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## Anxiety sensitivity cognitive concerns predict suicide risk

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## ABSTRACT

Anxiety sensitivity (AS) cognitive concerns, which reflects fears of mental incapacitation, have been previously associated with suicidal ideation and behavior. The first study aim was to replicate and extend upon previous research by investigating whether AS cognitive concerns can discriminate between those at low risk versus high risk for suicidal behavior. Secondly, we aimed to test the incremental predictive power of AS cognitive concerns above and beyond known suicide risk factors (i.e., thwarted belongingness and insomnia). The sample consisted of 106 individuals (75% meeting current criteria for an Axis I disorder) recruited from the community. Results revealed that AS cognitive concerns were a robust predictor of elevated suicide risk after covarying for negative affect, whereas AS social and physical concerns were not. Those with high, relative to low, AS cognitive scores were 3.67 times more likely to be in the high suicide risk group. Moreover, AS cognitive concerns significantly predicted elevated suicide risk above and beyond relevant suicide risk factors. Results of this study add to a growing body of the literature demonstrating a relationship between AS cognitive concerns and increased suicidality. Incorporating AS cognitive concerns amelioration protocols into existing interventions for suicidal behavior may be beneficial.

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## 1. Introduction

According to the Centers for Disease Control and Prevention, suicide is the 10th leading cause of death for Americans, with someone in the country dying by suicide every 13.7 min (CDC, 2010). Previous research has found that death by suicide is strongly predicted by both suicidal ideation and suicide attempt history (Weissman et al., 1989; Kessler et al., 1999). In addition, the National Comorbidity Survey found that approximately 70% of individuals with a lifetime history of suicide attempt met criteria for at least one anxiety disorder (Sareen et al., 2007). Recent research has indicated that anxiety disorders are significantly related to suicide, even after accounting for other relevant constructs such as depression. For example, Nepon et al. (2010) found anxiety disorders to be significantly associated with an increase in suicide attempts, even after covarying for Axis I and Axis II diagnoses.

Accurate categorization of suicide risk is clinically vital, helping to guide arguably the most important decisions a mental health care provider will have to make. Therefore, identifying risk factors that help to discriminate between individuals at low versus high risk for serious suicidal behavior is an important avenue for research. Previous research has proposed that there are distinct differences in suicide risk between individuals with passive thoughts about suicide and

individuals with a plan to kill themselves and/or a prior attempt (Joiner et al., 1999; Wingate et al., 2004). Specifically, two factors are particularly important when considering suicide risk: (1) past attempt history and (2) the nature of suicidal symptoms (i.e., resolved plans versus ideation) (Joiner et al., 1999). Within this framework, individuals with a past history of suicide attempt and/or resolved plans and preparations are at higher risk for death by suicide, whereas individuals showing only suicidal ideation are considered at a low risk.

One factor that has received recent attention in regard to suicide risk is anxiety sensitivity (AS), which refers to an individual's fear of anxiety-related sensations (Reiss et al., 1986). Previous research has established AS as a multidimensional construct comprised of three separate dimensions referring to fears of the physical, cognitive and social domains of anxiety (Taylor et al., 2007a). The AS physical concerns subscale reflects a fear of physical disaster (e.g., "It scares me when my heart beats rapidly"), such as a heart attack. The AS social concerns subscale reflects adverse social consequences associated with anxiety (e.g., "I worry that other people will notice my anxiety"). AS cognitive concerns refer to an individual's fear of cognitive dyscontrol or mental incapacitation (e.g., "When my thoughts seem to speed up, I worry that I might be going crazy") while feeling anxious or stressed.

AS is robustly associated with various forms of anxiety psychopathology (Taylor et al., 1992; Schmidt et al., 1997, 2006; Rodriguez et al., 2004). In addition, recent research has consistently suggested AS as an important risk factor involved in suicidal ideation and attempt history (Capron et al., 2012b, 2012c). AS cognitive concerns, in

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particular, appear to play an important role in suicide. Specifically, Capron et al. (2012c) found an association between AS cognitive concerns and suicidal ideation and suicide attempt in a sample of clinical outpatients. In addition, AS cognitive concerns were found to prospectively predict the initiation of suicidal ideation in a group of military cadets (Capron et al., 2012b). This association has been described within the depression–distress amplification model (Capron et al., 2012d), which suggests that AS cognitive concerns amplify the distress caused by uncomfortable feelings experienced when an individual is depressed. Specifically, the depression–distress amplification model proposes AS cognitive concerns as the mechanism that exacerbates the feelings of distress that accompany dysphoria. Suicidal ideation, a symptom of severe depression, manifests once the distress resulting from amplified depression reaches severe levels.

