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## Psychiatry Research

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# Test of the depression distress amplification model in young adults with elevated risk of current suicidality

Daniel W. Capron<sup>a</sup>, Dorian A. Lamis<sup>b</sup>, Norman B. Schmidt<sup>a,\*</sup><sup>a</sup> Department of Psychology, Florida State University, Tallahassee, FL, USA<sup>b</sup> Department of Psychiatry and Behavioral Sciences, Emory University School of Medicine, Atlanta, GA, USA

## ARTICLE INFO

## Article history:

Received 20 September 2013

Received in revised form

27 June 2014

Accepted 6 July 2014

Available online 12 July 2014

## Keywords:

Comorbidity

Cognitive vulnerability factors

Anxiety sensitivity

Prevention

## ABSTRACT

Suicide is a leading cause of death among young adults and the rate of suicide has been increasing for decades. A depression distress amplification model posits that young adults with comorbid depression and anxiety have elevated suicide rates due to the intensification of their depressive symptoms by anxiety sensitivity cognitive concerns. The current study tested the effects of anxiety sensitivity subfactors as well as the depression distress amplification model in a very large sample of college students with elevated suicide risk. Participants were 721 college students who were at elevated risk of suicidality (scored > 0 on the Beck Scale for Suicide Ideation). Consistent with prior work, anxiety sensitivity cognitive concerns, but not physical or social concerns, were associated with suicidal ideation. Consistent with the depression distress amplification model, in individuals high in depression, anxiety sensitivity cognitive concerns predicted elevated suicidal ideation but not among those with low depression. The results of this study corroborate the role of anxiety sensitivity cognitive concerns and the depression distress amplification model in suicidal ideation among a large potentially high-risk group of college students. The depression distress amplification model suggests a specific mechanism, anxiety sensitivity cognitive concerns, that may be responsible for increased suicide rates among those with comorbid anxiety and depression.

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## 1. Introduction

Among young adults in the United States, suicide is the second leading cause of death (American College Health Association, 2007). This public health threat appears to be escalating as the suicide rate among young adults has tripled since 1950's (American College Health Association, 2007). Despite these alarming statistics, the vast majority (over 90%) of individuals who die by suicide suffer from mental health disorders and treatment of these disorders can lead to reductions in deaths by suicide (Cavanagh et al., 2003). Therefore, identification of malleable risk factors related to suicide is a key research priority.

An emerging body of empirical work suggests that anxiety sensitivity is significantly associated with suicide related outcomes (Capron et al., 2012c). Anxiety sensitivity is a trait-like cognitive vulnerability that refers to a fear of anxiety related sensations and is made up of physical concerns, cognitive concerns, and social concerns subfactors (Reiss et al., 1986; Zinbarg et al., 1997). Most research on anxiety sensitivity has focused on the relations between anxiety sensitivity and panic attacks and panic disorder

(Schmidt et al., 1997; Schmidt et al., 2006). However, other work has shown an association between anxiety sensitivity and non-anxiety conditions such as depression (Taylor et al., 1996) and substance use disorders (Lejuez et al., 2006; Zvolensky et al., 2006; Schmidt et al., 2007a).

The relation between anxiety sensitivity and suicidality appears to be driven by the cognitive concerns facet. Anxiety sensitivity cognitive concerns refer to a fear of losing control of mental processes. Extant work has shown that anxiety sensitivity cognitive concerns are associated with increased levels of suicidal ideation in a number of populations with elevated suicide rates including outpatients with posttraumatic stress disorder (PTSD) symptomatology, individuals with HIV, college students and cigarette smokers (Capron et al., 2012a; Capron et al., 2012b; Capron et al., 2012d; Lamis and Jahn, 2012; Capron et al., 2013a). In addition, a recent study found that an anxiety sensitivity enhanced smoking cessation treatment resulted in lower suicidality among cigarette smokers at post-treatment compared to a control group that received only a general CBT smoking cessation treatment (Capron et al., 2013c).

