Anxiety Sensitivity Index-3 Suicidal Cognition Concerns: A New Measure Examining Negative Reactions to Suicidal Ideation

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Biographical Notes

Nicole S. Smith: Nicole is broadly interested in studying cognition in anxiety disorders. Specifically, she is interested in cognitive biases such as anxiety sensitivity as it applies to anxiety disorders and suicide prevention. She is also interested in applying principles from basic educational research to learning-based treatments for anxiety disorders. Most recently, Nicole has studied the phenomenon of nocturnal panic attacks, especially the differences between those who experience panic attacks only while awake and those who experience panic attacks both while asleep and while awake.

Brian W. Bauer: Brian is interested in suicide prevention research. He has investigated brief dialectical behavioral therapy interventions for suicide prevention, associations between ADHD and suicide, and suicide in veteran populations. Most recently, his work has focused on understanding how behavioral economic strategies and principles can be integrated into suicide prevention work.

Rachel L. Martin: Rachel’s research focus is on military deployment trauma and how deployment related experiences interact with individuals’ aggression to cause interpersonal distress. Specifically, she is interested in aspects of trauma such as moral injury and post-battle experiences.

Raymond P. Tucker: Dr. Tucker’s research interest is broadly in the area of suicide prevention. He is particularly interested in novel etiological and maintaining factors of suicidal ideation and suicide attempts; the study of which enhances theoretical models of suicide as well as the clinical assessment and management of suicide risk. Projects in this area included behavioral markers of suicide risk (e.g.,
implicit associations to suicide stimuli and attentional bias toward pain-related stimuli), the Acute Suicidal Affective Disturbance (ASAD) proposed clinical entity, and drivers of suicide. A parallel area of research investigates historical and current cultural factors that influence suicide risk and resilience in underrepresented populations. Much of this work has focused on ethnic and racial minority factors such as historical trauma in Indigenous communities and racial microaggressions in people of color. Current work also includes the impact of minority stressors and gender affirmation medical intervention on the maintenance of suicidal ideation in transgender veterans.

Daniel W. Capron: Dr. Capron’s research utilizes technology and cross-cutting translational research to better the understanding and treatment of anxiety, trauma, and suicide-related psychopathology. His current projects involve using computerized interpretation bias modification to reduce anxiety sensitivity, increasing treatment seeking behaviors in the Mississippi National Guard using behavioral economic techniques, and utilizing a brief mobile phone intervention to reduce suicide risk.
Highlights

- Created a new measure for sensitivity to thoughts of suicide and wanting to die
- Suicidal cognition concerns associated with suicidal ideation in the past two weeks
- Suicidal cognition concerns associated with lifetime worst point suicidal ideation
- Suicidal cognition concerns moderated AS cognitive concerns and ideation relation
Anxiety Sensitivity Index-3 Suicidal Cognition Concerns: A New Measure
Examining Negative Reactions to Suicidal Ideation

Objective: Anxiety sensitivity cognitive concerns (ASCC), the fear of the consequences of mental dyscontrol, has been established as a risk factor for suicidal ideation (SI). Treatments targeted at reducing ASCC have been shown to reduce suicide risk. In this study, a new self-report measure, the Anxiety Sensitivity Index-3 Suicidal Cognition Concerns (ASI-3-SCC), was developed to assess sensitivity specifically to thoughts of suicide and wanting to die.

Method: Participants completed the new measure as well as measures of anxiety sensitivity, depressive symptoms, SI, and worst point SI. We hypothesized that the ASI-3-SCC would be associated with SI and worst point SI. Additionally, we hypothesized that the ASI-3-SCC would moderate the relationship between ASCC and SI.

Results: As predicted, the ASI-3-SCC was significantly associated with SI in the past two weeks and lifetime worst point SI after accounting for ASCC and depression. The ASI-3-SCC also moderated the relationship between ASCC and SI such that ASCC was related to SI at high levels of ASI-3-SCC.

Conclusions: We suggest that the interpretation of SI and feelings of wanting to die as dangerous may lead to more attention to those thoughts when they occur and increased psychological distress associated with those thoughts. This measure will allow researchers to measure a novel construct in the literature and further examine the impact of catastrophic interpretations of suicidal thoughts.

Keywords: Suicide; Anxiety sensitivity cognitive concerns; Worst-point ideation
Introduction

Suicidal ideation (SI) is world-wide with nearly one in ten people experiencing SI throughout their lifetime; however, fewer than one-third of those who experience SI (29%) will make an attempt (Nock et al., 2008). Furthermore, only 15.4% of individuals who experience SI and do not develop a specific plan will make an attempt (Nock et al., 2008). With research efforts focused on individuals who attempt or die by suicide, important upstream preventative efforts at the ideation stage may be neglected (Jobes and Joiner, 2019), yet understanding SI is an important factor for suicide prevention. Studying the progression from ideation to attempt is difficult because there is not one mechanism of action (Franklin et al., 2017; Walsh, Ribeiro, & Franklin, 2019). SI and suicide attempts occur across nearly every psychiatric disorder (Harris and Barraclough, 1997), and amongst those without a mental health diagnosis (Stone et al., 2018). Therefore, transdiagnostic risk factors may be key to understanding the motives behind SI and subsequently decrease suicide.

