et al., 2012). In the other trial, participants ($n = 62$) were randomly assigned to complete either mindfulness-based stress reduction (MBSR) or to an active comparison condition of aerobic exercise (see Jazaieri, Goldin, Werner, Ziv, & Gross, 2012). Measures included in the present analyses were administered prior to randomization.

Participants were included in the treatment studies if they met criteria for a principal diagnosis of generalized SAD according to the Anxiety Disorders Interview Schedule for DSM-IV, Lifetime version (ADIS-IV-L; Di Nardo, Brown, & Barlow, 1994; see below). Additional diagnoses, including MDD and dysthymia, were also assessed with the ADIS-IV-L. Participants were excluded for current pharmacotherapy or psychotherapy; history of medical disorders or head trauma; and current psychiatric disorders other than generalized anxiety disorder, obsessive compulsive disorder (OCD), agoraphobia without a history of panic attacks, specific phobia, MDD, or dysthymic disorder. In Goldin et al. (2012), participants were also excluded for current MDD or OCD, as well as previous CBT treatment. In Jazaieri et al. (2012), participants were excluded for previous completion of an MBSR course or regular meditation practice or exercise regimen. With regard to depression diagnoses in the SAD+Dep group, most met diagnostic criteria for past MDD only (57.4%), current MDD only (21.3%), current MDD and current dysthymia (10.6%), current dysthymia only (8.5%), or past MDD and current dysthymia (2.1%).

HC participants had no history of any psychiatric problems assessed by the ADIS-IV-L and were selected to match participants with SAD in the Goldin et al. (2012) study in terms of sex, race, age, and years of education. Participants were recruited via community bulletin boards web-based community listings, and referrals from mental health clinics and providers.

Materials

Anxiety Disorders Interview Schedule for DSM-IV, Lifetime Version (ADIS-IV-L)

—The ADIS-IV-L (Di Nardo et al., 1994) is a widely-used, semi-structured diagnostic interview that assesses current and past episodes of anxiety and related disorders. For each diagnosis, the interviewer provides a Clinician's Severity Rating (CSR), which is a 9-point, Likert-type rating that ranges from 0 to 8; scores of 4 or greater indicate that the patient has met criteria for a DSM-IV diagnosis. In a reliability study of a mixed diagnostic group, the ADIS-IV-L indicated good to excellent inter-rater agreement for current disorders (range of κ 's = .67–.86) and lifetime disorders (range of κ 's = .58–.83), except dysthymia (e.g., $\kappa = .36$ as a lifetime diagnosis; T. A. Brown, Di Nardo, Lehman, & Campbell, 2001). All individuals administering the ADIS-IV-L had satisfied training criteria outlined by T. A. Brown et al. (2001) and were experienced clinicians with at least masters-level training in clinical psychology.

Brief Fear of Negative Evaluation Scale (BFNE)—The BFNE (Leary, 1983) is a 12-item self-report measure that was designed to assess the degree to which people experience apprehension at the prospect of being evaluated negatively. Participants rate each item using a five-point, Likert scale from 1 (*Not at all characteristic of me*) to 5 (*Extremely*

characteristic of me). Sample items include “I am afraid that people will find fault with me” and “Sometimes I think I am too concerned with what other people think of me.” Research suggests that the reverse-scored items have inferior validity and that only the eight straightforwardly worded items be used (BFNE-S; Rodebaugh et al., 2004; Weeks et al., 2005). The BFNE-S demonstrated excellent internal consistency in a sample of patients with SAD ($\alpha = .92$) and in a nonanxious control sample ($\alpha = .90$; Weeks et al., 2005). The BFNE-S demonstrated adequate internal consistency in all three of our groups (HC: $\alpha = .92$; SAD: $\alpha = .92$; SAD+Dep: $\alpha = .77$).