Recently, the depression distress amplification model was posited to explain the role of anxiety sensitivity cognitive concerns in the development of suicidal ideation (Capron et al., 2013b). Global anxiety sensitivity amplifies distress responses in the

\* Corresponding author. Tel.: +1 850 645 1766; fax: +1 850 644 7739.

E-mail address: [Schmidt@psy.fsu.edu](mailto:Schmidt@psy.fsu.edu) (N.B. Schmidt).

context of general stress and anxiety symptoms. However, anxiety sensitivity cognitive concerns appear to predispose individuals to show increased distress in the context of aversive physical and psychological mood symptoms. In the depression-distress amplification model, suicidal ideation is considered a symptom of depression corresponding to the severity of depression. Just as anxiety sensitivity increases distress responses in the context of uncomfortable physical sensations (Schmidt et al., 2007c), the depression-distress amplification model posits that anxiety sensitivity cognitive concerns amplify distress brought by uncomfortable sensations experienced in the context of emerging or existing dysphoria (e.g. lack of concentration, insomnia, anhedonia). Suicidal ideation emerges when the distress caused by the amplified depression reaches severe levels. This model has been evaluated in an adult clinical sample and been found to predict suicidal ideation above and beyond distress tolerance (Capron et al., 2013b). Further, distress amplification appears to be specific to anxiety sensitivity cognitive concerns, as an interaction between distress tolerance and depressive symptoms was not significantly associated with suicidal ideation (Capron et al., 2013b).

A prominent limitation in the anxiety sensitivity cognitive concerns and suicide literature is that a majority of participants in prior samples have not evidenced any suicidality (Capron et al., 2012c; Capron et al., 2012d). An examination of anxiety sensitivity cognitive concerns and suicidality on a sample where 100% of participants evidence elevated risk of current suicidality is needed to ensure the reliability of these findings. Another issue in the anxiety sensitivity and suicide literature is the relationship of the other anxiety sensitivity subfactors to suicidal ideation (i.e. physical, social). Although, most studies have not found a relationship between anxiety sensitivity social concerns and suicidal ideation, there are some exceptions (Capron et al., 2012a; Capron et al., 2012c). Likewise, one study found a trend toward a negative relationship between anxiety sensitivity physical concerns and suicidal ideation among individuals with HIV (Capron et al., 2012d). Further work is needed clarify these equivocal extant findings. To address these issues, the current study evaluated the role of anxiety sensitivity in suicidal ideation among a large sample of college students who endorsed at least some level of past week suicidal ideation, as measured by the Beck Scale for Suicide Ideation (BSS; Beck and Steer, 1991). Based on the strong association found between anxiety sensitivity cognitive concerns and suicidality in existing studies, we hypothesized that global anxiety sensitivity would be a significant predictor of suicidal ideation. Further, we predicted that among the anxiety sensitivity subfactors, only the cognitive concerns facet would have a significant association with suicidal ideation. The other primary goal of this study was to test the depression distress amplification model in this group of college students with elevated risk of current suicidality. Based on previous work (Capron et al., 2013b), we hypothesized that the depression distress amplification model (i.e. an interaction between anxiety sensitivity cognitive concerns and depression) would also predict suicidal ideation in this sample. Specifically, it is expected that higher levels of depression and anxiety sensitivity cognitive concerns will interact to predict increased suicidal ideation.

## 2. Methods

### 2.1. Participants

Data were collected from 1200 students at a large southeastern university. For the purposes of the current study, only 721 participants who reported some level of past week suicidal ideation (i.e., BSS > 0) were included. Demographic characteristics of the sample were as follows: 77.5% female, 75% European American, 12% African-American, 4% Hispanic, 3% Asian-American, and 5.7% "Other". The average age was

20 years (S.D.=1.23) and the sample consisted of college freshmen (30.0%), sophomores (24.0%), juniors (23.5%), and seniors (22.5%).