Despite emerging evidence suggesting an important relationship between AS cognitive concerns and suicidality, there are still a number of gaps in the literature. First, prior research has not investigated the predictive power of AS cognitive concerns in discriminating between individuals at low versus high risk for suicide attempts. Given the clinical importance of suicide risk classification, it is vital to examine the relationship between AS cognitive concerns and suicide indicators (e.g., whether individuals have a plan to kill themselves or have made a prior attempt) that are central to predicting risk. Second, in previous research examining the relationship between AS cognitive concerns and suicide attempt history (Capron et al., 2012b, 2012c), the original ASI (Reiss et al., 1986) was used to measure AS cognitive concerns. Continuing to elucidate this relationship using the ASI-3 (Taylor et al., 2007a) is needed, as this newer scale was designed to more reliably measure the AS subfactors. Finally, prior research has primarily investigated this relationship in fairly homogenous samples, thus limiting the generalizability of these findings.

The aim of the current study was to address these current gaps in the AS cognitive concerns and suicide literature by: (1) utilizing a treatment-seeking sample with various anxiety and mood diagnoses; (2) using a more psychometrically refined measure of AS cognitive concerns (i.e., ASI-3); (3) examining the predictive power of AS cognitive concerns in discriminating between those at low versus high risk for serious suicidal behavior; (4) testing the specificity of this relationship within the AS subfactors and (5) examining the specific association between AS and serious suicidal behavior, above and beyond the influence of other relevant suicidal risk factors including thwarted belongingness and insomnia. Thwarted belongingness and insomnia were included as covariates in the present investigation given their strong association with both suicidal behavior and anxiety sensitivity (Joiner et al., 2009; Joiner, 2009; Fairholme et al., 2012; Nadorff et al., 2012). Based on previous findings (Schmidt et al., 2001; Capron et al., 2012a, 2012c), we hypothesized that AS cognitive concerns would significantly predict individuals at low versus high risk for serious suicidal behavior after accounting for negative affectivity, whereas AS physical and social concerns would not. In addition, we hypothesized that AS cognitive concerns would robustly discriminate between those at a low versus high risk for serious suicidal behavior after covarying for thwarted belongingness, insomnia and negative affectivity.

## 2. Methods

### 2.1. Participants

106 individuals were recruited from the community to participate in a randomized clinical trial investigating the effects of a computerized treatment targeting specific risk factors associated with suicidality and post-traumatic stress disorder (PTSD), namely AS. Data for the present report were collected as part of a larger study (Schmidt et al., 2014). To be included, individuals had to be 18 years of age or older, English speakers, and report elevated levels of AS cognitive concerns. Individuals were excluded if they were suffering from psychotic and/or bipolar-spectrum disorders or were not stabilized on medication. Ages of the participants ranged from 18 to 87 ( $M=40.80$ ,  $S.D.=17.45$ ) and gender was fairly evenly

distributed (46.2% males). 50.9% were single, 17.9% married, 4.7% separated, 0.9% cohabitating, and 25.6% were divorced or widowed. The race/ethnicity was distributed as such: 67.9% White, 20.8% Black, 3.8% Hispanic, 0.9% Asian and 6.6% Other (e.g., bi-racial). With regard to the diagnostic makeup of the sample, participant's primary diagnoses were as follows: 36% anxiety disorders, 17% trauma and stressor-related disorders, 4% obsessive–compulsive and related disorders, 15% mood disorders, 3% substance-related diagnosis, 21% no diagnosis and 4% other (e.g., anorexia nervosa).