Social Interaction Anxiety Scale (SIAS)—The SIAS (Mattick & Clarke, 1998) is a 20-item self-report scale designed to measure fears of social interactions. Participants are asked to rate each item using a Likert scale from 0 (*not at all characteristic or true of me*) to 4 (*extremely characteristic or true of me*). Sample items include “I feel tense if I am alone with just one person” and “I find it difficult to disagree with another’s point of view.” The SIAS has been widely used in the assessment of social anxiety and has shown good reliability and validity in a number of studies (e.g., E.J. Brown et al., 1997; Mattick & Clarke, 1998; Safren, Turk, & Heimberg, 1998). Rodebaugh, Woods, and Heimberg (2007) have reported that the straightforward items of the SIAS are more valid indicators of social interaction anxiety than the reverse-scored items, which appear to be more strongly related to the construct of extraversion, and therefore suggest utilizing only the 17 straightforward items (SIAS-S) to calculate the total score. In the current sample, internal consistency of the SIAS-S was good in all three groups (HC: $\alpha = .90$; SAD: $\alpha = .88$; SAD+Dep: $\alpha = .88$).

Beck Depression Inventory–II (BDI-II)—The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report instrument which assesses the existence and severity of depressive symptoms. Participants rate the severity of each symptom, such as sadness and loss of interest, over the past two weeks on a 0–3 scale, with higher scores indicating greater severity. The BDI-II has been used extensively and has demonstrated good internal consistency in outpatient and undergraduate populations (e.g., Beck, Steer, Ball, & Ranieri, 1996; Storch, Roberti, & Roth, 2004), as it did in the three groups in the current sample (HC: $\alpha = .73$; SAD: $\alpha = .91$; SAD+Dep: $\alpha = .91$).

Implicit Association Test—Participants completed two IATs administered via computer. In both IATs, the concept discrimination was between self and other. In one IAT, the attribute discrimination was between anxiety and calmness, and in the other IAT, it was between acceptance and rejection. Stimuli from the self category were *I, own, my, me, and self*. Stimuli from the other category included *them, others, you, your, and they*. Items from the anxiety category included *afraid, anxious, uncertain, nervous, and fearful*, and items from the calmness category included *calm, restful, balanced, relaxed, and at ease*. Items representing the acceptance category were *loved, welcomed, admired, included, and respected*, and items representing the rejection category included *forgotten, alienated, deserted, shunned, and disliked*.

The IAT procedure was modeled after Egloff and Schmukle’s (2002) “IAT-Anxiety.” Within each IAT, there were five blocks of trials. In the first block, participants completed 20 practice trials categorizing the concept discrimination (i.e., self/other). In the second

block, an additional 20 practice trials were completed for categorizing the attribute stimuli. The fourth block was also a practice block of 20 trials for categorizing self/other items with the key assignment switched. The third and fifth blocks were each comprised of 40 critical trials in which participants categorized items into two combined categories. In the third block, items for self and the positive attribute were to be categorized on the left and in the fifth block items for self and the negative attribute were to be categorized on the right. We chose not to counterbalance the order of the pairings to remain consistent with the procedure of Egloff and Schmukle (2002). They argue that the advantages of this type of procedure may outweigh the disadvantages. Specifically, they suggest that, although we cannot interpret the IAT score in absolute terms, this type of consistent ordering optimizes comparison between participants and thus “generates an ordering according to the (relative) size of the IAT effect” (p. 1443).

Participants were instructed that they would be asked to make a series of category judgments. On each trial, a stimulus word was presented in the center of the screen and category labels presented in the upper left and right sides of the screen. Participants were instructed to use the *Q* key on the left side of the keyboard and the *P* key on the right side of the keyboard for their responses. They were told to keep their index fingers on the *Q* and *P* keys throughout the task and to respond as quickly and accurately as possible. They were also told that if they made an error they would see a red X and that the task would continue. Each of the IATs exhibited excellent reliability overall and within each group (anxiety/calmness IAT: overall $\alpha = .94$, SAD+Dep $\alpha = .94$, SAD $\alpha = .94$, HC $\alpha = .94$; acceptance/rejection IAT: overall $\alpha = .95$, SAD+Dep $\alpha = .96$, SAD $\alpha = .95$, HC $\alpha = .95$).

Procedure

Participants first provided written informed consent. Diagnostic status was determined with the ADIS-IV-L. Participants also completed a demographics questionnaire and the BDI-II at this appointment. After leaving the laboratory, participants were emailed a link to complete an online battery of self-report questionnaires, which included the social anxiety questionnaires reported in the current study. At a later appointment, participants completed the two versions of the IAT. Participants always completed the anxiety/calmness IAT prior to the acceptance/rejection IAT. The order of the tasks was kept consistent across participants for the same reason explained above regarding ordering of key assignments.