### 2.2. Measures

#### *Anxiety Sensitivity Index (Reiss et al., 1986)*

The anxiety sensitivity index (ASI) is a 16-item self-report instrument designed to measure the degree to which individuals are concerned about the potential negative effects of experiencing anxiety symptoms. Sample items include: "Unusual body sensations scare me" (anxiety sensitivity physical concern), "When I cannot keep my mind on a task, I worry that I might be going crazy" (anxiety sensitivity cognitive concern), and "It is important to me not to appear nervous" (anxiety sensitivity social concern). Respondents are asked to indicate the degree to which each item applies to them using a 5-point Likert scale ranging from 0 (*very little*) to 4 (*very much*). The ASI has three lower-order factors that all load on a single higher-order factor across diverse populations (Zinbarg et al., 1997). The lower-order factors represent physical, cognitive, and social concerns, and the higher-order factor represents the global anxiety sensitivity construct. The ASI has demonstrated good internal consistency across diverse populations (Peterson, 1993), including college students (Schmidt et al., 2007a). In the current sample, the coefficient alpha was 0.87 for global anxiety sensitivity and 0.85, 0.80 and 0.38 for the physical, cognitive, and social concerns sub-factors, respectively.

#### *Beck Depression Inventory-II (Beck et al., 1996)*

The Beck depression inventory (BDI-II) is a widely used 21-item self-report measure of severity of depressive symptoms experienced within the past two weeks. Each item measures a distinct depressive symptom (e.g., sad mood) through a series of four statements that reflect greater severity as they progress (e.g., "I do not feel sad," "I feel sad," "I am sad all the time," or "I am so sad or unhappy that I can't stand it"). Responses on the items are summed to derive a total scale score, with higher scores suggestive of higher depressive symptom severity. Good estimates of internal consistency and concurrent validity have been demonstrated in clinical and non-clinical samples (Bisconer and Gross, 2007; Naragon-Gainey et al., 2009). For example, Freedenthal et al. (2011) found that scores on BDI-II were correlated with measures of suicide risk and other measures of negative emotional states. In the current study, item 9 (suicidal ideation) was removed from the analyses to prevent representation of suicidal ideation in both the independent and dependent variable. The estimate of internal consistency reliability of the BDI-II among university undergraduates was 0.93.

#### *Beck Scale for Suicide Ideation (Beck and Steer, 1991)*

The Beck scale for suicide ideation (BSS) is a 21-item self-report questionnaire measuring individual's thoughts, attitudes and intentions regarding suicide, including attitudes toward living and dying, expected reactions to these thoughts, and frequency of past suicidal behavior. The first 19 items consist of three options graded according to the intensity of the suicidality and are summed to yield a total score, which ranges from 0 to 38. The items provide participants with three response options (e.g., "I have no wish to die", "I have a weak wish to die", or "I have a moderate to strong wish to die") and are rated on a scale from zero to two, based on intensity. Scores are summed to provide a total score indicative of suicide risk. The BSS is a valid and reliable measure in various populations (Miller et al., 2001), including college students (Cukrowicz et al., 2011). In the current study, the internal consistency reliability estimate was 0.84.

#### *Suicide Anger Expression Inventory-28 (Osman et al., 2010)*

The suicide anger expression inventory-28 (SAEI-28) is a self-report instrument assessing anger-expression and suicide-related constructs. Suicidal ideation was measured using the suicide rumination subscale, which consists of seven items from the total 28-item SAEI. Participants were asked to rate the items from 1 (*Not at all true of me*) to 5 (*Extremely true of me*). In the initial validation study, the suicide rumination subscale was the strongest predictor of suicidal ideation and behavior among the four subscales (Osman et al., 2010). In fact, this subscale appears to be a measure of suicidal ideation versus suicide rumination, as the ruminative quality of each thought is not directly assessed. Sample items on the suicide rumination subscale include both passive and active suicidal ideations: "I find myself wishing that I was dead", "I feel the urge or impulse to hurt myself physically", and "I seriously consider ending my life." The SAEI-28 subscales have demonstrated good internal consistency reliability in undergraduate college students (Osman et al., 2010; Lamis and Dvorak, 2013). The SAEI-28 was utilized as the main outcome measure over the more commonly used BSS. This decision was made because a number of previous reports on the anxiety sensitivity and suicidal ideation association have used Beck scales (Schmidt et al., 2001, Capron et al., 2012b, Capron et al., 2013a). Replicating these findings with a non-Beck measure would lead to more confidence in the validity of the relationship. It should be noted that the pattern of association between the ASI subscales and suicidal ideation was the same whether using the BSS or SAEI-28. In the current study, the reliability estimate for the suicide rumination subscale was 0.93.