Anxiety sensitivity (AS) is a transdiagnostic risk factor that has a moderate, consistent link to suicidal thoughts and behaviors (Capron et al., 2012a; Osman et al., 2010; Valentiner et al., 2002). AS represents a fear of fear, and comprises three subfactors that refer to fears related to physical, social, and cognitive aspects of anxiety (Reiss et al., 1986; Taylor et al., 2007). Of these subfactors, anxiety sensitivity cognitive concerns (ASCC) appears to be most consistently related to suicide risk (Capron et al., 2012b; Norr et al., 2016; Oglesby et al., 2015; Schmidt et al., 2014). ASCC is the fear of cognitive symptoms of anxiety such as racing thoughts (Taylor et al., 2007). Individuals with high ASCC often believe that difficulties with concentration indicate that they are “going crazy” or that something is very wrong with them (Taylor et al., 2007). Elevated ASCC is associated with PTSD, social anxiety, depression symptoms (Olthuis et al., 2014), panic disorder, obsessive-compulsive disorder, and generalized anxiety disorder.
symptoms (Wheaton et al., 2012). Schmidt and colleagues (2014) found that treatment targeted at reducing ASCC reduced SI and risk after a one month follow up. Thus, it seems possible to reduce a person’s SI by targeting ASCC specifically.

Studying the relationship between ASCC and suicide has mainly been limited to utilizing the Anxiety Sensitivity Index-3, which measures all AS subfactors (ASI-3; Taylor et al., 2007). Items assessing ASCC in this measure include “When my thoughts seem to speed up, I worry that I might be going crazy” and “When I feel ‘spacey’ or spaced out I worry that I may be mentally ill.” These items do not impose a content of thinking, but a change in speed and clarity of thought that often accompanies anxious arousal. Research indicates that how individuals react to certain thought content, specifically their own SI, relates to their intensity of suicidal thoughts (Pettit et al., 2009; Tucker et al., 2017). Thus, ASCC related specifically to SI may be an unmeasured but important construct.

In both clinical and non-clinical samples, people often attempt to suppress distressing thoughts (Freeston et al., 1991; Purdon and Clark, 1993; Wells and Morrison, 1994). Furthermore, effortful suppression of distressing/unwanted thoughts actually exacerbates thinking about the very topics they wish to suppress (Wegner et al., 1987). Importantly, people fearful of specific thoughts as well as an inability to detract from such thinking, show greater emotional vulnerability and more psychopathological symptoms (Muris et al., 1996). These relationships have been extended to the study of suicidal thoughts and behaviors as well (Najmi et al., 2007).

Recent work has extended the thought suppression literature to study attempts to control SI. Pettit and colleagues (2009) found that the tendency to suppress SI predicted more intensity of SI at 4-week follow-up. Tucker and colleagues (2017) found that distracting oneself from
suicidal thoughts was negatively related to SI and suicide risk (Tucker et al., 2017). Both punishing oneself for suicidal thoughts and worrying about other negative thoughts was positively related to SI and suicide risk (Tucker et al., 2017). Overall, both fearfulness about specific thoughts and thought control strategies relate to a person’s emotional experience when SI occurs.

What remains unexamined is whether intensity of SI is influenced by one’s interpretation that these thoughts signify mental incapacitation. The current study expands upon the literature by creating the Anxiety Sensitivity Index-3 Suicidal Cognition Concerns (ASI-3-SCC), designed to target aspects of ASCC related to suicidal thoughts and wanting to die. To examine the construct validity of this scale, we hypothesize a one-factor solution for the ASI-3-SCC to demonstrate that the measure assesses the unitary construct of sensitivity to thoughts of suicide and wanting to die (Brown, 2006). Based on prior literature that AS is related to suicide risk (Capron et al., 2012a; 2012b), and that certain cognitive vulnerabilities and control strategies potentiate the amount of distress in individuals with and without SI (Muris et al., 1996; Tucker et al., 2017), we hypothesize that the ASI-3-SCC will statistically predict both current and worst point SI. We suggest that while sensitivity to SI may be related to ASCC, it is a separate construct that interacts with ASCC to produce a unique effect on SI. As an exploratory analysis, we hypothesize the ASI-3-SCC will moderate the relationship between ASCC and SI. This measure is the first to directly address sensitivity to SI, and may provide a unique means to examine the relationship between ASCC and SI.
Methods

Participants

Participants (N = 174) were undergraduates from a large southern university. Inclusion criteria required participants to be 18 years of age or older and have a history of SI. Participants were excluded from analyses if out of range response values were recorded for any measure (N = 2), suggesting errors in data collection. Participants’ demographics can be found in Table 1. In this sample, 28 participants endorsed at least one suicide attempt, 128 endorsed SI within the last year, and 134 were above the suggested clinical cutoff for the Suicide Behaviors Questionnaire-Revised for community samples (SBQ-R; ≥7; Osman et al., 2001).