Results

Participant Characteristics

See Table 1 for descriptive statistics and omnibus tests comparing the three groups. Groups did not differ on age or sex; however, there were significant differences among the groups with regard to years of education completed and ethnicity (i.e., Caucasian versus non-Caucasian). Follow-up *t*-tests revealed the SAD+Dep group reported fewer years of education than the HC group, $t(81) = 2.60$, $p = .01$. The SAD group did not differ in years of education from either of the other two groups, p 's $> .06$. The omnibus chi-square test for ethnicity approached significance ($p = .06$), so we completed follow-up tests, which revealed a greater proportion of Caucasian than non-Caucasian individuals in the SAD+Dep group

than the HC group, $\chi^2 = 4.79, p = .04$. The SAD group did not differ on ethnicity compared with either the SAD+Dep group, $\chi^2 = 3.91, p = .07$, or the HC group, $\chi^2 = 0.29, p = .71$.

With regard to symptom measures, omnibus tests were all significant (see Table 1). In follow-up tests, the HC group reported significantly lower social anxiety and depression than both the SAD group [BFNE-S: $t(114) = 17.14, p < .001$, SIAS-S: $t(115) = 17.30, p < .001$; BDI-II: $t(122) = 7.22, p < .001$] and the SAD+Dep group [BFNE-S: $t(83) = 20.76, p < .001$; SIAS-S: $t(82) = 17.92, p < .001$; BDI-II: $t(87) = 11.11, p < .001$]. As expected, the SAD+Dep group endorsed greater depression than the SAD group [BDI-II: $t(127) = 4.57, p < .001$]; however, they did not differ in self-reported social anxiety [BFNE-S: $t(121) = 1.10, p = .27$; SIAS-S: $t(121) = 1.12, p = .26$].

IAT Data Scoring and Reduction

Response latencies from the IAT were scored according to the algorithm developed by Greenwald, Nosek, and Banaji (2003). Specifically, trials with response latencies greater than 10,000 ms were first deleted. Participants for whom more than 10% of trials had latencies less than 300 ms would then have been deleted, but there were no such individuals in the sample. Then, each error latency was replaced with an error penalty computed as the mean latency of correct responses for that block + 600 ms. These error penalty latencies were used from this point forward. Next, “inclusive” standard deviations for all trials in the critical blocks (i.e., blocks 3 and 5) were calculated. Then the mean latency for responses in each of the critical blocks was calculated. A *D* score for each IAT was calculated by subtracting the mean latency for self-anxiety and self-rejection associations from the mean latency for self-calmness and self-acceptance associations, respectively, and then dividing this difference by the appropriate inclusive standard deviation. This method of calculating a *D* score helps to account for overall response latency as well as improve the psychometric properties of the IAT (Lane, Banaji, Nosek, & Greenwald, 2007). Greater IAT scores indicate greater self-calmness or self-acceptance associations.

IAT Results

Within-group bivariate correlations between the two IATs and between each of the IATs and self-reports of social anxiety (SIAS-S) and depression (BDI-II) are shown in Table 2. The IAT scores correlated with each other within the SAD group and within the HC group, but not within the SAD+Dep group ($p = .06$). Only three correlations between IAT scores and self-report measures emerged as significant. In the SAD+Dep group, both IAT scores correlated with depression, with greater self-calmness and greater self-acceptance scores associated with lower depression. In the SAD group, greater self-calmness associations were associated with lower social anxiety.

See Figure 1 for mean IAT scores for each task by group. Because there was a significant difference among the groups for years of education and a near significant difference in ethnicity (i.e., Caucasian versus non-Caucasian), we first examined whether these demographic characteristics were related to implicit associations on either IAT, which would dictate whether they be included as covariates in the IAT data analyses. Bivariate correlations revealed that years of education was not significantly related to either anxiety/

calmness IAT scores, $r = .09$, $p = .24$, or acceptance/rejection IAT scores, $r = .11$, $p = .18$, nor was ethnicity related to either anxiety/calmness IAT scores, $r = -.03$, $p = .74$, or acceptance/rejection IAT scores, $r = .11$, $p = .16$. Therefore, analyses did not control for either years of education or ethnicity. Likewise, we did not control for self-reported social anxiety given that the two SAD groups did not differ on either social anxiety self-report measure.

