Is Social Anxiety Related to an Attentional Bias to Suicide?

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IS SOCIAL ANXIETY RELATED TO AN ATTENTIONAL BIAS TO SUICIDE?

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Arts

in

The Department of Psychology

by

Austin Warner Lemke
B.S., Texas Christian University, 2015
May 2018
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ABSTRACT

Suicide is the cause of death of over 800,000 people worldwide each year and is one of the leading causes of death in the U.S. Individuals with elevated social anxiety appear to be at a particularly high risk for suicide. Attentional bias is a maintaining factor in a broad range of psychological conditions including social anxiety, and an attentional bias toward suicide-related cues is related to both past and future suicide attempts. However, little research has been done on attentional biases toward suicide-related cues, and no known research has examined whether individuals with elevated social anxiety have a bias toward suicide-related cues. Thus, the present study examined the relationship between social anxiety and attentional bias toward suicide-related words. Further, given social anxiety’s relation to the suicide risk factors Thwarted Belongingness (TB) and Perceived Burdensomeness (PB), the present study examined the relationship of social anxiety to attentional biases toward TB- and PB-related words. Among 153 (71.9% female) university students, social anxiety was not related to an attentional bias toward suicide words, TB words, or PB words. Bias to suicide cues and PB cues were related to current (past two-week) suicidal ideation. Importantly, attentional bias toward suicide moderated the relationship of social anxiety with current suicidal ideation. Implications and future directions are discussed.
INTRODUCTION

Overview of Suicide

Over 800,000 people die by suicide worldwide each year, leading the World Health Organization to declare reducing suicide-related mortality a global imperative (World Health Organization, 2014). In the United States 35,000 deaths by suicide per year qualifies suicide as the United States’ 10th leading cause of death, and second leading cause among adults aged 18-24 (Center for Disease Control, 2016b). Suicide's costs to society are estimated to be between $44.6 billion (Center for Disease Control, 2014) and $58.4 billion (Shepard, Gurewich, Lwin, Reed, & Silverman, 2016) per year. Further, the suicide rate in the United States has increased 24% since 1999 (Curtin, Warner, & Hedegaard, 2016), and is projected to continue to rise (Mathers & Loncar, 2006). For every person that dies by suicide, many others attempt suicide or consider it. In 2014, nearly half a million people received medical care for self-inflicted injuries, nearly one million people reported a suicide attempt, and 9.4 million adults reported thoughts of suicide, or suicidal ideation (SI; Center for Disease Control, 2016a). Each year, 2-10% of adults in the U.S. experience SI (Nock et al., 2008).

Theories of Suicide

Given the drastic global scale of suicide, numerous theories have attempted to understand the etiological and maintaining mechanisms. Hopelessness theory (Abramson et al., 1998), an extension of the hopelessness theory of depression (Abramson, Alloy, & Metalsky, 1990), asserts that people consider suicide as a solution when they assume that their current problems are caused by global and universal factors and thus will never change. According to the escape theory (Baumeister, 1990), suicide is an escape from aversive self-awareness and negative affect. According to Beck’s cognitive theory of suicide (Wenzel & Beck, 2008), SI occurs when suicide
schemas combine with hopelessness and selective attention toward suicide-relevant cues, and suicide attempts occur after a threshold of tolerance is reached.

The Interpersonal Theory of Suicide (IPTS; Joiner, 2005; Van Orden et al., 2010) presents a model concerning factors that lead to SI and subsequent suicidal behavior. The IPTS posits that SI is caused by the simultaneous presence of thwarted belongingness (TB; i.e., a sense of isolation) and perceived burdensomeness (PB; i.e., feeling like a burden to loved ones), particularly when a feeling of hopelessness concerning these factors is present. When SI is present, a lethal or near-lethal suicide attempt occurs in the presence of acquired capability for suicide (i.e., the ability to overcome one’s own inherent drive for self-preservation). There is substantial support for the IPTS model of suicidality (for a review, see Hill & Pettit, 2014; Ribeiro & Joiner, 2009). Although a recent systematic review found that associations between IPTS factors, particularly TB and SI, are not consistently found to be significant (Ma, Batterham, Calear, & Han, 2016), analyses concerning SI included measures of suicidal behaviors, inhibiting the fit of its assumptions within the IPTS model for two reasons: (1) the IPTS model asserts that TB and PB are related to SI, not suicidal behaviors and (2) the model asserts that SI will occur in the presence of both TB and PB, so testing relationships of only TB or only PB to SI, as opposed to testing both together, do not test the IPTS model.

Anxiety and Suicide

Anxiety is a widely-purported risk factor for suicidality. According to Beck’s cognitive model of suicide (Wenzel & Beck, 2008), anxiety contributes to attentional fixation on suicide thoughts, which leads to suicidal behavior. Indeed, anxiety and/or agitation is characteristic of those who complete a suicide attempt during inpatient treatment (Busch, Clark, Fawcett, & Kravitz, 1993; Busch, Fawcett, & Jacobs, 2003; Sharma, Persad, & Kueneman, 1998). Suicide
prevention organizations (e.g., American Association of Suicidology, 2016; American Foundation for Suicide Prevention, 2016; National Suicide Prevention Hotline, 2016; Veterans Crisis Line, 2016) and a large corpus of research (for a review, see Bentley et al., 2016) also support anxiety as being related to suicidality. Specifically, a large body of research asserts that social anxiety is related to suicidality (Boden, Fergusson, & Horwood, 2007; Bolton et al., 2008; Borges, Angst, Nock, Ruscio, & Kessler, 2008; Nepon, Belik, Bolton, & Sareen, 2010; Nock, Hwang, Sampson, & Kessler, 2010; Sareen et al., 2005; Thibodeau, Welch, Sareen, & Asmundson, 2013). Social anxiety disorder (SAD), defined as “a marked or intense fear of social situations in which the individual may be scrutinized or evaluated by others” (American Psychiatric Association, 2013), is associated with SI and suicide attempts even after controlling for sociodemographic factors, depression and other psychopathology, and life stress (Boden et al., 2007), as well as other anxiety disorders (Sareen et al., 2005). It is also predictive of subsequent SI (Nock et al., 2010) and suicide attempts (Nock et al., 2009). Importantly, even subclinically elevated social anxiety is related to greater suicidality (Buckner, Joiner, Schmidt, & Zvolensky, 2012).

Despite the relation between social anxiety and suicidality, little research has examined what factors are related to greater suicidality among those with elevated social anxiety. Comorbid disorders, particularly depression, also increase suicide risk in those with elevated social anxiety (Dalrymple & Zimmerman, 2007; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). Yet, little attention has been paid to malleable psychosocial factors that may play a role. In fact, the only known studies that have striven to understand the social anxiety-suicide link have tested IPTS components and related constructions. Loneliness, but not a perceived lack of social support, mediated the relationship between social anxiety and SI
Specific tests of the relation of social anxiety to IPTS factors have produced mixed results – social anxiety is consistently associated with TB, but its relation to PB is less constant. A DSM-IV diagnosis of social phobia was related to and uniquely predictive of TB (but not PB) after controlling for age and sex (Silva, Ribeiro, & Joiner, 2015). Most studies have examined social anxiety continuously. Davidson et al. (2011) found social anxiety to be related to both TB and PB, but after controlling for depression it was only related to TB. Chu and colleagues (2016) also found social anxiety to be related to TB, but did they not test whether it was related to PB. Further, they found that TB mediated the relation between social anxiety and SI, whereas Davidson (2011) found no meditational effect. In fact, the latter study did not find TB to be associated with greater SI. Both Arditte et al. (2016) and Buckner et al. (2017) found that social anxiety was related to TB and PB, and that TB and PB mediated the relationship between social anxiety and SI. Further, Buckner et al. tested the IPTS moderated mediation model, finding that social anxiety was related to greater social anxiety indirectly through perceived burdensomeness only at higher levels of thwarted belongingness. Given that Buckner et al. conducted the truest test of the IPTS model by testing whether the presence of both TB and PB mediated the social anxiety-SI relation, this finding suggests that these factors may play an important role in this relation.

**Attentional Bias**

Attentional bias, a tendency to engage more readily to and disengage more readily from certain stimuli, has been linked to various forms of psychopathology including social anxiety (Amir, Freshman, & Foa, 2002) and suicidality (Becker, Strohbach, & Rinck, 1999; Cha, Najmi, Park, Finn, & Nock, 2010; Williams & Broadbent, 1986). According to cognitive models of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997), attentional processes,
particularly attentional bias, plays a large role in the etiology and maintenance of the social anxiety. For example, if an individual with elevated social anxiety is interacting with a strangers who both smile and frown, then he or she will attend more strongly to the frown than the smile (Veljaca & Rapee, 1998). Individuals with elevated social anxiety are more likely than non-anxious persons to attend to negative social cues (Gilboa-Schechtman, Foa, & Amir, 1999; Heeren, Reese, McNally, & Philippot, 2012; MacLeod, Mathews, & Tata, 1986; Mogg, Philippot, & Bradley, 2004; Pishyar, Harris, & Menzies, 2004; Veljaca & Rapee, 1998). They also display more difficulty in disengaging from threatening social cues (Buckner, Maner, & Schmidt, 2010; Schofield, Johnson, Inhoff, & Coles, 2012). Attentional bias has been shown to be malleable, as studies have trained socially anxious individuals to disengage from threatening cues; further, this lessening in attentional bias was accompanied by lower social anxiety (Amir, Weber, Beard, Bomyea, & Taylor, 2008; Heeren et al., 2012; Schmidt, Richey, Buckner, & Timpano, 2009).