Procedure

A pre-screening questionnaire was completed by students at the beginning of each semester, using the first item from the SBQ-R (“Have you ever thought about or attempted to kill yourself”). Participants who indicated that they have thought about suicide at least once were invited via email to participate in the current study. Selection criteria was not specified in the email. Eligible participants completed the self-report study questionnaires online and were provided with university counselling services contact information. A power calculation using G*Power (v. 3.1) revealed that 158 participants were needed to detect a small-to-medium effect size (f² = 0.1) using multiple linear regression with two predictor variables. All study procedures were approved by the university’s Institutional Review Board, and informed consent was obtained from all participants prior to data collection.
**Self-report measures.**

*Anxiety Sensitivity Index-3 Suicidal Cognition Concerns (ASI-3-SCC).*

The ASI-3-SCC is a 6-item measure of fear of suicide related cognitions and thoughts of wanting to die written specifically for this study, based on the wording of the ASI-3-Cognitive Concerns subscale. Items were composed to encapsulate reaction to a variety of suicide-related thoughts, including passive desire for death and more active suicidal thoughts. Items were generated by adjusting the wording of the ASI-3- Cognitive Concerns subscale to include thoughts of suicide and wanting to die (all revised items are included in Table 2). The resulting six items were pilot tested by four undergraduate research assistants prior to inclusion in the study. These students were asked questions regarding item clarity and recommended revisions. Participants were asked to rate how much they agree with statements using a 5-point Likert scale ranging from 0 (Very Little) to 4 (Very Much). All six items are summed to create a total score. Higher scores represent more fear of thoughts related to suicide and wanting to die. In this sample, the ASI-3-SCC demonstrated excellent internal consistency ($\alpha = .96$).

*Anxiety Sensitivity Index-3 Cognitive Concerns subscale (ASI-3-Cog; Taylor et al., 2007).*

The cognitive concerns subscale of the ASI-3 is a six-item measure of an individual’s fear of losing control of their mental processes. Participants were asked to rate how much they agree with each statement using a 5-point Likert scale ranging from 0 (Very Little) to 4 (Very Much). Items scores are summed to create the subscale score. Higher scores indicate more fear of the consequences of cognitive symptoms of anxiety. The ASI-3 has exhibited strong psychometric properties, including internal consistency, factor stability, and divergent validity (Chavarria et al., 2015; Farris et al., 2015; Taylor et al., 2007). In the current study, the ASI-3
cognitive subscale demonstrated excellent internal consistency ($\alpha = .92$).

*Depression Anxiety Stress Scales: Depression (DASS-21; Henry & Crawford, 2005)*.

The DASS-21 is a 21-item scale that measures depression symptoms, stress, and anxiety experienced over the past week. This study used the seven items from the depression subscale. Participants were asked to rate how much each statement applied to them during the past week using a 4-point scale with responses ranging from 0 (Did not apply to me at all) to 3 (Applied to me very much, or most of the time). Item scores are summed to create a subscale score with higher scores indicating more frequent depressive symptoms. The DASS has exhibited strong psychometric properties, including internal consistency, convergent validity, and divergent validity across cultures and age ranges (Henry & Crawford, 2005; Lee, 2019). In the current study, the DASS-21 depression subscale demonstrated excellent internal consistency ($\alpha = .94$).

*Depressive Symptom Inventory – Suicidality Subscale (DSI-SS; Metalsky & Joiner, 1997)*.

The DSI-SS is a subscale from the Hopelessness Depression Symptom Questionnaire. The subscale contains 4-items which measure SI over the past two weeks. Items were rated on a scale of 0 to 3, with higher ratings indicating more severity of SI. Items were then summed to create the suicidality subscale score. The DSI-SS has demonstrated excellent psychometric properties and has been shown to differentiate individuals with and without one or more historical suicide attempts in population-based samples (Metalsky & Joiner, 1997; von Glischinski et al., 2016). In the current study, the DSI-SS demonstrated good internal consistency ($\alpha = .88$).