### 2.3. Procedure

Data collection was conducted through an online survey over the course of three semesters, with approximately equal numbers of participants completing the study during each of the semesters. Students voluntarily completed the survey outside of class time in return for extra credit in their psychology course. Participants were informed of the study in regularly scheduled classes and through a posting on the online participant pool site. Participants completed a demographic survey and the study measures, which were presented in a randomized order. Prior to data collection, electronic informed consent was obtained from participants. The university's Institutional Review Board approved the study in advance of data collection, and ethical procedures were followed throughout the study.

### 2.4. Data analytic strategy

Multiple regressions were performed to assess the ability of global anxiety sensitivity/anxiety sensitivity subfactors (as measured by ASI) to predict levels of suicidal ideation (as measured by the suicidal ideation subscale of the SAEI), above and beyond gender and depressive symptoms (as measured by the BDI). Gender was included to control for gender differences in anxiety and mood pathology. Depressive symptoms were included as a covariate in all models due to the established relationship between depression and suicide (Beck et al., 1985; Bolton and Robinson, 2010). However, the pattern of findings did not change when performing the analyses without depressive symptoms in the model. Preliminary analyses revealed no threats or violations to multicollinearity or homoscedasticity. Suicidality variables are often positively skewed (higher frequency of low scores), as was the case in the current sample. Consistent with the recommendation for samples of this size (Pallant, 2007; Tabachnick and Fidell, 2007), we used logarithmic transformation on the SAEI suicidal ideation scale for all analyses, which resulted in substantially improved skewness/kurtosis. However, it should be noted that the pattern of findings was the same when using the non-transformed variable.

## 3. Results

### 3.1. Sample descriptives

Means, standard deviations, and intercorrelations for the variables included in these analyses can be found in Table 1. The mean ASI total and subscale scores were almost identical to a clinical outpatient sample (e.g.,  $M_{\text{total}}=22$ ; Capron et al., 2012c). Suicidal ideation was most highly correlated with depressive symptoms and anxiety sensitivity cognitive concerns. As anticipated, all variables were significantly correlated ( $p < 0.05$ ). As expected for a non-clinical sample, scores on the BSS indicated that the vast majority of participants reported minimal SI. The majority of participants indicating levels of past week suicidality (73.4%) reported total scores of 1–3. To our knowledge, the original authors of the BSS have not published a clinical cut score. However, one report found a cut score of  $\geq 24$  on the BSS to have 100% sensitivity and 90% specificity in predicting admission for clinically evaluated suicide risk (Cochrane-Brink et al., 2000). Only

one individual in the current sample of 721 scored 24 or greater on the BSS.

### 3.2. Primary analyses

Multiple regression was performed to assess the ability of global anxiety sensitivity to predict levels of suicidal ideation, above and beyond gender and depressive symptoms. The full model was statistically significant and accounted for 23.1% of the variance in suicidal ideation ( $F(3,717)=67.89$ ,  $p < 0.001$ ). Among covariates, both gender ( $t=2.38$ ,  $\beta=0.08$ ,  $p=0.02$ ,  $sr^2=0.01$ ) and depressive symptoms ( $t=9.64$ ,  $\beta=0.36$ ,  $p < 0.01$ ,  $sr^2=0.11$ ) were significantly associated with suicidal ideation. Accounting for these variables, global anxiety sensitivity ( $t=4.76$ ,  $\beta=0.18$ ,  $p < 0.01$ ,  $sr^2=0.03$ ) was a significant predictor of suicidal ideation.