### 2.2. Procedure

Individuals were recruited from the community via newspaper advertisements and flyers. Those deemed potentially eligible after an initial screening process were scheduled for a baseline appointment during which they completed a battery of self-report measures and a semi-structured diagnostic interview for the DSM-IV-TR Axis I disorders (First et al., 1996). Following the baseline assessment, eligible participants were randomly assigned to either a cognitive anxiety sensitivity treatment or a health information control condition. After the treatment phase, individuals were followed up at 1 month post-treatment. The current study utilizes data obtained during the baseline appointment, which took place prior to randomization and the onset of treatment. All procedures were approved by the university's institutional review board and data was collected after informed consent was obtained.

### 2.3. Measures

#### 2.3.1. Clinician administered

**2.3.1.1. Structured Clinical Interview for DSM-IV (SCID).** All psychiatric diagnoses were determined using the SCID-NP (First et al., 1996). The SCID was administered by trained doctoral candidate therapists who completed extensive training in the administration and scoring of the SCID. Training included reviewing SCID training tapes, observing live SCID administrations, and conducting mock interviews with other trained therapists. Throughout the process of training, all trainees received feedback until they demonstrated high levels of reliability. In addition, all SCIDs were reviewed by a licensed clinical psychologist to ensure accurate diagnoses. Percent agreement between clinical interviewers for random sample of these SCID interviews resulted in high inter-rater agreement (e.g., over 80% with a kappa of 0.77).

#### 2.3.2. Self-report measures

**2.3.2.1. Anxiety Sensitivity Index-3 (ASI-3).** The ASI-3 is an 18-item self-report questionnaire designed to measure fears of physiological arousal (Taylor et al., 2007b). The ASI-3 is a modification of the original ASI (Reiss et al., 1986). The multidimensional scale assesses three of the most commonly replicated subfactors of anxiety sensitivity (physical, cognitive, and social concerns). Respondents were asked to read a series of statements and rate the degree to which they agreed with each statement (e.g. "It scares me when my heart beats rapidly", "When I cannot keep my mind on a task, I worry that I might be going crazy" and "I worry that other people will notice my anxiety") using a five-point Likert type scale ranging from 0 (*Very little*) to 4 (*Very much*). Research has demonstrated that the ASI-3 is a reliable and valid measure of anxiety sensitivity (Taylor et al., 2007b). For the present analyses, internal consistency was good for the ASI-3 cognitive, physical, and social concerns subscales ( $\alpha=0.94$ ,  $\alpha=0.89$ ,  $\alpha=0.88$ ).

**2.3.2.2. Interpersonal Needs Questionnaire (INQ).** The INQ is a 15-item self-report questionnaire designed to measure two constructs defined by the Interpersonal Theory of Suicide: thwarted belongingness and perceived burdensomeness (Van Orden et al., 2010). Individuals are asked to read a series of statements and rate how they have been feeling recently on a seven-point Likert type scale ranging from 1 (*Not at all true for me*) to 7 (*Very true for me*). Previous research has demonstrated high internal consistency and construct validity for both subscales (Van Orden et al., 2008, 2012). In the present investigation, only five items from thwarted belongingness subscale were administered, as they were part of a larger ongoing study. In the current sample, internal consistency for this subscale was excellent ( $\alpha=0.94$ ).

**2.3.2.3. Insomnia Severity Index (ISI).** The ISI is a brief five-item self-report questionnaire assessing current sleep difficulties, satisfaction with current sleep pattern, and interference with everyday functioning due to sleep difficulties (Bastien et al., 2001). Items are rated on a five-point Likert type scale. The ISI has been demonstrated to be both a valid and reliable measure of insomnia (Bastien et al., 2001). Only a subset of items were included in the questionnaire battery (i.e., items one through three), as they were part of a larger ongoing investigation. The questionnaire demonstrated good reliability ( $\alpha=0.86$ ) in the current sample.