*Beck Scale for Suicide Ideation – Worst-Point revision (BSS-WP; Beck et al., 1997)*.
The BSS-WP is a 21-item measure of SI history at the worst point in participants’ lives. Each item was rated on a 3-point scale ranging from 0 to 2 with higher ratings indicating more SI. Items are summed to create a total score. The BSS-WP has shown strong psychometric properties including reliability, construct validity, convergent, and discriminant validity (Beck, Brown, & Steer, 1997). In the current sample, the BSS-WP demonstrated excellent internal consistency ($\alpha = .94$).

Data analytic plan.

An Exploratory Factor Analysis (EFA) using Mplus (version 8.1; Muthén and Muthén, 2019) with a forced one-factor solution was used to determine whether the ASI-3-SCC was a unitary construct. The sample was split randomly in half, with 87 participants used in the EFA and 87 participants used in a Confirmatory Factor Analysis (CFA). A random number generator was used to assign participants either to the EFA or CFA analysis. Factors were extracted using a maximum likelihood method. Kaiser-Meyer-Olkin (KMO) of sampling adequacy, item communalities, and Bartlett’s test of sphericity were used to examine the factorability of ASI-3-SCC. The scree plot (Figure 1), factor matrix, eigenvalues, and parallel analysis were used to determine the fit of the forced one-solution structure. A CFA using the lavaan package (v. 0.6-5; Rosseel, 2012) in R (v. 3.6.1; R Core Team, 2019) using the remaining 87 participants to verify the EFA results. The recommendations presented by Brown (2006) and Hu and Bentler (1999) were used to evaluate goodness-of-fit for the model. Bivariate correlations between ASI-3-SCC scores and other predictors of suicide-related phenomena were examined to provide understanding regarding divergent and convergent validity (Table 3).

Descriptive statistics and regression analyses were conducted using SPSS (v. 23.0) and listwise deletion. Eight cases total were excluded due to missing data for the DASS-21
Depression subscale ($N=7$), ASI-3 Cognitive concerns subscale ($N=1$). The required sample size was achieved even after cases were removed due to missing data and patterns in significance remained unchanged. The data was examined for outliers using box plots for each measure. No univariate outliers were detected. Two multiple regression analyses were used to test whether ASI-3-SCC scores statistically predicted current SI and worst point SI. The authors chose to test the model on current SI to determine how sensitivity to SI impacts the frequency and intensity of SI in the short term. The model was tested on worst-point SI because previous research has indicated that worst-point SI may be a better predictor of suicide attempt than current SI (Beck et al., 1999). Depressive symptoms were added as a covariate to each of the regression models due to the close relationship with SI; however, analyses were also run without depressive symptoms, as suggested by Rogers and colleagues (2018). ASCC was a covariate for each of the regression models to investigate if the effects of suicide cognition concerns were attributable to ASCC. Due to the possible high multicollinearity among variables, the variance inflation factor (VIF) was set at a conservative cutoff of 3.00 (Craney and Surles, 2002).

To test the moderating role of ASI-3-SCC in the relationship between SI and ASCC, we conducted a moderation analysis using the SPSS PROCESS (3.0) macro by Hayes (2017). A 5000 bootstrapping sampling technique with 95% bias corrected confidence intervals was used with follow up analyses probing for interactions below $p < .10$ and conditioning values set at 16th, 50th, and 84th percentiles. We also conducted a moderation analysis to test the moderating role of ASI-3-SCC in the relationship between worst-point SI and ASCC. The data used in this manuscript may be found in the online data repository, Mendeley Data (Smith et al., 2019).

**Results**

Descriptive statistics as well as convergent and discriminant validity information are
presented in Table 3. DSI-SS (current SI), BSS-WP (worst point SI), DASS-21 (depression), and ASI-3-Cog (ASCC) exhibited significant skew and kurtosis, and were rank-transformed using Blom’s transformation to better approximate a normal distribution. Transformed variables were used in all analyses, however, non-transformed descriptive statistics are presented in Table 3 to ease interpretation.\(^1\) All VIF statistics were less than 3.00, suggesting no issues with multicollinearity were present.

**Factor structure of the ASI-3-SCC**

*Exploratory factor analysis.*

Extracted communalities of all ASI-3-SCC items were above .20, suggesting that these items share a large amount of variance with the unitary factor of the forced resulting one-factor solution. The matrix of the six scored ASI-3-SCC items were adequately factorable (KMO = .91; Bartlett’s test of sphericity \(\chi^2[15] = 702.21, p < .001\)). The scree plot of the EFA indicated one prominent factor (see Figure 1). This factor had an eigenvalue of 5.21 and accounted for 87% of the variance, suggesting a one-factor structure. The eigenvalue for a possible second factor was .31, lending further support for the one-factor arrangement. Results indicated an adequate-to-good fitting model: \(\chi^2(9)=30.844, p<.001, \text{RMSEA}=.167 (90\% \text{CI:} .105 \text{ to } .233, p=.002)\). All six items loaded onto the one factor and all factor loadings were above .85 (see Table 2), which is also consistent with a one-factor solution.