A one-way analysis of variance (ANOVA) comparing the three groups on implicit self-calmness associations was significant, $F(2, 173) = 7.30$, $p < .01$, $\eta^2 = 0.08$. Follow-up t -tests revealed that the SAD+Dep group had the weakest self-calmness associations [compared to the HC group: $t(89) = 3.76$, $p < .001$, Cohen's $d = 0.80$; compared to the SAD group: $t(130) = 2.37$, $p = .02$, Cohen's $d = 0.44$]. The SAD group also exhibited weaker self-calmness associations than the HC group, $t(127) = 1.99$, $p < .05$, Cohen's $d = 0.36$.

Results for the acceptance/rejection IAT were similar but not identical. A one-way ANOVA comparing the three groups' implicit self-acceptance associations was significant, $F(2, 173) = 3.13$, $p < .05$, $\eta^2 = 0.04$. Levene's test for equality of variances was significant, so reported follow-up t -tests were based on the test that did not assume equal variances. Such t -tests revealed that the SAD+Dep group exhibited weaker self-acceptance associations than the HC group, $t(86.54) = 2.75$, $p < .01$, Cohen's $d = 0.59$, and the SAD group, $t(118.52) = 1.98$, $p = .05$, Cohen's $d = 0.35$. The SAD group and HC group did not differ on self-acceptance associations, $t(102.48) = 0.91$, $p = .36$, Cohen's $d = 0.17$.

Post Hoc Analyses

Given that approximately half of the SAD+Dep group comprised individuals with remitted depression ($n = 27$), we explored whether the above results differed if the SAD+Dep group was split into its two subgroups (i.e., SAD+Current Dep, SAD+Past Dep). A one-way ANOVA comparing the four groups' implicit self-calmness associations was significant, $F(3, 172) = 5.43$, $p < .01$, $\eta^2 = .09$. Follow-up t -tests were largely consistent with the previous analysis, in that both of the SAD+Dep groups exhibited weaker self-calmness associations than the HC group, $ps < .05$. In addition, the two SAD+Dep groups did not differ from one another, $t(45) = 1.19$, $p = .24$, Cohen's $d = 0.35$. However, whereas the SAD +Current Dep group continued to exhibit weaker self-calmness associations than the SAD group, $t(103) = 2.69$, $p < .01$, Cohen's $d = 0.53$, the SAD+Past Dep group did not differ from the SAD group, $t(110) = 1.23$, $p = .22$, Cohen's $d = 0.23$. This final comparison suggests the previously observed differences between the SAD and SAD+Dep groups in self-calmness associations may be driven by those with current depression.

With regard to the acceptance/rejection IAT, the omnibus ANOVA was again significant, $F(3, 172) = 3.70$, $p = .01$, $\eta^2 = .06$. Follow-up t -tests revealed significant divergences from previous analyses. Here, the SAD+Current Dep group exhibited weaker self-acceptance associations than the other three groups [compared to the SAD+Past Dep group: $t(45) = 2.76$, $p < .01$, Cohen's $d = 0.82$; compared to the SAD group, $t(103) = 2.69$, $p < .01$, Cohen's $d = 0.53$; compared to the HC group, $t(62) = 3.73$, $p < .01$, Cohen's $d = 0.95$]. In contrast, the SAD+Past Dep group did not differ from the SAD group, $t(110) = 0.30$, $p = .77$, Cohen's $d = 0.06$, or from the HC group, $t(69) = 1.10$, $p = .28$, Cohen's $d = 0.26$. Given that the two

SAD+Dep groups and the SAD group did not differ from one another on self-reported social anxiety as assessed with the SIAS-S, $ps > .30$, these results clearly suggest that current depression is driving the difference in self-acceptance associations observed previously.