Attentional biases have also been found to be related to suicidality. Specifically, Williams and Broadbent (1986) used a modified version of the Stroop task (Stroop, 1935) to compare color identification times among suicide attempters, non-suicidal hospital patient controls, and healthy controls in response to neutral, negative emotional, or suicide-related words. They found that all groups took more time to name suicide-related and negative emotional words compared to neutral words. Those who had attempted suicide, however, had larger identification time discrepancies between suicide-related and neutral words than hospital controls or healthy controls, with those who had attempted suicide taking longer to identify suicide-related words. Becker and colleagues (1999) also used a modified Stroop task to compare individuals with a past suicide attempt to healthy controls, finding that the suicide attempt group took significantly
longer to name the colors of suicide words (e.g., darkness, redemption, cry for help, hang, end, coldness, quietness, repose, blade, hurt feeling, rage, grave) compared to neutral, positively valenced, or negatively valenced words; the control group showed no difference between word groups. SI was significantly correlated to the attentional bias for suicide words, whereas anxiety, depression, and hopelessness were not. Among university students, there was no overall significant difference in attentional bias to suicide-related words (i.e., suicide, death, funeral) between those with and without a past suicide attempt (Chung & Jeglic, 2016). However, past attempters did show a bias to the word “suicide” compared to non-attempters, and an attentional bias to suicide-related words was found among female attempters compared to female non-attempters. Further, among women, SI was related to attentional bias to suicide-related words regardless of attempt history.

Richard-Devantoy et al. (2016) conducted a cross-sectional study comparing suicide attempters to non-attempters with a mood disorder, as well as a meta-analysis of all known studies of attentional bias towards suicide-related words. The cross-sectional analyses did not support an attentional bias towards any type of word, including suicide-related words, among past attempters versus non-attempters; however, the meta-analysis found a small (Hedges’ g = .22) but significant attentional bias toward suicide-related words, but not negative or neutral words, among attempters versus non-attempters. This suggests that individuals more prone to suicide (i.e., those with a history of suicidal behaviors) display an attentional bias not to negatively valenced words more broadly, but to specifically words related to suicide.

Importantly, among psychiatric inpatients, an attention bias for suicide-related cues using a computerized Stroop task was predictive of a suicide attempt by 6-month follow-up even after controlling for history of a mood disorder, history of multiple suicide attempts, severity of
suicidal thoughts, and both patient and clinician-rated prediction of a future suicide attempt (2010). This finding suggests that attentional bias to suicide-related words may be a risk factor for suicide attempt and thus could be an important factor to address in treatment and prevention efforts.

In sum, those with a history of suicide attempt appear to have an attention bias for suicide-related words. Further, attentional bias for suicide-related words is prospectively related to future suicide attempts. However, there remain several limitations to our understanding of the role of attentional bias and suicidality. First, no known study has examined whether social anxiety is related to attentional bias to suicide-related words. Second, no known studies have tested whether social anxiety is related to an attentional bias toward IPTS words. Third, no known studies have tested whether suicidality moderates the relation of social anxiety with suicide- or IPTS-related words. Given that attentional bias is found in both social anxiety (e.g., Amir et al., 2002) and suicidality (e.g., Cha et al., 2010), and that suicide rates are elevated among individuals with elevated social anxiety (Nock et al., 2010), it is possible that those with elevated social anxiety, particularly those with SI, might also display an attentional bias to these words.

**Measures of Attentional Bias**

All known research on attentional bias and suicidality has utilized a Stroop task, most recently a modified Emotional Stroop Task (EST; Cha et al., 2010), in which participants are asked to press a button with a color that corresponds to the color of differently-valenced words. Attentional bias is operationalized as difference in time that it takes to respond to different words (i.e., the difference in time that it takes to identify the color of a suicide word versus negative, positive, and neutral words). However, it has been argued that Stroop tasks may not reflect true
attentional bias, as it does not allow for facilitated attention or difficulty in disengagement (Cisler, Bacon, & Williams, 2009). Further, Stroop tasks may also measure information processing that is independent of attentional bias (Waters, Sayette, & Wertz, 2003), and the interference effect in an emotional Stroop task may be the effect of effortful avoidance rather than capture of attention (De Ruiter & Brosschot, 1994). Therefore, the dot-probe task (MacLeod et al., 1986) may be a more sensitive measure of attentional bias. Despite not being used in previous studies regarding suicidality, it has been successfully used to measure attentional biases in those with social anxiety (Amir, Elias, Klumpp, & Przeworski, 2003; Asmundson & Stein, 1994; Mogg & Bradley, 2002; Stevens, Rist, & Gerlach, 2009). There is evidence that dot probe studies using reaction time to measure attentional bias toward threat identify bias less reliably than studies using eye-tracking software (Price et al., 2015), but studies using a dot probe paradigm have been used to identify attentional bias toward threat in anxious individuals with similar effectiveness compared to the emotional Stroop task and more successfully than emotional spatial cuing (for a review, see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007). Despite the body of research concerning use of a dot probe task to measure attentional bias toward threat, no known studies have used the dot probe task to measure attentional bias toward suicide-related words. Further, past suicide attempters display neurocognitive deficits including deficits in information processing, and they perform more poorly on a non-emotional (color word) Stroop task than non-attempters (Keilp et al., 2014). Given that past suicidality is related to poorer performance on neurological facets measured by the Stroop task (e.g., information processing), a dot-probe task may measure attentional bias to suicide-related words more accurately than Stroop tasks.
The Current Study

The present study set out to fill several important gaps in the literature on social anxiety and SI. The primary aim of the study was to determine whether social anxiety was associated with a greater attentional bias to suicide-related words. It was hypothesized that higher social anxiety would be positively associated with greater attentional bias to suicide-related words compared to neutral words and negative non-emotional words.

The study had several secondary aims. The current study aimed to determine whether social anxiety was associated with a greater attentional bias to words related to IPTS interpersonal factors. It was hypothesized that individuals with greater social anxiety would show a greater attentional bias to both TB and PB words compared to neutral and negative words. Given that this was the first known study to test attentional bias to IPTS-related words, the third aim of the current study was to test whether current SI was related to greater attention to TB and PB words. Fourth, we tested whether the relationship between social anxiety and attentional bias to suicide-related words was moderated by current SI. It was hypothesized that at higher levels of SI, greater social anxiety would be positively associated with greater bias to suicide words. Fifth, we tested whether the relationship between social anxiety and attention to IPTS words was moderated by current SI. It was hypothesized that at higher levels of SI, greater social anxiety would be positively associated with greater bias to IPTS words. Social anxiety was be assessed as a continuous variable because social anxiety exists on a continuum (Crome, Baillie, Slade, & Ruscio, 2010). Depression was included as a covariate given this strong correlation between depression and SI (Nock et al., 2010).
METHOD

A Priori Power Analysis and Sample Size.

Previous studies investigating the effect of suicide attempts on attentional bias to suicide words have reported a small effect (Hedge's g = .22; Richard-Devantoy et al., 2016). Thus, G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) was used to determine the sample size needed to detect a small effect with power of .80 (Cohen, 1988) and an alpha level of .05 for a linear regression with one tested predictor and three total predictors to test the hypothesis that the interaction of social anxiety and current SI would be related to an attentional bias to suicide-related words. This hypothesis was chosen for the power analysis because it required the most power. Thus, the sample necessary to achieve .80 power and to detect a small effect for the study’s primary hypotheses was 74 participants. To ensure that at least half of the sample required for sufficient power (37 participants) endorse past-year suicidality (SI and/or behavior), additional steps were taken. Given that previous data collected in our laboratory (Buckner et al., 2017) suggest that 27.8% of LSU students have experienced past-year suicidality, recruitment of 133 students was expected to be necessary to include the desired number of participants with past-year suicidality. As less than 37 participants endorsed past-year suicidality after recruitment of 133 students, additional participants were recruited until 160 participants, 33 of whom endorsed past-year suicidality, were recruited.

Sample and Procedures.