\(^1\) The pattern of significance was the same for transformed and non-transformed variables in the regression analyses. The non-transformed ASI-3-SCC and interaction term did not reach statistical significance in the moderation analysis.
Confirmatory factor analysis.

Recommendations from Brown (2006) and Hu and Bentler (1999) include a non-significant chi-square statistic ($\chi^2$), a Standardized Root Mean Square Residual (SRMR) value below .10, a Root Mean Square Error of Approximation (RMSEA) value less than .08, as well as Tucker-Lewis Index (TLI) and Comparative Fit Index (CFI) values above .90. The CFA consisted of one latent variable and six observable indicators. Results indicated an adequate-to-good fitting model across all indices except RMSEA: $\chi^2 (9)=26.858, p=.001$, SRMR=.027, RMSEA=.151 (90% CI: .089 to .218, $p=.008$), TLI=.945, CFI=.967.

Multiple linear regression analyses

To examine the association between ASI-3-SCC and DSI-SS, DASS-21$^2$ and ASI-3-Cog scores were added to step one, and the ASI-3-SCC was added in step two (see Table 4). The overall model was significant $F(2,161) = 36.20, p = .001$, $R^2 = .31$] and in step one found that DASS-21 was a significant predictor of DSI-SS [$\beta = .52, t(161) = 7.33, p < .001$] but ASI-3-Cog was not. In step two, there was a significant change in the variance explained [$F(3,160) = 30.70$, $\Delta R^2=.06, f^2 = .095, p < .001$], and DASS-21 [$\beta = .49, t(160) = 7.12, p < .001$] and ASI-3-SCC [$\beta = .28, t(160) = 3.72, p < .001$] were significant predictors of DSI-SS but ASI-3-Cog was not.

To determine whether ASI-3-SCC statistically predicted BSS-WP scores, DASS-21 and ASI-3-Cog scores were added to step one, and the ASI-3-SCC was added in step two (see Table 2). The pattern of significance for the overall model was the same with and without DASS-21 included in step one of the regression models. ASCC was a significant predictor of both current ideation and worst-point ideation in step one when DASS-21 was not included ($p < .01$) and was a significant predictor of current ideation ($p = .03$) but not worst-point ideation ($p = .48$) in the second step.

$^2$ The pattern of significance for the overall model was the same with and without DASS-21 included in step one of the regression models. ASCC was a significant predictor of both current ideation and worst-point ideation in step one when DASS-21 was not included ($p < .01$) and was a significant predictor of current ideation ($p = .03$) but not worst-point ideation ($p = .48$) in the second step.
5). The overall model was significant \(F(2,161) = 5.19, p = .007, R^2 = .06\), with DASS-21 scores significantly predicting BSS-WP \(\beta = .20, t(160) = 2.43, p = .016\) but not ASI-3-Cog scores. The second step, adding ASI-3-SCC, resulted in a significant change in the variance explained \(F(3,160) = 7.02, \Delta R^2 = .03, f^2 = .033, p < .001\), and ASI-3-SCC \(\beta = .28, t(160) = 3.18, p < .001\) and DASS-21 \(\beta = .17, t(160) = 2.09, p = .038\) were both significant predictors of BSS-WP, but ASI-3-Cog was not.

**Moderation analyses**

A moderation model was performed with ASI-3-Cog as the predictor variable, ASI-3-SCC as the moderating variable, and DSI-SS (current SI) as the outcome variable. The overall model was significant \(F(3,167) = 12.30, p < .001, R^2 = .18\). The interaction of ASI-3-Cog and ASI-3-SCC significantly predicted DSI-SS \(b = .02, t(167) = 2.00, p = .049, 95\% CI = .000 to .032, \Delta R^2 = .02, f^2 = .03\). Examination of simple slopes indicated that the interaction was significant at high levels of ASI-3-SCC \(t = 2.09, p = .038\). Specifically, when ASI-3-SCC scores reached 18.00, the interaction of ASI-3-Cog and ASI-3-SCC significantly predicted DSI-SS scores, \(b = .19, t(167) = 2.03, p = .044, 95\% CI = .005 to .370\).\(^3\) When DASS-21 scores (depressive symptoms) were added to the model as a covariate, the interaction term trended towards, but did not reach significance \(b = .01, t(167) = 1.86, p = .06, 95\% CI = -.001 to .028\) and significantly predicted SI at scores 65.85% and above.