Discussion

The current study was the first to examine implicit associations of the self in a clinical, treatment-seeking sample of individuals with generalized SAD with and without comorbid depression. In line with hypotheses, a diagnosis of SAD was associated with the strength of the anxiety-calmness IAT effect. Individuals with SAD exhibited weaker self-calmness associations than non-anxious, non-depressed healthy controls. In addition, those with SAD and comorbid depression showed the weakest self-calmness associations compared to both individuals with SAD without a history of depression and healthy controls. When we looked more specifically at the depression subgroups in *post hoc* analyses, both the SAD-past depression and SAD-current depression groups showed weaker self-calmness associations than the healthy controls. However, whereas the SAD-current depression group showed weaker self-calmness associations than the SAD-only group, the SAD-past depression group did not. On the self-rejection/acceptance IAT, the SAD-current depression group showed the weakest self-acceptance associations. However, in this analysis, self-acceptance associations did not differ among individuals with SAD and remitted depression, non-depressed individuals with SAD, and healthy controls. These findings suggest that current depression has a significant effect on both self-calmness and self-acceptance associations in socially anxious individuals. Notably, self-reported (explicit) level of social anxiety did not differ between the SAD-only and SAD-depression groups.

Our findings that individuals with SAD demonstrate weaker self-calmness associations than non-anxious controls replicate results from previous studies using non-clinical samples (e.g., Gamer et al., 2008; Glashouwer & de Jong, 2010). The lack of significant difference between the SAD group and healthy controls on the self-acceptance IAT was unexpected. This implicit association has been far less examined in relation to social anxiety than has the self-calmness association. Only two studies (Clerkin & Teachman, 2010; Teachman & Allen, 2007) have utilized the self-acceptance IAT, but the nature of these specific studies make predictions based upon them somewhat difficult. Teachman and Allen examined implicit self-acceptance associations among adolescents (ages 13–18) as part of a larger longitudinal investigation of adolescent social development in familial and peer contexts (Allen, Porter, & McFarland, 2006), whereas Clerkin and Teachman focused on the utility of training implicit associations in socially anxious college students. Although the implicit self-acceptance associations of the socially anxious participants improved with training, the authors did not examine the implicit self-acceptance associations of socially anxious participants versus healthy controls. Because fear of negative evaluation and rejection are highly related to SAD (American Psychiatric Association, 2013; Harb et al., 2002), we expected to see this difference, which did not appear. It is also of interest that recent research (Mallott, Maner, DeWall, & Schmidt, 2009; Maner, DeWall, Baumeister, & Schaller, 2007) has demonstrated that non-anxious persons react to social rejection with an increase in prosocial behavior and the desire to affiliate with others whereas those with high levels of social anxiety do not show this pattern of response but rather are characterized by

social withdrawal in the face of social exclusion. Further research on the implicit self-acceptance associations of persons with SAD appears warranted.

The Impact of Comorbid Depression

In our primary analyses, the SAD-depression group showed the weakest self-calmness associations compared to non-depressed SAD individuals and healthy controls. However, *post hoc* analyses revealed that the difference between the SAD-depression and SAD-only groups was driven by those with current depression; those with remitted depression were no different from socially anxious persons without a history of depression.

With regard to rejection/acceptance implicit associations, the impact of current comorbid depressive was robust. Surprisingly, the SAD-only, SAD-past depression, and healthy control groups did not differ on self-acceptance associations. The SAD-current depression group had the weakest self-acceptance associations, weaker than any of the other groups. That comorbid depression should have an effect here follows from the literature on rejection sensitivity as a risk factor for depression (Ayduk et al., 2001; Boyce & Parker, 1989; Downey & Feldman, 1996), although it is unclear why only those with current depression exhibited a difference from the SAD-only group. It is possible that current depression may be more closely linked with the expectation of negative outcomes, or at least greater certainty about such outcomes, than social anxiety with or without past depression, and that this was reflected in our findings.