The sample was composed of undergraduate students recruited through psychology classes for research participation credit at Louisiana State University (LSU). Inclusion criteria for the current study included being an undergraduate student at LSU enrolled in an undergraduate Psychology course and being at least 18 years of age. Exclusion criteria
included not being fluent in English, having uncorrected vision problems, and endorsement of three or more items on the Infrequency Scale (IS; Chapman & Chapman, 1983). No participants were excluded due to any of the above criteria. Although 160 participants completed the study, six were excluded because their number of correct responses on the dot probe task was two standard deviations below the mean number of correct responses of all participants, and one additional participant was excluded for having an average response time over two standard deviations from the mean of all participants (see Stimuli section). This method of exclusion of outliers was consistent with previous research on attentional bias to suicide cues (Cha et al., 2010; Chung & Jeglic, 2016). The final sample consisted of 153 (79.1% female) students. The mean age of participants was 19.45 (SD = 1.95, ranged from 18 to 32). The racial/ethnic composition was 15.7% non-Hispanic African American or Black, 10.5% Asian, 2.6% multiracial, 64.7% non-Hispanic Caucasian, 5.2% Hispanic Caucasian, and 1.3% “other.”

Participants signed up for a lab appointment using the LSU psychology department’s online survey sign-up system. On the day of their laboratory appointment, participants provided informed consent then completed study self-report measures via qualtrics.com, a secure, online data-collection site. Next, participants completed a dot-probe task. Upon completion of the study, all participants received referral information for psychological resources (e.g., Student Mental Health, LSU Psychological Services Center, National Suicide Hotline) and research participation credit. A certificate of confidentiality was obtained from the National Institute of Health to ensure confidentiality.
Measures

Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998). The SIAS is a 20-item self-report questionnaire used to assess social interaction fears. Participants rate items (e.g., “I have difficulty making eye contact with others”) on a 0 (not at all) to 4 (extremely) scale. The SIAS has shown good internal consistency, discriminant validity, and construct validity (Mattick & Clarke, 1998). The SIAS showed good consistency in the current sample (α = .86).

The Inventory of Depression and Anxiety Symptoms (IDAS; Watson et al., 2007). The question, “I had thoughts of suicide,” from the depression subscale of the IDAS was used to assess SI in the past two weeks, and study analyses used this variable as the measure of SI. This item is rated on a 1 (not at all) to 5 (extremely) scale. Additionally, the dysphoria subscale of the IDAS was used to measure depression given that it does not contain the item used to assess suicide and has shown good internal consistency, discriminant validity, and construct validity (Watson et al., 2007). The IDAS showed good internal consistency in the current sample (α = .92), as did the dysphoria subscale (α = .87).

The Suicide Behaviors Questionnaire – Revised (SBQ-R; Osman et al., 2001). The SBQ-R is a 4-item self-report questionnaire used to assess suicide risk. Additionally, a modified version of the first SBQ-R item (“Have you thought about or attempted to kill yourself in the last year?”) was used to assess past-year suicidality. History of suicidality was assessed along with past two-week suicidal ideation to monitor the number of participants who reported some degree of past-year suicidality. The SBQR has shown good internal consistency, discriminant validity, and construct validity (Osman et al., 2001). The SBQ-R with the added question showed good internal consistency in the current sample (α = .86).
The Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, Witte, & Joiner, 2012). The INQ contains 15 items, with six assessing PB (e.g., “These days the people in my life would be better off if I were gone”) and nine assessing TB (e.g., “These days, I feel disconnected from other people”) scored from 1 (not at all true for me) to 7 (very true for me). Internal consistency, discriminant validity, and construct validity for the perceived burdensomeness and thwarted belongingness subscales have been shown to be good (Van Orden et al., 2012). This scale was used to test whether the TB and PB words correlate with these measures of TB and PB. In the current sample, both the PB subscale (α = .91) and TB subscale (α = .84) showed adequate internal consistency.

Infrequency Scale (IS; Chapman & Chapman, 1983). Four questions from the IS (e.g., “I find that I often walk with a limp, which is the result of a skydiving accident”) was included to identify individuals who provide random or invalid responses. Participants responded on a five-point scale ranging 0 (strongly agree), 1 (somewhat agree), 2 (neither agree or disagree), 4 (somewhat disagree), to 5 (strongly disagree). Responses in the opposite of the expected direction (i.e., responding “disagree” or “strongly disagree” when the expected response would be “agree” or “strongly agree”) was considered endorsement of the item. As in prior online studies (e.g., Cohen, Iglesias, & Minor, 2009), individuals who endorsed three or more infrequency items would have been excluded from the study. No participants were excluded due to responses on this measure.

Stimuli

Consistent with previous research (Chung & Jeglic, 2016), neutral words (museum, paper, engine) and suicide-related words (funeral, suicide, dead) were used. TB words (lonely, outsider, rejected) and PB words (burden, self-blame, unwanted) were derived from dimensions
of TB and PB as described in the IPTS model (Van Orden et al., 2010). Negative words were included to test whether social anxiety was related specifically to suicide-related words and IPTS words or simply to negative words in general. Negative words used in the current study (poverty, infection, cancer) differed from those used in previous research (stupid, alone, rejected; Cha et al., 2010; Chung & Jeglic, 2016; Richard-Devantoy et al., 2016) to prevent overlap with IPTS words. According to the Affective Norms for English Words (ANEW; Bradley & Lang, 1999), the negative words show similar affective valence (1.61) to the suicide words (1.52) and available TB words (lonely, rejected; 1.84). Affective ratings were not available for PB words, so a pilot study was conducted with five undergraduate students who rated PB words on the ANEW rating scale. Mean ratings for PB words were as follows: burden = 3.6, self-blame = 3.2, unwanted = 3. Paired samples t-tests were conducted to measure whether the overall mean of all three PB words ($M = 3.47$, $SD = 1.07$) was significantly different from ratings of neutral words, ($M = 5.93$, $SD = 1.85$), negative words, ($M = 3.00$, $SD = .88$), suicide words ($M = 2.47$, $SD = .51$), and TB words ($M = 3.13$, $SD = 1.28$). Affective ratings for PB words were significantly lower than neutral words, $t(4) = -6.59$, $p = .003$, $d = 2.95$, but were not significantly different compared to negative words $t(4) = 1.30$, $p = .263$, $d = .59$, suicide words, $t(4) = 1.56$, $p = .194$, $d = .70$, or TB words $t(4) = 1.41$, $p = .230$, $d = .62$. Consistent with previous research on both suicide word bias (Richard-Devantoy et al., 2016) and on anxiety-related attentional bias (Hirsch et al., 2011; Pishyar et al., 2004), bias indices were created for each participant by subtracting each participant’s average response time to suicide/IPTS word-congruent probes (i.e., when the probe replaced the suicide, TB, or PB word) from average response time to suicide/IPTS word-incongruent probes (i.e., when the probe replaced the negative or neutral word) using the following formula: bias index = mean RT to incongruent trials – mean RT to congruent trials. A
greater positive bias index score reflects a greater attention bias toward the suicide/IPTS construct measured, while a negative score reflects avoidance of the suicide/IPTS word, and a score of zero reflects no bias. For example, the TB/neutral bias index was calculated using trials in which a TB word and a neutral word were simultaneously shown on the screen by subtracting congruent trials (i.e., trials in which the probe replaced the TB word) from incongruent trials (i.e., trials in which the probe replaced the neutral word). A higher score on the TB/neutral bias index reflects an attentional bias toward the TB words relative to the neutral words.

Individual-item outliers were defined as a reaction time of <150 ms or >2000 ms, consistent with previous research (Schneier et al., 2016). These outliers were excluded by trimming incorrect responses and individual outlier responses. Additionally, participants with average response times two standard deviations from the mean of all participants or with error rates two standard deviations above the mean of all participants were excluded from all analyses as outliers, consistent with extant literature on attentional bias to suicide words (Cha et al., 2010). No participant that was excluded as an outlier endorsed any history of SI.

Task

Attentional bias was assessed using a dot-probe task (MacLeod et al., 1986), which has been used in previous studies of attentional bias in social anxiety (Evans, Walukevich, & Britton, 2016; Schneier et al., 2016). Each trial began with a 500 ms fixation cross presented in the middle of the screen to focus the participant’s visual attention. Next, a pair of words appeared above and below the center of the screen for 500 ms. Each pair included one suicide, TB, or PB word and one negative or neutral word (see Table 1 for a list of all possible word combinations). The positions of the words were counterbalanced such that each group of words appeared at the top and bottom positions an equal number of times. After removing the words, a probe (an arrow
head pointing “<” or “>”) randomly replaced one of the two locations previously occupied by a word and remained until participants pressed a key to respond. Participants were instructed to indicate the location of the probe by pressing a button as quickly and accurately as possible. Of note, although some newer dot-probe tasks indicate direction in which the probe is facing (e.g., Schneier et al., 2016), effects can be expected using the original version, used in the current study, in which the location (upper or lower) of the probe is indicated (Mogg, Bradley, & Williams, 1995). Response time and accuracy were measured for each trial. Each participant completed 108 total trials, such that each combination of word types was shown 12 times while counterbalancing position on the screen.