Another regression analysis was performed to determine the relation between the three anxiety sensitivity subfactors (as measured by the appropriate ASI subscale) and suicidal ideation. Again, gender and depressive symptoms were added as covariates. The full model included five predictor variables (gender, depressive symptoms, anxiety sensitivity physical concerns, anxiety sensitivity cognitive concerns, and anxiety sensitivity social concerns). The full model was statistically significant and accounted for 24.5% of the variance in suicidal ideation ( $F(5,715)=46.39$ ,  $p < 0.001$ ). Among covariates, depressive symptoms ( $t=8.56$ ,  $\beta=0.32$ ,  $p < 0.01$ ,  $sr^2=0.09$ ) were significantly associated with suicidal ideation, whereas gender ( $t=1.62$ ,  $\beta=0.05$ ,  $p=0.11$ ,  $sr^2 < 0.01$ ) was not. As predicted, anxiety sensitivity cognitive concerns ( $t=5.94$ ,  $\beta=0.26$ ,  $p < 0.01$ ,  $sr^2=0.05$ ) were a significant predictor of suicidal ideation but anxiety sensitivity physical concerns ( $t=-0.13$ ,  $\beta=-0.01$ ,  $p=0.89$ ,  $sr^2 < 0.01$ ) and anxiety sensitivity social concerns ( $t=-0.34$ ,  $\beta=-0.01$ ,  $p=0.73$ ,  $sr^2 < 0.01$ ) were not.

To extend the depression distress amplification model, we evaluated the anxiety sensitivity cognitive concerns  $\times$  depressive symptom interaction in the prediction of suicidal ideation. The model contained four primary predictor variables (gender, depressive symptoms, anxiety sensitivity cognitive concerns, and the anxiety sensitivity cognitive  $\times$  depressive symptoms interaction). Again, gender was added as a covariate. All variables were mean centered prior to inclusion in the model. The full model containing all predictors was statistically significant,  $F(4,716)=60.10$ ,  $p < 0.001$ . The covariate, gender ( $t=1.66$ ,  $\beta=0.06$ ,  $p=0.10$ ,  $sr^2 < 0.01$ ), was not significantly associated with suicidal ideation. The main effects of depressive symptoms ( $t=8.85$ ,  $\beta=0.33$ ,  $p < 0.001$ ,  $sr^2=0.10$ ), anxiety sensitivity cognitive concerns ( $t=4.75$ ,  $\beta=0.20$ ,  $p < 0.001$ ,  $sr^2=0.03$ ) and their interaction ( $t=2.51$ ,  $\beta=0.10$ ,  $p=0.01$ ,  $sr^2=0.01$ ) were significantly associated with suicidal ideation.

**Table 1**  
Means, standard deviations and intercorrelations for included measures

Measure	M	S.D.	1	2	3	4	5	6
1. ASI – Total	23.01	10.70	–					
2. ASI – Physical	11.34	6.56	0.93**	–				
3. ASI – Cognitive	3.85	3.47	0.80**	0.59**	–			
4. ASI – Social	7.82	2.63	0.69**	0.50**	0.43**	–		
5. BDI	10.50	9.96	0.48**	0.37**	0.55**	0.30**	–	
6. BSS	3.59	3.75	0.23**	0.17**	0.32**	0.09*	0.44**	–
7. SAEI_SR	9.18	4.47	0.31**	0.23**	0.38**	0.17**	0.53**	0.66**

ASI=Anxiety sensitivity index; BDI=Beck depression inventory – II; BSS=Beck scale for suicide ideation; SAEI\_SR=Suicide anger expression inventory – Suicide rumination subscale.

\*\*  $p < 0.001$ .

\*  $p < 0.05$ .