More than two decades ago, Alloy, Kelly, Mineka, and Clements (1990) proposed a cognitive explanation for when and why anxiety and depression co-occur. They theorized that differing degrees of certainty about one's ability to control important outcomes (i.e., helplessness) and negative-outcome expectancies (i.e., hopelessness) resulted in a pure anxiety, mixed anxiety-depression, or pure depression presentation. They argued that those who experience anxiety are uncertain of their helplessness. Those who are certain of their helplessness *and* of negative outcomes primarily experience depression. Those in a mixed depression-anxiety state were theorized to be more certain of their helplessness but uncertain about negative outcomes. If we apply this helpless-hopelessness theory to explain the self-acceptance IAT results, it could be argued that those with comorbid depression held more negative outcome expectancies and were therefore more likely to expect rejection. Non-depressed individuals with SAD, in contrast, may have had relatively weaker negative outcome expectancies.

Social anxiety-relevant implicit associations may be more negative and/or stable among socially anxious individuals when depression is present. Like the attentional bias research reviewed earlier (Grant & Beck, 2006; LeMoult & Joormann, 2012; Musa et al., 2003), this suggests that the presence of depressive symptoms may modify maladaptive cognitive processes in those with social anxiety. Similar to the arguments of Mathews and MacLeod (2005) presented in the introduction, Musa and colleagues (2003) noted that their findings of nullified attention bias to threat at relatively brief exposure durations suggests that anxiety and depression are associated with biases at different stages of information processing—preattentive and selective attention processes are affected in anxiety, and effortful, controlled processes are more likely to be disrupted in depression. In the IAT, although the

processes under study are implicit in nature and thereby outside of conscious awareness, stimuli are presented at durations sufficient for more elaborative processing. As such, our findings that individuals with SAD with current comorbid depression exhibited less positive implicit associations than individuals with SAD with no depression, who themselves exhibited less positive implicit associations than healthy controls (at least in the case of self-calmness associations), appear to converge with this theory. Further, our results suggest that SAD with current comorbid depression may represent a more severe instantiation of social anxiety despite the fact that this was not reflected in our study on explicit self-report measures of social anxiety, nor has it been consistently apparent in the studies on attentional bias.

At present, it is unclear why those with SAD and remitted depressed performed similarly to socially anxious individuals without a history of depression, but not to those with current depression, on both IAT tasks. Research on information processing biases comparing currently to formerly depressed individuals is, to our knowledge, scant. A handful of studies suggest that currently and formerly depressed individuals exhibit similar attention biases (Fritzsche et al., 2010; Gupta & Kar, 2012; Joormann & Gotlib, 2007) and memory biases towards sad stimuli (Fritzsche et al., 2010; Gupta & Kar, 2012). However, in the one study that has examined implicit associations found that on a self-esteem IAT, those with remitted depression exhibited higher implicit self-esteem than those with current depression and those without a history of depression (Franck, De Raedt, & De Houwer, 2008). More research is needed to investigate whether implicit biases associated with depression are better characterized as a state marker of a depressive episode, or a trait-like characteristic of people at risk for depression.

Limitations and Future Directions

It should be noted that there are limitations in using the IAT as a paradigm for examining implicit associations. As mentioned earlier, the IAT was designed to measure relative association strengths and was not meant to measure the difference in evaluative associations with a single target concept (e.g., acceptance versus rejection associations with the self). Karpinski (2004) points out that while some target concepts have obvious and meaningful complementary pairs (e.g., young-old), others do not (e.g., Santa Claus). He contends that in many instances, the *unspecified other* is not a meaningful complement to the *self* target concept for the research hypothesis being tested. Pinter and Greenwald (2005) counter by arguing that the *other* has been found to have a neutral valence. However, given that the *other* may be perceived by socially anxious individuals as a threatening stimulus, we would likely benefit from examining implicit self associations that are not tied to an *other* when studying SAD.

As an alternative method, Karpinski and Steinman (2006) developed a Single Category IAT (SC-IAT) that eliminates the need for a second contrast category. Preliminary examinations of the SC-IAT suggest it shows acceptable reliability and validity (Karpinski & Steinman, 2006). Therefore, a potential next step would be for future studies of social anxiety and implicit associations to compare the SC-IAT to traditional IAT measures.

In addition to limitations of the IAT, there were also some methodological limitations to the current study. For one, *other* stimuli, chosen to be consistent with previous studies, included the words “you” and “your.” Respondents may have potentially confused these words as belonging to the *self* category, thus adding noise to the IAT results. Also, the order of administration of the IATs used in the study was not counterbalanced, and the acceptance-rejection IAT always followed the anxiety-calmness IAT. Practice effects may have weakened the acceptance-rejection IAT effect.