Table 1. List of word combinations.

<table>
<thead>
<tr>
<th>Funeral Museum</th>
<th>Funeral Paper</th>
<th>Funeral Engine</th>
<th>Funeral Poverty</th>
<th>Funeral Infection</th>
<th>Funeral Cancer</th>
</tr>
</thead>
<tbody>
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<td>Dead Museum</td>
<td>Dead Paper</td>
<td>Dead Engine</td>
<td>Dead Poverty</td>
<td>Dead Infection</td>
<td>Dead Cancer</td>
</tr>
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<td>Suicide Paper</td>
<td>Suicide Engine</td>
<td>Suicide Poverty</td>
<td>Suicide Infection</td>
<td>Suicide Cancer</td>
</tr>
<tr>
<td>Outsider Museum</td>
<td>Outsider Paper</td>
<td>Outsider Engine</td>
<td>Outsider Poverty</td>
<td>Outsider Infection</td>
<td>Outsider Cancer</td>
</tr>
<tr>
<td>Rejected Museum</td>
<td>Rejected Paper</td>
<td>Rejected Engine</td>
<td>Rejected Poverty</td>
<td>Rejected Infection</td>
<td>Rejected Cancer</td>
</tr>
<tr>
<td>Unwanted Museum</td>
<td>Unwanted Paper</td>
<td>Unwanted Engine</td>
<td>Unwanted Poverty</td>
<td>Unwanted Infection</td>
<td>Unwanted Cancer</td>
</tr>
<tr>
<td>Museum</td>
<td>Paper Funeral</td>
<td>Engine Funeral</td>
<td>Poverty</td>
<td>Infection</td>
<td>Cancer</td>
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<td>Funeral</td>
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</table>

(table continued.)
Table 1. List of word combinations.

<table>
<thead>
<tr>
<th>Museum</th>
<th>Paper</th>
<th>Engine</th>
<th>Poverty</th>
<th>Infection</th>
<th>Cancer</th>
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<tbody>
<tr>
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<td>Dead</td>
<td>Dead</td>
<td>Dead</td>
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<tr>
<td>Suicide</td>
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<tr>
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<td>Lonely</td>
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<tr>
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<tr>
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<td>Rejected</td>
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<tr>
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<td>Burden</td>
<td>Burden</td>
<td>Burden</td>
<td>Burden</td>
</tr>
<tr>
<td>Self-blame</td>
<td>Self-blame</td>
<td>Self-blame</td>
<td>Self-blame</td>
<td>Self-blame</td>
<td>Self-blame</td>
</tr>
<tr>
<td>Unwanted</td>
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<td>Unwanted</td>
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</tr>
</tbody>
</table>

**Data Analytic Strategy**

To test whether social anxiety was related to attentional bias toward suicide-related words compared to neutral words, two linear regressions were conducted in which social anxiety was the predictor variable and the suicide word/neutral word and suicide word/negative word bias index was the outcome variable. Additionally, given that one prior study (Chung & Jeglic, 2016) found group differences in response time only to the word “suicide,” two linear regressions were conducted in which a bias index specific to the word “suicide” compared to either negative or neutral words was the outcome variable and social anxiety and current SI were predictor variables.

To test whether social anxiety or current SI was related to attentional bias toward IPTS words, eight linear regressions were conducted. Separate models were conducted for each predictor (social anxiety or current suicidality) and outcome (TB word/neutral word, TB
word/negative word, PB word/neutral word, and PB word/negative word bias indices). For all analyses, Cohen’s $f^2$ (Selya, Rose, Dierker, Hedeker, & Mermelstein, 2012) was conducted to measure effect size.

To test whether the interaction of social anxiety and SI would be related to attentional bias toward suicide-related words or ITPS words, we conducted a series of hierarchical linear regressions. Separate regressions were conducted for each predictor and each dependent variable. Predictor variables were: Step 1: depression, Step 2: main effects of social anxiety and current SI, and Step 2: the social anxiety X current SI interaction. This strategy ensures that effects at Step 3 cannot be attributed to the variance shared with variables in Steps 1 and 2 (Cohen & Cohen, 1983). Social anxiety and current SI were centered to reduce multicollinearity. The form of any significant interactions would be examined by graphing regression lines. To probe the nature of significant interactions, tests of simple slopes of the regression lines were conducted (Aiken, West, & Reno, 1991).
RESULTS

Sample Characteristics

The final sample of 153 participants included 55 individuals (35.9%) with a lifetime history of SI. Thirty-three participants (21.5% of the total sample) endorsed past-year SI, and seven (4.6% of the total sample) endorsed past two-week SI on the IDAS. Of the seven that endorsed past two-week SI, six (86% of those with past two-week SI) endorsed a 3 (moderate level of past two week SI) and one (14% of those with past two-week SI) endorsed a 5 (extreme level of past two week SI). Three participants (2.0% of the total sample) endorsed a lifetime suicide attempt, none of which was in the last year.

Descriptive Measures of Variables and Manipulation Check

Please see Table 2 for means, standard deviations, and ranges of response times and number of errors and Table 3 for means, standard deviations, ranges, and correlations of study variables. A manipulation check was conducted by determining the differences in participants’ mean response times to congruent and incongruent trials. The difference in mean response times to congruent and incongruent trials was 7.49 ms. Additionally, a paired samples t-test examining the difference between participants’ average response times on congruent and incongruent trials revealed longer response times to incongruent trials than congruent trials, \( t(152) = 2.10, p = .037, d = .091 \). Although there was a significant difference between each participant’s average congruent and incongruent trial response times, the less than small effect size indicates that the magnitude of the difference was trivial. This implies that although the differences in average response times was not likely to be due to chance, the size of the difference was not large enough to suggest any meaningful difference in response times, indicating that there was no manipulation and the task did not work as intended. However, it is possible that differences in
response times could be subject to individual differences, as research has shown that the direction of effects in a dot probe task can vary on an individual level (Zvielli, Bernstein, & Koster, 2014). Individual differences in response times could be dependent on each individual’s degree of social anxiety, SI, TB, and PB. Thus, analyses testing the present study’s hypotheses regarding the relation of these factors to attentional biases in the dot probe task are warranted.

Table 2. Means, standard deviations, and ranges of response times (in ms) and number of errors.

<table>
<thead>
<tr>
<th>Word Type</th>
<th>Congruency</th>
<th>Incongruent M (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Congruent M (SD) [Range]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suicide/Negative</td>
<td>514.66 (103.80) [375.67-1404.60]</td>
<td>533.37 (97.69) [377.00-1163.17]</td>
<td></td>
</tr>
<tr>
<td>Suicide/Neutral</td>
<td>519.54 (86.06) [365.89-1033.25]</td>
<td>511.82 (90.66) [375.88-1031.00]</td>
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</tr>
<tr>
<td>TB/Negative</td>
<td>513.42 (81.14) [358.13-880.60]</td>
<td>513.78 (93.58) [366.11-1094.71]</td>
<td></td>
</tr>
<tr>
<td>TB/Neutral</td>
<td>513.46 (96.44) [371.78-1215.43]</td>
<td>562.90 (93.68) [394.67-1029.50]</td>
<td></td>
</tr>
<tr>
<td>PB/Negative</td>
<td>518.64 (105.47) [359.10-1406.50]</td>
<td>504.35 (74.23) [339.80-719.50]</td>
<td></td>
</tr>
<tr>
<td>PB/Neutral</td>
<td>512.28 (100.61) [368.13-1404.20]</td>
<td>512.46 (88.31) [362.10-1093.67]</td>
<td></td>
</tr>
<tr>
<td>“Suicide”/Negative</td>
<td>504.89 (110.48) [364.33-1451.50]</td>
<td>562.32 (134.20) [365.33-1493.00]</td>
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</tr>
<tr>
<td>“Suicide”/Neutral</td>
<td>508.02 (89.60) [365.33-1088.00]</td>
<td>508.68 (114.70) [353.33-1521.00]</td>
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</tr>
<tr>
<td>All included trials</td>
<td>514.77 (90.30) [365.88-1235.22]</td>
<td>522.71 (83.69) [379.64-1031.20]</td>
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<tr>
<td>Number of errors</td>
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<td>1.12 (2.18) [0-17]</td>
<td></td>
</tr>
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Table 3. Means, standard deviations, ranges, and correlations of study variables (bias indices in ms).