A moderation model was performed with ASI-3-Cog as the predictor variable, ASI-3-SCC as the moderating variable, and BSS-WP (worst-point SI) as the outcome variable. The

\(^3\) When the moderator and independent variable were interchanged, the model was not significant, \(b = .05, t(167) = 1.84, p = .07, 95\% CI = -.003 to .095\).
overall model was significant $F(3, 167) = 4.27, p < .01, R^2 = .07$. Interaction of ASI-3-Cog and ASI-3-SCC, however, did not significantly predict worst point SI [$b = <0.01, t(167) = -0.65, p = 0.95, 95\% CI = -0.02$ to $0.02$]. When DASS-21 was added to the model as a covariate, the interaction term remained non-significant.

**Discussion**

This study examined how sensitivity to SI relates to the frequency and intensity of SI using the newly developed Anxiety Sensitivity Index-3 Suicidal Cognitions Concerns (ASI-3-SCC). Our findings indicated a one-factor solution for ASI-3-SCC and that ASCC and ASI-3-SCC scores were highly correlated, but not redundant, suggesting that individuals who interpret anxious cognitive symptoms as catastrophic may also interpret thoughts of suicide similarly. Further, supporting our hypotheses, increased sensitivity to suicidal thoughts was significantly associated with both current and worst-point SI. Lastly, our results indicated that ASI-3-SCC scores moderate the relationship between AS and current SI (but not worst-point), but this effect did not hold after accounting for depressive symptoms.

Sensitivity to thoughts of suicide and wanting to die was significantly associated with SI over the past two weeks after accounting for depression symptoms and ASCC. Similar to how individuals with elevated ASCC interpret anxious cognitive symptoms as being indicators of permanent detrimental consequences such as “going crazy” (Taylor et al., 2007), individuals with elevated sensitivity to SI may interpret such thoughts as more distressing, and catastrophize these thoughts as being signs of insanity or mental ruin. Importantly, the relationship was also

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4 When the moderator and independent variable were interchanged, the model was not significant, $b = <0.01, t(167) = -0.58, p = 0.56, 95\% CI = -0.013$ to $0.007$. 
significant when depression symptoms were not covaried out of the model. Individuals who are concerned with the consequences of suicidal thoughts also report more severe SI. Perhaps those who have more frequent thoughts of suicide do not feel in control of such thoughts and appraise their SI as more dangerous and more indicative of mental ruin. Although the construct is new, these results may provide insight into the relationship that global rumination has with SI (Rogers and Joiner, 2017). It is possible that individuals who consider thoughts of suicide to be a sign of mental ruin may be likely to attend to such thoughts more often and consider them uncontrollable, possibly preventing them from active coping (e.g., seeking mental health resources).

A lack of active coping in response to distressing thoughts may explain how SI might develop in those who appraise the cognitive symptoms as disastrous. Distress related to catastrophic cognitions about anxiety symptoms is thought to be exacerbated by ASCC, leading to more catastrophic cognitions in a positive feedback loop (Katz et al., 2011). For example, the depression-distress amplification model suggests that ASCC amplifies the distress related to cognitive symptoms of depression (e.g. anhedonia, lack of concentration, etc.), with SI developing as depression becomes more severe (Capron et al., 2013). Sensitivity to SI may follow a similar pattern, whereby catastrophic cognitions related to SI increase distress, leading to more intense thoughts of suicide. Sensitivity to SI was significantly associated with worst-point SI, even after accounting for depression and ASCC. Individuals who reported the most concern about thoughts of suicide also reported more SI at the worst point in their lives, indicating that they remember their worst point as more severe than those with low sensitivity to thoughts of suicide.
Sensitivity to suicidal thoughts moderated the relationship between current SI and ASCC, suggesting that an individual’s sensitivity to thoughts of suicide and wanting to die (at elevated levels) amplified the association that ASCC had with SI. This finding expands upon the established relationship between ASCC and suicide (Capron et al., 2012b; Norr et al., 2016; Oglesby et al., 2015; Schmidt et al., 2014) by suggesting that sensitivity to thoughts of suicide specifically, in addition to cognitive symptoms more broadly, impacts the severity of SI. Individuals who are prone to catastrophizing the consequences of anxious cognitive symptoms and thoughts about suicide may experience compounded psychological distress, leading to increased SI. When depression symptoms were accounted for, however, sensitivity to thoughts of suicide no longer moderated the relationship between ASCC and current SI. Rogers and colleagues (2018) suggest that statistical models containing SI with depression symptoms excluded relates to the will to attempt suicide, whereas SI with depression symptoms included is related to a desire for death. Therefore, sensitivity to thoughts of suicide and wanting to die may contribute to increased desire for death, due to increased psychological distress, but may not be indicative of the stronger capability for suicide that is associated with fearlessness about death. Sensitivity to thoughts of death and suicide did not moderate the relationship between ASCC and worst-point SI, indicating that reactions to thoughts of suicide do not impact the relationship between ASCC and desire for death or will to attempt suicide at the worst point in a person’s life.