In summary, the present results underscore the utility of examining implicit cognitions in our attempts to better understand and treat SAD, alone and when it is comorbid with current depression. The self-calmness and self-acceptance IATs differentiated among groups, but the specific patterns of results differed. Differences between the SAD-only and SAD-current depression groups could reflect differences in specific schema or provide an implicit index of severity of social anxiety that might complement typically employed explicit measures. Future research should look further into the malleability of maladaptive implicit associations and examine the relationship between these associations and behavior. Clerkin and Teachman (2010) demonstrated that self-acceptance associations among socially anxious college students could be strengthened by training and that trained participants were more likely to complete an impromptu speech than untrained participants. Replicating these findings in a clinical sample of persons with SAD could have important implications for treatment. One interesting avenue to pursue would be to investigate whether the addition of implicit association training to more commonly applied cognitive behavioral treatments would be most beneficial for persons with SAD and comorbid depression.

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Highlights

- We examined the implicit associations of patients with SAD with/without depression
- Self-calmness associations were weaker in nondepressed SAD patients than controls
- Self-calmness associations were weakest in SAD patients with depression
- Self-rejection associations did not differ in nondepressed SAD patients/controls
- Self-rejection associations were weakest in SAD patients with depression
- Differences in implicit associations were best accounted for by patients with current depression
- SAD patients with/without depression did not differ on self-reported social anxiety

Figure 1.

Scores on two Implicit Association Tests (IATs) for individuals with social anxiety disorder (SAD), social anxiety disorder and a current and/or past diagnosis of depression (SAD +Dep), and healthy controls (error bars are standard errors).

Table 1

Demographic Information and Self-Report Measures by Diagnostic Group

Variable	SAD	SAD+Dep	Healthy Controls	Test Statistic
% female	52.9	40.4	54.5	$\chi^2 = 2.4$
% Caucasian	45.9	63.8	40.9	$\chi^2 = 5.6$
Age (<i>SD</i>)	33.8(9.1)	32.7(7.5)	33.5(9.8)	$F = 0.2$
Years education (<i>SD</i>)	16.9(2.1)	16.2(2.1)	17.3(2.0)	$F = 3.4^*$
BFNE-S (<i>SD</i>)	31.5(5.6)	32.5(3.8)	13.6(4.6)	$F = 204.1^{**}$
SIAS-S (<i>SD</i>)	46.5(9.8)	48.6(9.4)	16.4(6.5)	$F = 173.9^{**}$
BDI-II (<i>SD</i>)	11.4(9.0)	19.4(10.4)	1.2(1.8)	$F = 52.4^{**}$

Note. SAD – Social anxiety disorder; SAD+Dep – SAD with current or past depression; % Caucasian – proportion of individuals who self-identified as Caucasian versus non-Caucasian; BFNE-S – Brief Fear of Negative Evaluation Scale, straightforward item total; SIAS-S – Social Interaction Anxiety Scale, straightforward item total; BDI-II – Beck Depression Inventory - II.

*
 $p < .05$;

**
 $p < .001$

Table 2

Bivariate Correlations of the IATs by Diagnostic Group

	Anxiety/Calmness Implicit Association Test	Acceptance/Rejection Implicit Association Test
Social Anxiety Disorder (SAD)		
A/R IAT	.44***	
SIAS-S	-.25*	-.15
BDI-II	.20	-.07
Social Anxiety Disorder + Depression (SAD+DEP)		
A/R IAT	.28	
SIAS-S	-.02	-.23
BDI-II	-.45**	-.35*
Healthy Control (HC)		
A/R IAT	.66***	
SIAS-S	-.04	-.20
BDI-II	-.19	-.26

Note. SIAS-S –Social Interaction Anxiety Scale, straightforward item total; BDI-II – Beck Depression Inventory - II. Because of the use of listwise deletion, the sample sizes differ from those reported for the primary analyses (SAD = 69, SAD+Dep = 44, HC = 32).

*
 $p < .05$;

**
 $p < .01$;

 $p < .001$