<table>
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<tr>
<th>Variables</th>
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<th>4</th>
<th>5</th>
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<th>13</th>
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<td>6. PB</td>
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</tr>
<tr>
<td>7. Suicide/Negative Bias</td>
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<td>.07</td>
<td>.06</td>
<td>.00</td>
<td>.15</td>
<td>.03</td>
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<td>8. Suicide/Neutral Bias</td>
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<td>.14</td>
<td>.21**</td>
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<tr>
<td>9. “Suicide”/Negative Bias</td>
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<td>.15</td>
<td>.04</td>
<td>.13</td>
<td>.11</td>
<td>.06</td>
<td>.56**</td>
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<td>1</td>
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<td></td>
</tr>
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<td>10. “Suicide”/ Neutral Bias</td>
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<td>.11</td>
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<td>.15</td>
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<td>11. TB/Negative Bias</td>
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<td>12. TB/Neutral Bias</td>
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<td>.06</td>
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<td>.08</td>
<td>.06</td>
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<td>.05</td>
<td>-.04</td>
<td>-.32**</td>
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<td>13. PB/Negative Bias</td>
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<td>-.07</td>
<td>-.04</td>
<td>-.15</td>
<td>-.35**</td>
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</table>

*(table continued.)*
### Table 3. Means, standard deviations, ranges, and correlations of study variables (bias indices in ms).

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>6</th>
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<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td>1</td>
</tr>
<tr>
<td>PB/Neutral</td>
<td>.09</td>
<td>.04</td>
<td>.19*</td>
<td>.17**</td>
<td>.10</td>
<td>.20*</td>
<td>.03</td>
<td>.09</td>
<td>.05</td>
<td>.18*</td>
<td>.03</td>
<td>.08</td>
<td>-.3**</td>
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<tr>
<td>Bias</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>M (SD)</td>
<td>23.32</td>
<td>.27</td>
<td>17.86</td>
<td>1.07</td>
<td>18.23</td>
<td>7.38</td>
<td>22.08</td>
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<td>.00-</td>
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<td>[6.00-</td>
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<td>[-299.78-</td>
<td>[-334.60-</td>
<td>[-108.50-</td>
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</tbody>
</table>

*p < .05, **p < .01
Correlations between self-reported study variables and attention biases to the same constructs were examined to test whether the bias indices exhibited the expected effects, as individuals with greater SI, TB, and PB would be expected to show greater bias to these constructs. Current SI was positively correlated to suicide/neutral bias, $r = .213, p = .008$, but not suicide/negative bias, $r = .000, p = .996$. Current SI was not correlated to “suicide”/neutral bias, $r = .114, p = .162$ or “suicide”/negative bias, $r = .127, p = .120$. TB was not correlated to TB/neutral bias index, $r = .151, p = .065$, but was significantly negatively correlated to TB/negative bias index, $r = - .196, p = .016$. PB was significantly positively correlated to PB/neutral bias index, $r = .169, p = .038$, but not PB/negative bias, $r = -.153, p = .060$. Although the suicide/neutral bias index and PB/neutral bias index exhibited effects in the expected direction, the failure of the other bias indices to do the same suggests that the bias indices may not have reliably measured attentional bias to the constructs to which they should have been related.

**Social Anxiety’s Relation to Suicide and IPTS Cues**

Social anxiety was not related to the suicide/negative bias index, $F(1, 151) = .348, p = .556, f^2 = .002$, or to suicide/neutral bias index, $F(1, 150) = .194, p = .556, f^2 = .002$. Social anxiety was also not related to the “suicide”/neutral bias index, $F(1, 150) = .766, p = .383, f^2 = .005$, or to the “suicide”/negative bias index, $F(1, 150) = .411, p = .523, f^2 = .003$. Social anxiety was not significantly related to the TB/negative bias index, $F(1, 151) = 2.265, p = .134, f^2 = .008$, or the TB/Neutral bias index, $F(1, 151) = .098, p = .754, f^2 = .001$. Similarly, social anxiety was not related to the PB/negative bias index, $F(1, 151) = .984, p = .323 f^2 = .006$, or the PB/neutral bias index, $F(1,151) = 1.098, p = .296, f^2 = .007$. 

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Current SI was not significantly related to the TB/Negative bias, \( F(1, 151) = .608, \ p = .437, f^2 = .004 \), or to TB/Neutral word bias index, \( F(1, 151) = .498, \ p = .482, f^2 = .003 \).

Similarly, current SI was not related to PB/Negative bias index, \( F(1, 151) = .803, \ p = .372, f^2 = .005 \). However, current SI was related to PB/neutral bias index, \( F(1, 151) = 4.701, \ p = .032, f^2 = .031 \). Current SI was not related to suicide/negative bias index, \( F(1, 151) = .000, \ p = .996, f^2 = .000 \). However, current SI was related to suicide/neutral word bias index, \( F(1, 150) = 7.13, \ p = .008, f^2 = .047 \). Current SI was not related to the “suicide”/negative bias index, \( F(1, 151) = 2.44, \ p = .120, f^2 = .016 \), or the “suicide”/neutral bias index, \( F(1,150) = 1.976, \ p = .162, f^2 = .013 \).

**Social Anxiety X SI in the Prediction of Attentional Bias**

Separate hierarchical linear regressions were conducted for each outcome variable (suicide word/negative word bias index, suicide word/neutral word bias index, TB/negative word bias index, TB/neutral word bias index, PB/negative word bias index, and PB/neutral word bias index). The assumption of multicollinearity was violated in two variables, SI and the social anxiety X SI interaction, whose tolerance remained less than .10. To address this, a log transformation was performed on the centered current SI variable, resulting in acceptable levels of tolerance in all variables (i.e., >.10). For each model, the predictor variables were entered in three steps. Step 1: depression, Step 2: centered social anxiety and log-transformed current SI, and Step 3: included the social anxiety X SI interaction.\(^1\) No interactions were significant (see Tables 4-9).

\(^1\) The model was run with and without depression as a covariate, and the patterns remained the same in both models.
Table 4. Hierarchical linear regression of the Social Anxiety x Suicidality interaction in the prediction of attentional bias to suicide words compared to negative words.

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>$f^2$</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
<th>sr$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Covariates</strong></td>
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<td>.553</td>
<td>.004</td>
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<td></td>
<td></td>
<td>.458</td>
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<tr>
<td>Depression</td>
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<td>.089</td>
<td>.005</td>
<td></td>
<td></td>
<td></td>
<td>.867</td>
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<tr>
<td><strong>Step 2: Main Effects</strong></td>
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<td>1.385</td>
<td>.014</td>
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<td>.715</td>
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<td>.241</td>
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<td>.009</td>
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<td>.699</td>
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<td>.001</td>
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</table>

Note. sr$^2$ = semi-partial correlation.

Table 5. Hierarchical linear regression of the Social Anxiety x Suicidality interaction in the prediction of attentional bias to suicide words compared to neutral words.

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>$f^2$</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
<th>sr$^2$</th>
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Note. sr$^2$ = semi-partial correlation.
Table 6. Hierarchical linear regression of the Social Anxiety x Suicidality interaction in the prediction of attentional bias to TB words compared to negative words.

<table>
<thead>
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<th>ΔR²</th>
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<td>-1.025</td>
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<td>.639</td>
<td>.031</td>
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<tr>
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<td>.156</td>
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</tbody>
</table>

Note. sr² = semi-partial correlation.

Table 7. Hierarchical linear regression of the Social Anxiety x Suicidality interaction in the prediction of attentional bias to TB words compared to neutral words.

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>ΔR²</th>
<th>ΔF</th>
<th>f²</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>sr²</th>
</tr>
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<tbody>
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<td>.001</td>
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<td>.769</td>
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</tr>
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<td>-.294</td>
<td>-.294</td>
<td>.769</td>
<td>.001</td>
</tr>
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<td>Step 2: Main Effects</td>
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<td>.013</td>
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<td></td>
<td>.594</td>
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<td>Social Anxiety</td>
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<td></td>
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<td>.047</td>
<td>.456</td>
<td>.649</td>
<td>.001</td>
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<td>.234</td>
<td>.009</td>
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<td>.060</td>
<td>.013</td>
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</table>

Note. sr² = semi-partial correlation.
### Table 8. Hierarchical linear regression of the Social Anxiety x Suicidality interaction in the prediction of attentional bias to PB words compared to negative words.