In the next step, we probed the hypothesized two-way interaction between depressive symptoms and anxiety sensitivity cognitive concerns (See Fig. 1). As predicted, at high levels of depressive symptoms (1 S.D. above the mean) the effect of anxiety sensitivity cognitive concerns was significant ( $t=6.77$ ,  $\beta=0.29$ ,  $p < 0.001$ ,  $s^2=0.06$ ), such that those participants who had high levels of anxiety sensitivity cognitive concerns and high levels of depressive symptoms were at the greatest risk for elevated suicidal ideation. At low levels of depressive symptoms, the effect of anxiety sensitivity cognitive concerns was not significant ( $p=0.12$ ), also as predicted.

#### 4. Discussion

The current findings indicate a relation between anxiety sensitivity cognitive concerns (i.e. a fear of cognitive dyscontrol) and elevated suicidal ideation in college students reporting elevated risk of current suicidality. This is the first study to examine the anxiety sensitivity cognitive concerns and suicidality association in a sample of such individuals. As such, this study adds to a growing literature indicating that anxiety sensitivity cognitive concerns is related to SI in clinical (Schmidt et al., 2001; Capron et al., 2012b; Capron et al., 2012c) and non-clinical (Capron et al., 2012a; Capron et al., 2012d; Capron et al., 2013a) samples. The present findings also provide additional support for the depression distress amplification model. This is the first test of the model in a non-clinical sample and corroborates the results of the original test (Capron et al., 2013b).

The depression distress amplification model potentially elucidates the complicated relationship between comorbid anxiety/depression and young adult suicidality. In empirical and epidemiological reports, comorbid anxiety and depression appear to be a consistently strong predictor of elevated suicide attempt rates among adolescents and young adults (Wunderlich et al., 1998; Pawlak et al., 1999; Foley et al., 2006). The depression distress amplification model posits that suicidal ideation is caused by depression amplified by anxiety sensitivity cognitive concerns, not simply that comorbidity is a proxy for greater overall psychopathology. Unlike a greater overall psychopathology model, the depression distress amplification model suggests the basis for specific empirical tests that can refine our understanding of these constructs and potentially lead to improvement of current interventions.

The depression distress amplification model is consistent with other current models of the development of suicidality. A positive feedback model (Katz et al., 2011) is conceptually similar to the current model. However, the depression distress amplification model posits a specific mechanism that contributes to suicidal ideation (i.e. anxiety sensitivity cognitive amplification of depressive symptoms) and therefore has more specificity. A number of other theoretical models of suicidal behavior have posited that cognitive processes contribute to heightened suicide risk (Abramson et al., 1998; Smith et al., 2006). Specifically, Smith et al. (2006) found that rumination and hopelessness led to heightened suicide risk. Anxiety sensitivity cognitive concerns, depression, and their interaction may be specific mechanisms in this process as at-risk individuals who ruminate on their dysphoric and phrenophobic (i.e. fear of going crazy) symptoms may become hopeless as these symptoms increase over time. Finally, anxiety sensitivity cognitive concerns may amplify the experience of psychological pain in vulnerable individuals, a risk factor for acquiring the capability for suicide from the Interpersonal-Psychological Theory (Joiner, 2005).

If future work corroborates the relationship between anxiety sensitivity cognitive concerns and suicide, directly targeting anxiety sensitivity may be a strategy of mitigating suicide risk.