These results have important clinical implications. Sensitivity to thoughts of suicide and wanting to die is likely to lead to worry about the consequences of those thoughts. As prior research has found, worry about suicidal thoughts is positively related to SI and suicide risk and that distraction was negatively associated with SI and risk (Tucker et al., 2017). Therefore,
efforts to instruct individuals who are highly sensitive to thoughts of suicide to distract themselves instead of worrying about the consequences of such thoughts may help to lessen distress and SI. At extreme levels, sensitivity to SI might manifest as suicidal obsessions in obsessive-compulsive disorder (OCD) and require more thorough intervention in the form of exposure and response prevention therapy (Al-Zaben, 2012; Rachamallu et al., 2017; Wetterneck et al., 2016). The present study did not incorporate measures of OCD symptomatology, requiring future research to determine the relationship between sensitivity to SI and OCD. Altering cognitive bias modification (CBM) treatments (Capron and Schmidt, 2016; Capron et al., 2017) to reduce sensitivity to thoughts of suicide and wanting to die represent a promising area for future research in reducing SI.

This study had several limitations. First, the cross-sectional design used here makes causal conclusions about the relationship between sensitivity to thoughts of suicide and SI impossible. There were also no attention checks included in the online questionnaire to ensure quality of responding. While outlier analyses were conducted to detect unusual responses, future studies would improve upon these results by embedding quality assurance items, especially in lengthy questionnaires. The sample was limited to undergraduate students, who may not be representative of all individuals experiencing SI. Participants had a history of SI, but few participants had past suicide attempts, making analyses of suicidal behaviors impossible. Future research should test the ASI-3-SCC using a sample with a higher proportion of attempt survivors to assess how sensitivity to SI relates to suicidal behaviors. The ASI-3-SCC examines a variety of different types of thoughts about suicide and wanting to die, in order to capture responses to the types of SI that many people experience. Therefore, we cannot say with certainty which types of thoughts
are contributing to the relationships described here. Reactions to passive thoughts about wanting to die may impact SI very differently from thoughts related to planning a suicide attempt. Future studies should seek to differentiate between reactions to different types of thoughts about suicide and wanting to die to better define those relationships. Additionally, psychometric tests of the ASI-3-SCC in the current study were preliminary. The RMSEA fit statistics for the EFA and CFA were outside of conventional recommendations for model fit, which may be attributed to the relatively small sample size and small degrees of freedom used in the current study (Kenny et al., 2015). Future studies should examine the factor structure of this new measure in larger sample sizes in order to gain more confidence in the fit of the one factor solution. Tests of convergent and divergent validity as well as test-retest reliability are needed in future studies. Longitudinal and intervention designs would help determine the directionality of these relationships.

Further examination into this construct could provide insight into preventative measures that have been used for related constructs, such as ASCC. Treatments directed at reducing ASCC have been found to reduce suicide risk (Schmidt et al., 2014). A CBM directed at thoughts of suicide and wanting to die may decrease sensitivity to those thoughts and therefore decrease SI. Future research should examine if CBM targeted at reducing sensitivity to thoughts of suicide and wanting to die would decrease the frequency and/or intensity of such thoughts.

Acknowledgements: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Interest: None.
References