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>ΔR²</th>
<th>ΔF</th>
<th>f²</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>sr²</th>
</tr>
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<tbody>
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<td>8.236</td>
<td>.053</td>
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<td>.005</td>
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<td>.051</td>
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<td></td>
</tr>
<tr>
<td><strong>Step 2: Main Effects</strong></td>
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<td>.466</td>
<td>.062</td>
<td></td>
<td></td>
<td>.031</td>
<td></td>
</tr>
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<td>.898</td>
<td>.371</td>
<td>.005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
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<td>.228</td>
<td>.820</td>
<td>.000</td>
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<td><strong>Step 3: Interactions</strong></td>
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<td>.566</td>
<td>.062</td>
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<td></td>
<td>.052</td>
<td></td>
</tr>
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<td>Social Anxiety X SI</td>
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<td>.752</td>
<td>.453</td>
<td>.004</td>
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<td></td>
</tr>
</tbody>
</table>

Note. sr² = semi-partial correlation

### Table 9. Hierarchical linear regression of the Social Anxiety x Suicidality interaction in the prediction of attentional bias to PB words compared to neutral words.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>ΔR²</th>
<th>ΔF</th>
<th>f²</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>sr²</th>
</tr>
</thead>
<tbody>
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<td>5.714</td>
<td>.037</td>
<td></td>
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<td>.018</td>
<td></td>
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<td>Depression</td>
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<td>.018</td>
<td>.036</td>
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<td></td>
<td></td>
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<tr>
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<td>.042</td>
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<td>.098</td>
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<td>.552</td>
<td>.002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>.063</td>
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<td>.003</td>
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<td><strong>Step 3: Interactions</strong></td>
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<td>.046</td>
<td></td>
<td></td>
<td>.144</td>
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</tr>
<tr>
<td>Social Anxiety X SI</td>
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<td>.752</td>
<td>.453</td>
<td>.004</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: sr² = semi-partial correlation
Social Anxiety X Attentional Bias in the Prediction of SI

Given that it may only be those socially anxious persons with an attention bias toward suicide-related cues that exhibit greater current SI, additional hierarchical linear regressions were conducted to test whether the relationship of social anxiety and current SI was moderated by attentional bias to suicide, TB, or PB bias indices. Separate models were conducted for each outcome variable (Tables 10-17). Predictor variables were entered in three steps: Step 1: depression, Step 2: social anxiety and bias index; and Step 3: the social anxiety X bias index interaction.

For the model including social anxiety X suicide/negative bias index, depression accounted for 18% of the variance and social anxiety and suicide/negative bias index accounted for an additional 1% (Table 10). Within Step 2 of the model, neither social anxiety nor suicide/negative bias index was significantly related to current SI (Table 10). The interaction did not account for any additional variance, and within Step 3 social anxiety X suicide/negative bias index was not significantly related to current SI.

Table 10. Hierarchical linear regression of the Social Anxiety x Suicide/Negative Bias index interaction in the prediction of current SI.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>ΔR²</th>
<th>ΔF</th>
<th>f²</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>sr²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: Covariates</td>
<td>.180</td>
<td>33.190</td>
<td>.220</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td>.424</td>
<td>5.761</td>
<td>&lt;.001</td>
<td>.180</td>
</tr>
<tr>
<td>Step 2: Main Effects</td>
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<td>.570</td>
<td>.229</td>
<td>.567</td>
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<td></td>
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<tr>
<td>Social Anxiety</td>
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<td></td>
<td></td>
<td>.094</td>
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<td>.005</td>
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<td>Suicide/Negative Bias</td>
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<td>.714</td>
<td>.001</td>
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<td>Step 3: Interactions</td>
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<td>.230</td>
<td>.876</td>
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<td></td>
</tr>
<tr>
<td>Social Anxiety X Suicide/Negative Bias</td>
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<td></td>
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<td>-.157</td>
<td>.876</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note. sr² = semi-partial correlation.
For the model including social anxiety X suicide/neutral bias index, depression accounted for 19% of the variance and social anxiety and suicide/neutral bias index accounted for an additional 3% (Table 11). Within Step 2 of the model, suicide/neutral bias index, but not social anxiety, was significantly positively related to current SI (Table 11). The interaction accounted for an additional 12% of the variance. Within Step 3, the social anxiety X suicide/neutral bias index interaction was significant above and beyond the covariate and main effects. The form of the interaction was examined by graphing regression lines at high and low levels of suicide/neutral bias (Figure 1). At higher levels of suicide/neutral bias, the simple slope was significant, $\beta = .51$, $p < .001$, indicating that social anxiety was significantly positively related to current SI. At lower levels of suicide/neutral bias, the simple slope was not significant, $\beta = .08$, $p = .322$ (Figure 1).

Table 11. Hierarchical linear regression of the Social Anxiety x Suicide/Neutral Bias interaction in the prediction of current SI.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>$f^2$</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
<th>$sr^2$</th>
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<tr>
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<td>.274</td>
<td>.103</td>
<td>1.120</td>
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<td></td>
<td></td>
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</tr>
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<td>.026</td>
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<td>.123</td>
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</table>

Note. $sr^2 = semi-partial correlation$
Figure 1. Social anxiety and current SI moderated by suicide word/neutral word bias. Note. *p < .05.

For the model including social anxiety X TB/negative bias index, depression accounted for 18% of the variance and social anxiety and TB/negative bias index accounted for an additional 1% (Table 1.2). Within Step 2 of the model, neither social anxiety nor TB/negative bias index was significantly related to current SI (Table 1.2). The interaction accounted for an additional 1% of the variance, and within Step 3 social anxiety X TB/negative bias index was not significantly related to current SI.

For the model including social anxiety X TB/neutral bias index, depression accounted for 18% of the variance and social anxiety and TB/neutral bias index accounted for an additional 1% (Table 1.3). Within Step 2 of the model, neither social anxiety nor TB/neutral bias index was significantly related to current SI (Table 1.3). The interaction accounted for an additional 1% of the variance, and within Step 3 social anxiety X TB/neutral bias index was not significantly related to current SI.
Table 12. Hierarchical linear regression of the Social Anxiety x TB/Negative Bias index interaction in the prediction of current SI.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>ΔR²</th>
<th>ΔF</th>
<th>f²</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>sr²</th>
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</thead>
<tbody>
<tr>
<td>Step 1: Covariates</td>
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<td>&lt;.001</td>
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<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.424</td>
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<td>&lt;.001</td>
<td>.180</td>
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<td></td>
</tr>
<tr>
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<td>.318</td>
<td>.005</td>
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<tr>
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<td>.963</td>
<td>.000</td>
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</table>

Note. sr² = semi-partial correlation.

Table 13. Hierarchical linear regression of the Social Anxiety x TB/Neutral Bias index interaction in the prediction of current SI.

<table>
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<th>Predictor variable</th>
<th>ΔR²</th>
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<th>β</th>
<th>t</th>
<th>p</th>
<th>sr²</th>
</tr>
</thead>
<tbody>
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<td>Step 1: Covariates</td>
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<td>33.190</td>
<td>.227</td>
<td>&lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.424</td>
<td>5.761</td>
<td>&lt;.001</td>
<td>.180</td>
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<td></td>
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<td>.959</td>
<td>.339</td>
<td>.005</td>
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<td>.865</td>
<td>.388</td>
<td>.004</td>
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</tr>
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<td>.241</td>
<td>.358</td>
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<td>.358</td>
<td>.005</td>
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</tr>
</tbody>
</table>

Note. sr² = semi-partial correlation.
For the model including social anxiety X PB/negative bias index, depression accounted for 19% of the variance and social anxiety and PB/negative bias index accounted for an additional 1% (Table 14). Within Step 2 of the model, neither PB/neutral bias index nor social anxiety was significantly related to current SI (Table 14). The interaction accounted for an additional 2% of the variance. Within Step 3, the social anxiety X PB/negative bias index interaction was significant above and beyond the covariate and main effects. The form of the interaction was examined by graphing regression lines at high and low levels of PB/negative bias (Figure 2). At higher levels of PB/negative bias, the simple slope was significant, $\beta = .16, p = .047$, indicating that social anxiety was significantly positively related to current SI. At lower levels of PB/negative bias, the simple slope was also significant, $\beta = -.338, p < .000$, indicating that social anxiety was significantly negatively related to current SI.

Table 14. Hierarchical linear regression of the Social Anxiety x PB/Negative Bias index interaction in the prediction of current SI.

<table>
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<tr>
<th>Predictor variable</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>$f^2$</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
<th>sr$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Covariates</strong></td>
<td>.180</td>
<td>33.190</td>
<td>.227</td>
<td></td>
<td></td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td>.424</td>
<td>5.761</td>
<td>&lt;.001</td>
<td>.180</td>
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<tr>
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<td>.229</td>
<td>.092</td>
<td>.979</td>
<td>.329</td>
<td>.005</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>.000</td>
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<td></td>
<td></td>
</tr>
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<td>.050</td>
<td>.021</td>
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<td></td>
<td>-.050</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $sr^2$ = semi-partial correlation.
For the model including social anxiety X PB/neutral bias index, depression accounted for 19% of the variance and social anxiety and PB/neutral bias index accounted for an additional 2% (Table 15). Within Step 2 of the model, neither PB/neutral bias index nor social anxiety was significantly related to current SI (Table 15). The interaction accounted for an additional 8% of the variance. Within Step 3, the social anxiety X PB/neutral bias index interaction was significant above and beyond the covariate and main effects. The form of the interaction was examined by graphing regression lines at high and low levels of PB/neutral bias (Figure 3). At higher levels of PB/neutral bias, the simple slope was significant, $\beta = .48, p < .001$, indicating that social anxiety was significantly positively related to current SI. At lower levels of PB/neutral bias, the simple slope was not significant, $\beta = .05, p = .550$. 