**2.3.2.4. Positive and Negative Affect Schedule-Expanded Form (PANAS-X).** The PANAS-X is a 60-item self-report measure consisting of 13 subscales including negative affect (Watson and Clark, 1999). Items are rated on a five-point Likert type scale ranging from 1 (*Very slightly or none*) to 5 (*Extremely*). Previous research has indicated that the PANAS-X has acceptable internal consistency, temporal

reliability, and convergent validity (Watson and Clark, 1999). Within the current investigation, the PANAS-X negative affect subscale was used to account for the effects of an underlying temperament. In the present investigation, the PANAS-X negative affect subscale demonstrated excellent internal consistency ( $\alpha=0.93$ ).

**2.3.2.5. Suicide risk.** Severity of suicidal risk was assessed using the Suicidal Behavior Questionnaire-Revised (SBQ-R). The SBQ-R is a brief four-item self-report questionnaire targeting lifetime prevalence of suicidal thoughts and behaviors, current suicidal ideation, and suicidal risk (Osman et al., 2001). In the current investigation, only SBQ-R item 1 (*Have you ever thought about or attempted to kill yourself?*) was used to determine suicide risk. Prior research has demonstrated clinically important and distinct differences among suicidal ideators and those with plans and/or previous attempts (Joiner et al., 1999). Thus, *low suicide risk* was defined as someone who had never thought about or attempted to kill themselves or had only a brief passing thought about attempting to kill themselves. *High suicide risk* was defined as someone who had a plan to kill themselves or had made a prior attempt.

### 3. Results

#### 3.1. Sample descriptives

High suicide risk, as defined by a prior suicide attempt or a plan for suicide, was found in 29% of the sample. In addition, 19% of the sample endorsed having attempted suicide at least once in the past. Bivariate correlations between the measures are shown in Table 1. As expected due to the association between the constructs that were assessed, all measures were significantly correlated. Notably, the ASI-3 cognitive subscale was significantly correlated with SBQ-R item one ( $r=0.29$ ). In addition, the ASI-3 social concerns subscale was significantly correlated with SBQ-R item one ( $r=0.28$ ), whereas the physical concerns subscale was not ( $r=0.09$ ).

#### 3.2. Primary analyses

Direct logistic regression was performed to assess the incremental influence of ASI-3 cognitive concerns on the likelihood that respondent's would endorse elevated suicide risk. To test the specificity of this relationship, the model contained four independent variables, negative affect, ASI-3 cognitive concerns, ASI-3 physical concerns and ASI-3 social concerns subscale scores. Negative affect was included to control for general mood and anxiety psychopathology. The full model containing all predictors was statistically significant,  $\chi^2(1, N=104)=4.03, P=0.04$ , indicating that the model was able to distinguish between individuals based on suicide risk. The model as a whole explained between 3.8% (Cox and Snell *R* square) and 5.4% (Nagelkerke *R* squared) of the variance in suicidal behavior, and correctly classified 71.2% of cases. Results indicated that the ASI-3 cognitive subscale was a robust predictor of elevated suicide risk (OR=1.11, Wald=5.31,  $P=0.021$ ), whereas negative affect (OR=1.02, Wald=0.43,  $P=0.51$ ),

ASI-3 physical concerns (OR=0.93, Wald=2.16,  $P=0.142$ ) and ASI-3 social concerns (OR=1.05, Wald=0.89,  $P=0.345$ ) were not.

An additional direct logistic regression was performed to derive an odds ratio for high risk for suicidal behavior given low versus high ASI-3 cognitive concerns group. To obtain this, we split individuals into two groups, low and high ASI-3 cognitive concerns, using a median split (Median=11). ASI-3 cognitive concerns low versus high group was the only independent variable in the model. The full model was statistically significant  $\chi^2(1, N=104)=8.61, P=0.003$ , indicating that the model was able to distinguish between individuals based on suicide risk. The model as a whole explained between 7.8% (Cox and Snell *R* square) and 11.1% (Nagelkerke *R* squared) of the variance in suicidal behavior, and correctly classified 70.8% of cases. Results indicated that ASI-3 cognitive concerns low versus high group was a robust predictor of elevated suicide risk (OR=3.67, Wald=7.96,  $P=0.005$ ), which suggests that an individual is 3.67 times more likely to be in the high suicide risk group if they are also in the high ASI-3 cognitive concerns group.