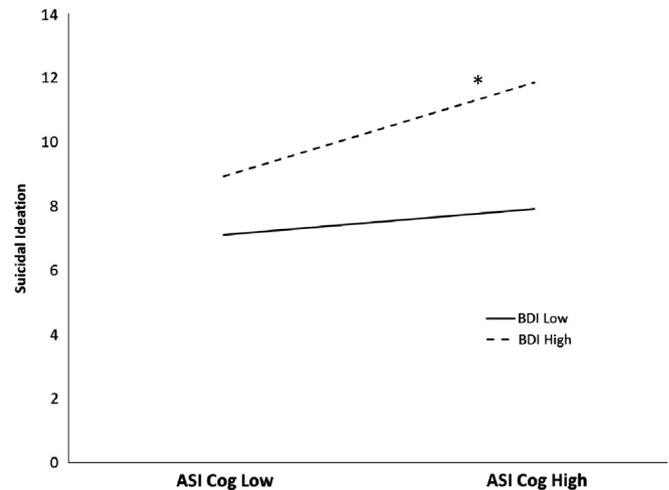


Fig. 1. Interaction of anxiety sensitivity cognitive concerns by depressive symptoms predicting level of suicidal ideation as hypothesized by the depression distress amplification model. ASI=Anxiety sensitivity index; BDI=Beck depression inventory. \* $p < 0.01$ .

In adults, the utilization of brief interventions featuring psychoeducation and interoceptive exposure exercises have consistently reduced total anxiety sensitivity and anxiety sensitivity subfactors (Schmidt et al., 2007b; Feldner et al., 2008; Keough and Schmidt, 2012). However, more work is needed in this area with the only published investigation to date indicating that cigarette smokers (a group at elevated risk for suicide) who underwent an anxiety sensitivity augmented smoking cessation intervention had significantly lower post-treatment suicidality than a control group (Capron et al., 2013c).

It is important to note the limitations of the present study. Primarily, the design of the study precluded us from examining the causal roles of anxiety sensitivity cognitive concerns in suicidal ideation among these college students. Specifically, we were unable to ascertain whether these high anxiety sensitivity cognitive scores preceded increased suicidality or whether modification of anxiety sensitivity might reduce suicide risk. In addition, we did not have a measure of anxiety in the study. So we were unable to test whether the hypothesized distress amplification by anxiety sensitivity cognitive concerns is specific to depression. Future large-scale prospective studies are needed to help clarify these relationships. Second, the ASI was developed to measure anxiety sensitivity as a unitary construct. Although the ASI is used frequently to look at anxiety sensitivity subfactors (Stewart et al., 1997; Schmidt et al., 2001), it would have been ideal to measure the anxiety sensitivity subfactors with the Anxiety Sensitivity Index-3 (Taylor et al., 2007). Although the ASI-social subfactor was not an important outcome variable in this study, the low reliability of the subscale (Cronbach's  $\alpha = 0.38$ ) demonstrates this issue. However, previous work has shown that anxiety sensitivity cognitive concerns are consistently associated with suicide related outcomes whether being assessed with the ASI (Capron et al., 2012c) or the ASI-3 (Capron et al., 2012a). Another limitation is that although the sample was comprised exclusively of college students reporting some level of current suicidality according to the BSS, the overall symptom severity of the sample was not high. However, this sample could be considered at-risk and therefore is a strong population to target for identification of malleable risk factors. It is interesting to note that because suicidality variables are almost always positively skewed the distribution of suicidality was somewhat similar to previous reports (Schmidt et al., 2001; Capron et al., 2012c). Finally, the assessment of suicide-relevant

behaviors was limited in the current report. It is not known, for example, whether the results of this study would generalize to death by suicide. However, suicide related behaviors, such as suicidal ideation, are strong predictors of eventual death by suicide (Suominen et al., 2004).

The present report also adds some notable contributions to the anxiety sensitivity cognitive concerns and suicidality literature. First, after excluding participants who did not report any level of past week suicidality, the sample of participants reporting current suicidal ideation was still relatively large. Previous work has used samples with relatively low percentages of participants reporting suicide risk (Schmidt et al., 2001; Capron et al., 2012c). Future work should continue to test the effect of anxiety sensitivity cognitive concerns and the depression distress amplification model on increasingly severe samples. Second, this is the first report of the depression distress amplification model among college students. Given the escalating rates of death by suicide among young adults this is an important area for clinical research. The depression distress amplification model may eventually lead to better identification, treatment and prevention of death by suicide.

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