Figure 2. Social anxiety and current SI moderated by PB/negative word bias. Note. *p < .05.
Table 15. Hierarchical linear regression of the Social Anxiety x PB/Neutral Bias index interaction in the prediction of current SI.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>$f^2$</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
<th>$sr^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: Covariates</td>
<td>.180</td>
<td>33.190</td>
<td>.227</td>
<td></td>
<td></td>
<td>&lt;.001</td>
<td>.180</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td>.424</td>
<td>5.761</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
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<td>.242</td>
<td>.424</td>
<td>1.062</td>
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<td></td>
<td>.099</td>
<td>1.062</td>
<td>.290</td>
<td>.006</td>
</tr>
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<td></td>
<td></td>
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<td>.186</td>
<td>.010</td>
</tr>
<tr>
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<td>16.137</td>
<td>.377</td>
<td>.319</td>
<td>4.017</td>
<td>&lt;.001</td>
<td>.079</td>
</tr>
</tbody>
</table>

Note: $sr^2$ = semi-partial correlation.

Figure 3. Social anxiety and current SI moderated by PB/neutral word bias.
Note. *$p < .05$. 
For the model including social anxiety X “suicide”/negative bias index, depression accounted for 18% of the variance and social anxiety and “suicide”/negative bias index accounted for an additional 2% (Table 16). Within Step 2 of the model, neither “suicide”/negative bias index nor social anxiety was significantly related to current SI (Table 16). The interaction accounted for an additional 7% of the variance. Within Step 3, the social anxiety X “suicide”/negative bias index interaction was significant above and beyond the covariate and main effects. The form of the interaction was examined by graphing regression lines at high and low levels of “suicide”/negative bias (Figure 4). At higher levels of “suicide”/negative bias, the simple slope was significant, $\beta = .35, p < .001$, indicating that social anxiety was significantly positively related to current SI. At lower levels of “suicide”/negative bias, the simple slope was not significant, $\beta = -.091, p = .265$.

Table 16. Hierarchical linear regression of the Social Anxiety x “Suicide”/Negative Bias index interaction in the prediction of current SI.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>$f^2$</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
<th>$sr^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Covariates</strong></td>
<td>.181</td>
<td>33.150</td>
<td>.221</td>
<td>&lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td>.425</td>
<td>5.758</td>
<td>&lt;.001</td>
<td>.181</td>
</tr>
<tr>
<td><strong>Step 2: Main Effects</strong></td>
<td>.017</td>
<td>1.613</td>
<td>.247</td>
<td>.203</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Anxiety</td>
<td></td>
<td></td>
<td></td>
<td>.091</td>
<td>.986</td>
<td>.326</td>
<td>.005</td>
</tr>
<tr>
<td>Suicide-only/Negative Bias</td>
<td>.108</td>
<td>1.464</td>
<td>.145</td>
<td>.012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3: Interactions</strong></td>
<td>.027</td>
<td>5.127</td>
<td>.257</td>
<td>.025</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Anxiety X “Suicide”/Negative Bias</td>
<td>.169</td>
<td>2.264</td>
<td>.025</td>
<td>.023</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: $sr^2$ = semi-partial correlation.
For the model including social anxiety X “suicide”/neutral bias index, depression accounted for 18% of the variance and social anxiety and “suicide”/neutral bias index accounted for an additional 2% (Table 17). Within Step 2 of the model, neither “suicide”/neutral bias index nor social anxiety was significantly related to current SI (Table 17). The interaction accounted for an additional 7% of the variance. Within Step 3, the social anxiety X “suicide”/neutral bias index interaction was significant above and beyond the covariate and main effects. The form of the interaction was examined by graphing regression lines at high and low levels of “suicide”/neutral bias (Figure 5). At higher levels of “suicide”/neutral bias, the simple slope was significant, $\beta = .39, p < .001$, indicating that social anxiety was significantly positively related to current SI. At lower levels of “suicide”/neutral bias, the simple slope was not significant, $\beta = -.078, p = .338$. 

Figure 4. Social anxiety and current SI moderated by “suicide”/negative word bias. Note. *$p < .05$. 
Table 17. Hierarchical linear regression of the Social Anxiety x “Suicide”/Neutral Bias index interaction in the prediction of current SI.

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>ΔR²</th>
<th>ΔF</th>
<th>f²</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>sr²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Covariates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.181</td>
<td>33.150</td>
<td>.221</td>
<td></td>
<td></td>
<td>&lt;.001</td>
<td>.181</td>
</tr>
<tr>
<td><strong>Step 2: Main Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Social Anxiety</td>
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<td>1.062</td>
<td>.290</td>
<td>.006</td>
<td></td>
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<tr>
<td>Suicide-only/Neutral Bias</td>
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<td>.430</td>
<td>.668</td>
<td>.001</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Step 3: Interactions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Anxiety X “Suicide”/Neutral Bias</td>
<td>.254</td>
<td>3.214</td>
<td>.002</td>
<td>.053</td>
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<td></td>
<td></td>
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</tbody>
</table>

*Note: sr² = semi-partial correlation.*

Figure 5. Social anxiety and current SI moderated by “suicide”/neutral word bias.

Note. *p < .05.
DISCUSSION

This study was the first to examine several factors involving the relationship of social anxiety to attentional bias toward suicide. First, the present study was the first to examine the relation of social anxiety to an attentional bias toward suicide. Second, this study was the first to examine attentional bias toward TB and PB, as well as to examine the relation of attentional bias to these words to factors shown to be related to TB and PB – social anxiety and SI (Buckner et al., 2017). Third, the current study used a dot-probe task to measure attentional bias toward suicide. Inconsistent with our hypothesis, no relation was found between social anxiety and suicide/negative bias or suicide/neutral bias. SI was related to suicide/neutral bias, but not suicide/negative bias, nor to bias toward the word “suicide” itself.

First, this study found that social anxiety was not related to an attentional bias toward suicide words. While social anxiety is related to suicidal ideation (Buckner et al., 2017), and social anxiety was correlated with past-year suicidality and past two-week SI in the current study, this relation did not extend to an attentional bias toward suicide-related words or the word “suicide” itself. This was the first known test of any form of anxiety to attentional bias to suicide. Other than SI or suicide attempts, depression is the only known suicide risk factor found to be correlated to attentional bias toward suicide (Williams & Broadbent, 1986). Depression was correlated with attentional bias to the word “suicide” compared to neutral words, but not suicide-related words more broadly, in the current study. Taken together, these findings highlight the need for further testing of the relationships between attentional bias to suicide and other factors related to suicidality.
Second, this was the first known study to examine attentional bias toward TB and PB words. Neither social anxiety nor past-year suicidality was related to an attentional bias toward TB or PB words. Additionally, while PB was positively correlated to the PB/neutral word bias index, TB was negatively correlated to TB/negative word bias index, such that greater TB was related to a greater bias away from TB words. These mixed results convey the need for further testing of these relationships using clinical samples more at risk for TB and PB.

Third, the present study used a dot probe task to measure the relation of current SI to attentional bias to suicide. Presence of current SI was related to an attentional bias toward suicide-related words compared to neutral but not negative words. This finding is somewhat consistent with previous research, which has found either that suicidality was related to attentional bias to suicide compared to negative, neutral, and positive words (Becker et al., 1999; Cha et al., 2010) or that suicidality was not associated with group differences between any word type (Chung & Jeglic, 2016; Richard-Devantoy et al., 2016). Taken together, these findings suggest that attentional bias toward suicide cues exhibits a small effect and is inconsistently found. This conveys the need for further research regarding underlying factors contributing to this relation. For example, longer time interval since last attempt has been found to be negatively associated with bias toward suicide (Cha et al., 2010; Chung & Jeglic, 2016). In fact, Cha and colleagues (2010) found an attentional bias toward suicide cues in those with a past-week attempt but not in those whose last attempt was less recent.

Fourth, the present study did not find any significant moderating effect current SI on the relationship between social anxiety and attentional bias to suicide, TB, or PB words. This is consistent with this study’s finding that social anxiety is not related to attentional bias to suicide, TB words, or PB words, and adds that this relation remains insignificant even at higher levels of
suicidality. This lack of an effect may be due to the low level of suicidality in the current sample compared to previous studies (e.g., Cha et al., 2010). Thus, further research with a population that experiences greater frequency and intensity of SI and suicidal behaviors is necessary.

Finally, the present study provides novel findings on the moderating effect of attentional bias on the relationship of social anxiety and current suicidal ideation. Specifically, attentional bias toward suicide words compared to neutral words and attentional bias to the word “suicide” compared to either negative or neutral words uniquely moderated the relationship of social anxiety to current SI, such that social anxiety was related to current SI at low, but not high, levels of attentional bias to suicide. This provides evidence that socially anxious individuals who display an attentional bias toward suicide are at particularly high risk for SI. Further, the moderating effect of attentional bias seems to suggest the potential for use of Attention Bias Modification (ABM; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002) in populations with high suicide risk. However, one recent study attempting to use ABM to reduce attentional bias toward suicide and related suicidal ideation behaviors found that ABM did not significantly reduce suicidality (Cha et al., 2017). This was largely because the tasks employed (both a probe detection task and an EST) did not reduce bias toward suicide more effectively than control, but there was also no significant effect of change in bias on SI. Taken together, these findings underline the importance of identification of attentional bias toward suicide and of improvement of its modification.