A final direct logistic regression was performed to assess the influence of ASI-3 cognitive concerns on the likelihood that respondent's would report an increased suicide risk after covarying for other known associated variables. The model contained four independent variables, negative affect, ASI-3 cognitive subscale scores, insomnia and thwarted belongingness. Insomnia and belongingness were included given their strong association with both suicidal behavior and anxiety sensitivity (Joiner, 2009; Fairholme et al., 2012; Nadorff et al., 2013). The full model containing all predictors was statistically significant,  $\chi^2(4, N=104)=10.58, P=0.03$ . The model as a whole explained between 9.7% (Cox and Snell *R* square) and 13.8% (Nagelkerke *R* squared) of the variance in suicidal behavior, and correctly classified 69.2% of cases. Once again, the ASI-3 cognitive subscale was a robust predictor of elevated suicide risk (OR=1.10, Wald=5.84,  $P=0.016$ ), whereas negative affect (OR=1.08, Wald=0.42,  $P=0.52$ ), insomnia (OR=0.99, Wald=0.03,  $P=0.87$ ) and thwarted belongingness (OR=0.99, Wald=0.003,  $P=0.96$ ) were not.

### 4. Discussion

As hypothesized, AS cognitive concerns significantly classified individuals at low versus high risk for suicide among a heterogeneous sample comprised mainly of individuals with anxiety and mood disorder diagnoses. These findings remained significant even after accounting for overall negative affect. Our results support a growing body of work establishing AS cognitive concerns as an important factor in relation to suicidal behavior and risk (Schmidt et al., 2001; Capron et al., 2012a, 2012c). Moreover, results indicated that this relationship was specific to AS cognitive concerns as we also found that AS social concerns and AS physical concerns did not

**Table 1**  
Zero-order correlations, means, standard deviations, and ranges.

	1	2	3	4	5	6	7	Mean	S.D.
1. ASI-3 Cog	–							11.04	7.05
2. ASI-3 Soc	0.59***	–						11.30	6.42
3. ASI-3 Phys	0.54***	0.60***	–					9.00	6.40
4. SBQ-R 1	0.29**	0.28**	0.09	–				2.12	1.05
5. PANAS-NA	0.46***	0.50***	0.47***	0.18	–			23.09	10.16
6. INQ-TB	–0.27**	–0.36***	–0.28**	–0.21*	–0.28**	–		21.38	5.30
7. ISI	0.32**	0.32**	0.36***	0.09	0.31**	–0.18	–	9.65	5.30

Note: ASI-3 Cog=Anxiety Sensitivity Index 3, cognitive subscale; ASI-3 Soc=Anxiety Sensitivity Index 3, social subscale; ASI-3 Phys=Anxiety Sensitivity Index 3, physical subscale; SBQ-R 1=Suicidal Behavior Questionnaire-Revised, item 1; PANAS-NA=Positive and Negative Affect Schedule, negative affect subscale; INQ-TB=Interpersonal Needs Questionnaire, thwarted belongingness select items; ISI=Insomnia Severity Index, select items.

\*  $P < 0.05$ .

\*\*  $P < 0.01$ .

\*\*\*  $P < 0.001$ .

incrementally predict suicide risk group. These findings are consistent with previous research demonstrating discrete associations among AS subfactors and anxiety-relevant outcomes (Deacon and Abramowitz, 2006; Rector et al., 2007). In particular, these findings are consistent with research demonstrating the cognitive subfactor of AS as being predictive of previous suicide attempts, whereas the physical subscale of AS was not (Capron et al., 2012c).

This study was the first to investigate the relationship among AS cognitive concerns, thwarted belongingness and insomnia when predicting increased suicide risk. As predicted, AS cognitive concerns were able to discriminate between individuals at low versus high risk for suicidal behavior, even after accounting for these other known suicidal risk factors. According to the Interpersonal Theory of Suicide (Van Orden et al., 2010), thwarted belongingness, which is defined as an unmet need for social connectedness, is an important factor when determining an individual's suicide risk. Specifically, the theory posits that mood-related risk factors, such as thwarted belongingness, increases one's risk for suicidal ideation and attempts (Van Orden et al., 2010). In addition, the extant literature has shown that insomnia plays a significant role in regards to increased suicidality, even after accounting for depression and additional relevant covariates (Ribeiro et al., 2012). Within this context, insomnia is viewed as a symptom of psychological overarousal (i.e., anxiety), which may lead to increased risk for acute death by suicide (Ribeiro et al., 2012). Given the robust association between suicide risk group and AS cognitive concerns, above and beyond thwarted belongingness and insomnia symptoms, our results highlight the importance of AS cognitive concerns as a predictor of increased suicidality.