Table 1. Sample demographics

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<th>Sample Size</th>
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<tbody>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>19.78 (3.07)</td>
</tr>
<tr>
<td>Range</td>
<td>18 – 41</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>74.9%</td>
</tr>
<tr>
<td>Male</td>
<td>25.1%</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>78.9%</td>
</tr>
<tr>
<td>African American/Black</td>
<td>1.7%</td>
</tr>
<tr>
<td>Asian</td>
<td>2.3%</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>5.7%</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>6.3%</td>
</tr>
<tr>
<td>Mixed</td>
<td>5.1%</td>
</tr>
<tr>
<td>Suicidal Thoughts and Behaviors</td>
<td></td>
</tr>
<tr>
<td>Lifetime suicide attempt</td>
<td>16.0%</td>
</tr>
<tr>
<td>Suicidal ideation in the past year</td>
<td>73.6%</td>
</tr>
<tr>
<td>SBQ-R ≥7</td>
<td>77.0%</td>
</tr>
</tbody>
</table>
Table 2. Factor loadings based on an exploratory factor analysis with a forced one-factor solution for items from the Anxiety Sensitivity Index-3 Suicidal Cognition Concerns scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When I cannot keep my mind off of suicide or wanting to die, I worry that I might be going crazy.</td>
<td>0.86</td>
</tr>
<tr>
<td>2. It scares me when I am unable to keep my mind off of suicide or wanting to die.</td>
<td>0.85</td>
</tr>
<tr>
<td>3. When I think about suicide or wanting to die, I worry that I may be mentally ill.</td>
<td>0.92</td>
</tr>
<tr>
<td>4. When my thoughts of suicide or wanting to die seem to speed up, become stronger, or become more frequent, I worry that I might be going crazy.</td>
<td>0.96</td>
</tr>
<tr>
<td>5. When I have trouble thinking about things other than suicide or wanting to die, I worry that there is something wrong with me.</td>
<td>0.94</td>
</tr>
<tr>
<td>6. When my mind is stuck on thoughts of suicide or wanting to die, I worry that there is something terribly wrong with me.</td>
<td>0.97</td>
</tr>
</tbody>
</table>
Figure 1. Scree Plot for the Exploratory Factor Analysis of the six-item Anxiety Sensitivity Index-3 Suicidal Cognition Concerns.
Table 3. Convergent and Discriminant Validity Correlations and Descriptive Statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ASI-3-SCC</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. ASI-3-Cog</td>
<td>.552**</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. BSS-WP</td>
<td>.260**</td>
<td>.148</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. DSI-SS</td>
<td>.403**</td>
<td>.328**</td>
<td>.356**</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>5. DASS-21</td>
<td>.292**</td>
<td>.391**</td>
<td>.249**</td>
<td>.555**</td>
<td>--</td>
</tr>
<tr>
<td>Mean</td>
<td>9.52</td>
<td>6.64</td>
<td>11.97</td>
<td>1.84</td>
<td>9.93</td>
</tr>
<tr>
<td>SD</td>
<td>8.2</td>
<td>6.57</td>
<td>9.44</td>
<td>2.12</td>
<td>5.33</td>
</tr>
<tr>
<td>Range</td>
<td>0 - 24</td>
<td>0 - 24</td>
<td>0 - 37</td>
<td>0 - 8</td>
<td>4 - 25</td>
</tr>
</tbody>
</table>

*Note: **p < .01, *p < .05. ASI-3-SCC = Anxiety Sensitivity Index-3 Suicidal Cognition Concerns. ASI-3-Cog = Anxiety Sensitivity Index-3 Cognitive Concerns Subscale. BSS-WP = Beck Scale for Suicide Ideation-Worst point revision. DSI-SS = Depressive Symptom Inventory-Suicidality Subscale. DASS-21 = Depression Anxiety Stress Scales: Depression.*
Table 4. Results from the hierarchical multiple regression examining the incremental predictive validity of ASI-3-SCC on DSI-SS scores

<table>
<thead>
<tr>
<th></th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$\beta$</th>
<th>$SE$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASS-21</td>
<td>.31</td>
<td>.52</td>
<td>.06</td>
<td>7.33</td>
<td>&lt; .001</td>
<td></td>
</tr>
<tr>
<td>ASI-3-Cog</td>
<td></td>
<td></td>
<td>.07</td>
<td>.06</td>
<td>.96</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td>.37</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASI-3-SCC</td>
<td></td>
<td></td>
<td>.28</td>
<td>.01</td>
<td>3.72</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

Note. **p<.001. *p<.05. DSI-SS = Depressive Symptom Inventory – Suicide Subscale. DASS-21 = Depression Anxiety Stress Scales: Depression. ASI-3-Cog = Anxiety Sensitivity Index-3 Cognitive Concerns Subscale. ASI-3-SCC = Anxiety Sensitivity Index-3 Suicidal Cognition Concerns.
Table 5. Results from the hierarchical multiple regression examining the incremental predictive validity of ASI-3-SCC on BSS-WP scores

<table>
<thead>
<tr>
<th></th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
<th>$\beta$</th>
<th>$SE$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASS-21</td>
<td>.06</td>
<td>.20</td>
<td>.08</td>
<td>2.43</td>
<td>.016</td>
<td></td>
</tr>
<tr>
<td>ASI-3-Cog</td>
<td>.09</td>
<td>.08</td>
<td>.08</td>
<td>.95</td>
<td>.36</td>
<td></td>
</tr>
<tr>
<td>ASI-3-SCC</td>
<td></td>
<td>.28</td>
<td>.01</td>
<td>3.18</td>
<td>&lt; .001</td>
<td></td>
</tr>
</tbody>
</table>

Note. **$p$ < .001. *$p$ < .05. BSS-WP = Beck Scales for Suicide Ideation-Worst point revision. DASS-21 = Depression Anxiety Stress Scales: Depression. ASI-3-Cog = Anxiety Sensitivity Index-3 Cognitive Concerns Subscale. ASI-3-SCC = Anxiety Sensitivity Index-3 Suicidal Cognition Concerns.