Both PB/neutral bias index and PB/negative bias index moderated the social anxiety and current SI relation, but surprisingly, the effects were in opposite directions. Specifically, social anxiety was related to greater SI at greater levels of PB/neutral bias, but at lower levels of PB/negative bias. Given that PB words were more aversive than neutral words but less aversive
than negative words, this finding may suggest that in the absence of suicide-related cues, attentional bias to aversive words in general may be related to suicide. This is consistent with literature showing that those with a history of suicide showed a larger interference effect to negative versus neutral words (Williams & Broadbent, 1986). While PB words were not rated as significantly less aversive than suicide, TB, or negative words, the effect size of the difference was moderate, indicating that the difference in affective valence may have affected the study’s findings concerning PB.

The above findings should be viewed in light of the small difference in response times between congruent and incongruent trials in the manipulation check. This, combined with the fact that no bias index was greater than 50.15 ms, suggests that there was little evidence of attentional bias found and that there was no effect of the dot probe manipulation. As interpreting and drawing conclusions from the data are reliant on the task’s manipulation and valid measurement of attentional bias, further testing of dot probe tasks for attentional bias to suicide cues is necessary to determine the validity of the task as a measure of attentional bias to suicide before conclusions can be drawn. Specifically, given that there was no overall bias toward suicide, TB, and PB congruent probes, and that correlations between each factor and the factors’ bias indices were inconsistently found, future research should investigate the validity words used in the paradigm or consider use of words or images more salient to those with greater SI, TB, or PB. Attentional bias to the suicide-related words used in the present study were not consistently related to suicidality (Chung & Jeglic, 2016; Richard-Devantoy et al., 2016), and given that no other known studies have examined attentional bias to TB and PB words, there remains little to no evidence that attentional bias to the words used are related to greater TB or PB.
The average response times and error rates for both congruent trials and incongruent trials were within one standard deviation of the means of previous dot probe studies involving attention to threat among anxious individuals (Bradley, Mogg, Falla, & Hamilton, 1998; Mogg et al., 1995). Additionally, the current sample’s mean social anxiety, past two-week SI, TB, and PB were within one standard deviation of those of another study involving social anxiety and IPTS factors (Buckner et al., 2017). However, Buckner and colleagues (2017) used a much larger sample (n = 780), allowing for greater variability in past two-week SI. In light of this, future research would benefit from use of a sample more likely to experience current SI (e.g., outpatient sample) or target high-risk collegiate individuals (e.g., students with depressed mood or substance use problems; Brener, Hassan, & Barrios, 1999; Garlow et al., 2008).

**Limitations and Future Directions**

The current study should be interpreted in light of some limitations. First, due to the cross-sectional nature of the study, causal inferences cannot be made. Second, the sample consisted of undergraduate university students who were primarily Caucasian females. While this sample was warranted given that suicide is the second-leading cause of death among adults aged 18-24 (Center for Disease Control, 2016b), use of this sample limits the generalizability of the findings, specifically in comparison to other studies of attentional bias toward suicide. Because of this, further research using more diverse populations and clinical samples is warranted. Third, most predictor variables were self-report measures, which are subject to misremembered or misreported responses. Future work should consider use of follow-up questions, interviews, or medical histories. However, there is evidence that participants disclose more SI on self-report measures than in interviews (Kaplan et al., 1994), indicating that use of self-report measures may be appropriate. Fourth, the sample included only seven participants
with past two-week SI, which limits the variable's available variance and makes it difficult to draw meaningful conclusions from data using the variable. Future research should include a greater number of participants with a history of SI, particularly current SI, given that recency of suicidality plays a role in whether an attentional bias to suicide words is found, as in prior studies attentional bias to suicide words was negatively associated with time since last attempt, and was only significantly related to history of an attempt when the attempt was in the past week (Cha et al., 2010).

A final limitation was failure to pilot test the novel task to measure the direction of the effects prior to study initiation, given that this was the first known study to use a dot probe task to measure attentional bias toward suicide words with the exception of one study that tested ABM for suicidal ideation (Cha et al., 2017). Although the suicide-related words used in the current study have been used in previous attentional bias research and have been found to be related to suicidality (Cha et al., 2010), attentional bias to TB or PB has not been studied. Thus, this limitation is particularly relevant to measures of attentional bias to TB and PB words. The TB and PB words used possessed only face validity, as failure to pilot test the program prevented any development of construct validity, which is necessary to draw strong conclusions from the results of the study. Pilot testing would have aided in the identification and use of words that drew the attention of those with greater TB and PB.

Future research of the dot probe task measuring an attentional bias toward suicide would benefit from use of a similar sample to that of previous studies that found a significant bias toward suicide-related words (Becker et al., 1999; Cha et al., 2010; Williams & Broadbent, 1986). Specifically, a sample of individuals with a past-week suicide attempt should be used. This would allow for examination of these factors within a population in which an attentional
bias to suicide has previously been shown. Use of the dot probe task in this sample would allow for a more direct comparison of effects between the dot probe and the EST, leading to a greater understanding of the cognitive mechanisms underlying the effects found in the extant literature.

In order to gain a better understanding of the relation of social anxiety to attentional bias related to suicide, these factors should also be examined using the previously used EST. Use of the EST would allow for examination of the relation of social anxiety to the interference effect found in previous studies. Further, future studies should consider use of a direct comparison to study the underlying mechanisms present in the EST and dot probe task. The only known study to measure the intraindividual relation of two tasks’ measurement of suicide bias found no correlation between the EST and probe discrimination (Cha et al., 2017). This is supported by previous evidence that the two tasks may measure different processes (Cisler et al., 2009), indicating that further direct comparison of the tasks would elucidate the underlying mechanisms (i.e., response inhibition in the EST versus attentional allocation in the dot probe). These findings would inform both theories of suicide (e.g., Wenzel & Beck, 2008) and treatment efforts by clarifying cognitive risk factors related to suicidal ideation and behavior. Additionally, future research using the dot probe to measure attentional bias toward suicide cues may consider using images associated with suicide (e.g., pills, a gun, a noose) because implicit association with suicidal images is related to greater suicidal ideation, TB, and PB (Tucker, Wingate, Burkley, & Wells, 2017). Further, evidence from anxiety literature suggests that images may provide a more sensitive measure of attentional bias than words (Pishyar et al., 2004). Future dot probe studies using words to measure attentional bias, particularly attentional bias to TB and PB, should consider testing a broad range of words in order to identify words that most effectively measure attentional bias to TB and PB. Taken together, these findings indicate that additional research is
needed to identify underlying mechanisms present in attentional bias toward suicide and the
tasks that would best capture them.

Overall, the present study contributed to a mixed body of literature on attentional bias
toward suicide (Richard-Devantoy et al., 2016) by providing evidence that attentional bias
toward suicide plays a meaningful role in the relationship of social anxiety and suicidal ideation,
and by using a dot probe task to give further support that suicidal ideation is related to an
attentional bias toward suicide. These findings inform research by giving support to use of a dot
probe task to measures attentional bias toward suicide and informs treatment efforts by providing
evidence that attentional bias toward suicide contributes to suicidality among socially anxious
individuals. However, the small number of participants who endorsed current SI limits the ability
to make clinically significant conclusions regarding the study’s findings. Future research using a
sample with a greater amount of current SI is necessary to test the reliability of the finding.

Further research using higher-risk samples and direct comparisons of task-based measures of
suicidality will further elucidate the relationships found in the current study.
REFERENCES


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VITA

Austin Lemke, raised in New Orleans, completed his Bachelor of Science in the John V. Roach Honors College at Texas Christian University in Fort Worth, Texas, where he majored in psychology and minored in general business. While at Texas Christian University, he participated in Dr. Brenton Cooper’s behavioral neuroscience lab and Dr. Cathy Cox’s Social Relationship Lab. In Dr. Cooper’s lab, he assisted with research studying behavioral manifestations of anxiety in rats, specifically the buffering effect of social interaction on anxiety and vocalizations indicative of anxiety. In Dr. Cox’s lab he assisted with projects investigating a range of topics including nostalgia and Terror Management Theory. He also completed his Honor’s Thesis in Dr. Cox’s lab, which examined how depressed individuals manage anxieties associated with the awareness of death.

Austin’s interest in clinical psychology led him to Louisiana State University, where he will receive his Master of Arts in Clinical Psychology. While in Dr. Julia Buckner’s Anxiety and Addictive Behaviors Lab, he has participated in research examining anxiety, substance use, and suicidality, with an emphasis on how these constructs relate to each other. His research interests center on the relation of social anxiety to suicidality.