Taken together, our results are consistent with the depression–distress amplification model (Capron et al., 2012d) wherein AS cognitive concerns are thought to exacerbate responses to feelings of depression, leading to increased suicidal ideation. Within this model, suicidal ideation is considered a symptom of depression that corresponds to the severity of the depressive episode. Similar to the way AS increases distress in response to uncomfortable physical sensations (Schmidt et al., 2007b), AS cognitive concerns may amplify the distress brought on by feelings of dysphoria. Suicidal ideation emerges when this amplification reaches severe levels. Given the recent criticism within psychological science for its lack of replication (Pashler and Wagenmakers, 2012), these findings provide an important replication and extension of previous work investigating the relationship between these two constructs.

The results of the present investigation highlight the importance of assessing AS cognitive concerns when evaluating suicide risk. In addition to inquiring about current ideation, plans, preparations and prior attempts, clinicians should assess elevations in AS cognitive concerns as part of a comprehensive suicide risk assessment. In addition, when appropriate, clinicians should consider utilizing brief AS interventions, as these protocols may offer a novel means to reduce current risk among suicidal patients. Indeed, a number of studies have shown that AS can be successfully lowered (Keough and Schmidt, 2012). Specifically, Schmidt et al. (2007a) demonstrated that a brief AS intervention could significantly reduce overall AS and that these reductions were sustained at a 2-year follow-up. More recent research has demonstrated that interventions targeting AS cognitive concerns dimensions are successful at reducing overall AS cognitive concerns as well as disorder specific symptomology over a 1 month follow-up (Mitchell et al., 2014). Future work should continue to investigate the effectiveness of AS cognitive concerns interventions in terms of suicide risk.

Limitations of the current study should be considered in light of future directions. First, given the cross-sectional nature of the current study, clear conclusions regarding causality cannot be made. Specifically, our findings as support for the depression–distress amplification model are tempered given that our study did not directly assess this model. Future investigations should examine the relationships between

these variables prospectively in order to elucidate the temporal relationships among them. In addition, future work should attempt to experimentally test the depression–distress amplification model and the effect of the proposed mechanism, AS cognitive concerns, in terms of suicidal outcomes. Second, it is possible that the association between AS cognitive concerns and suicidality may not generalize to actual death by suicide. It should be noted however, that suicide attempt is the strongest predictor of death by suicide (Suominen et al., 2004). In addition, the current sample size was relatively small. Future investigations should attempt to replicate these findings in larger samples. Data on perceived burdensomeness and hopelessness were not available in the current investigation. Future work should seek to investigate the predictive power of AS cognitive concerns after accounting for these well-established risk factors for suicidal behavior. Although the current investigation accounted for levels of negative affect, future work may benefit from investigating these associations after accounting for levels of general anxiety. Lastly, future investigations should seek to examine these relationships without a dichotomous outcome variable.

Despite these limitations, the current study provides valuable information in regards to the role of AS cognitive concerns in predicting suicide risk. As previously stated, to our knowledge this investigation is the first to examine the relationship among AS cognitive concerns, thwarted belongingness, insomnia and suicide risk. Our findings are promising, given previous research demonstrating the malleability of AS. Future work investigating the efficacy of brief AS cognitive concerns interventions will be crucial in determining the generalizability of these findings.

## Contributors

Author one wrote the majority of the introduction, results, and discussion sections. Author two assisted with writing the introduction and discussion sections. Author three wrote the methods section and conducted literature searches. Author four provided critical feedback on all drafts of the manuscript. All authors contributed significantly to the manuscript and approved the final version being submitted.

## Conflicts of interest

We have no conflicts of interests to disclose.

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