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The role of anxiety sensitivity cognitive concerns in suicidal ideation: A test of the Depression-Distress Amplification Model in clinical outpatients



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ARTICLE INFO

Article history:

Received 9 June 2015

Received in revised form

16 December 2015

Accepted 12 February 2016

Available online 13 February 2016

Keywords:

Suicide

Suicidal ideation

Anxiety sensitivity

Depression

ABSTRACT

Suicide constitutes a significant public health burden as global suicide rates continue to increase. Thus, it is crucial to identify malleable suicide risk factors to develop prevention protocols. Anxiety sensitivity, or a fear of anxiety-related sensations, is a potential malleable risk factor for the development of suicidal ideation. The Depression-Distress Amplification Model (DDAM) posits that the anxiety sensitivity cognitive concerns (ASCC) subfactor interacts with depressive symptoms to amplify the effects of depression and lead to suicidal ideation. The current study tested the DDAM across the two most widely-replicated factors of depressive symptoms (cognitive and affective/somatic) in comparison to a risk factor mediation model where ASCC are related to suicidal ideation via depressive symptoms. Participants included 295 clinical outpatients from a community clinic. The interaction between ASCC and depressive symptoms in the prediction of suicidal ideation was not significant for either cognitive or affective/somatic symptoms of depression. However, results revealed a significant indirect effect of ASCC through cognitive symptoms of depression in the prediction of suicidal ideation. These cross sectional findings are not consistent with the DDAM. Rather, the relationship may be better conceptualized with a model in which ASCC is related to suicidal ideation via cognitive symptoms of depression.

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1. Introduction

Suicide death rates in the United States have been reported to be steadily increasing over the past 15 years (AFSP, 2013). Identifying individuals at risk for suicide is a vital component of the prevention and treatment of this critical public health issue. A number of important constructs have been identified as robust predictors of suicidal behavior. Along with attempt history and history of mental illness, suicidal ideation has been identified as a critical predictor of completed suicide (Weissman et al., 1989; Kessler et al., 1999). To increase the public health impact of treating suicide, identifying malleable risk factors and mechanisms through which suicidal ideation develops is paramount.

One such risk factor is anxiety sensitivity (AS), or the fear of the physical, social, and cognitive consequences of experiencing anxiety (Reiss et al., 1986). AS is composed of three lower-order dimensions involving the fear of physical consequences of anxiety

(e.g., having a heart attack), social consequences of publically observable symptoms of anxiety (e.g., being judged by others for blushing), and cognitive consequences of anxiety (e.g., losing one's mind; Zinbarg et al., 1997). Whereas a positive association has been found between overall AS and suicide (Valentiner et al., 2002; Osman et al., 2010), a growing body of literature implicates AS cognitive concerns, as opposed to AS physical or social concerns, as central to this relation (e.g., Capron et al., 2012a, 2012c). Further, recent experimental evidence suggests that reduction in the AS cognitive concerns dimension via AS-focused treatment mediates change in suicidal ideation (Schmidt et al., 2014). Thus, extant data suggests that the cognitive concerns dimension of AS is robustly and uniquely associated with suicidal ideation, with recent evidence suggesting that the AS cognitive concerns dimension may be causally related to suicidal phenomena.

Similar to mood psychopathology where only a minority of individuals become suicidal (Joiner et al., 2005), not all people with elevated AS cognitive concerns develop suicidal ideation. The specific relations between these constructs can be illuminated by considering the role overall AS plays in response to stress. Overall

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AS increases distress responses in the context of general stress and anxiety symptoms (Reiss et al., 1986). The Depression–Distress Amplification Model (DDAM; Capron et al., 2013b) offers one possible explanatory model for the relation between AS cognitive concerns and suicidal ideation. Just as overall AS increases distress responses in the context of uncomfortable physical sensations (Schmidt et al., 2007), this model suggests that the AS cognitive concerns dimension specifically amplifies distress brought on by the 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. According to this model, we would expect those individuals with high levels of depressive symptoms and high levels of AS cognitive concerns to have elevated levels of suicidal ideation.

There is some empirical support for this model in clinical outpatients (Capron et al., 2013b), young adults with elevated risk of suicidal ideation (Capron et al., 2014), and adolescents followed over a two-year period (Capron et al., 2015). However, there are other potential mechanisms that may account for the relation between AS cognitive concerns and suicidal ideation. In a recent study by Allan et al. (2015), the AS cognitive concerns dimension was only associated with suicidal ideation when depression was not controlled for. Given that AS cognitive concerns have been identified as a risk factor for depression (Zavos et al., 2012) and depression as a risk factor for suicidal ideation (Beck et al., 1985; Bolton and Robinson, 2010), it is plausible that the relation between AS and suicidal ideation is mediated through depression rather than moderated by depression level. To our knowledge, no studies have examined this mediation model in contrast to the DDAM (i.e., interaction).

Another consideration that has not been adequately addressed in prior studies examining the interrelations between AS, depression, and suicidal ideation is the multidimensionality of depression symptoms, as captured by the Beck Depression Index-2 (BDI-2; Beck et al., 1996). Whereas most studies examining the relations between AS, depression, and suicidal ideation include depression as a unidimensional construct, there is ample evidence suggesting that depression can be conceptualized as multidimensional (e.g., Vanheule et al., 2008). Across studies in college students, community outpatients, and across American, Japanese, and Dutch versions of the BDI-2, two factors have often emerged, labeled cognitive and affective/somatic symptoms (Beck et al., 1996; Steer et al., 1999; Whisman et al., 2000; Kojima et al., 2002; Vanheule et al., 2008). Although no studies have examined whether these lower-order depression factors differentially relate to AS or suicidal ideation, several studies have found differential relations between these lower-order dimensions and external variables including gender, age, and personality traits (Steer et al., 1999; Vanheule et al., 2007). Further, a meta-analysis (Naragon-Gainey, 2010) found that the strength of the relationship between AS and depression varied ($\rho=0.23\text{--}0.61$) across the depression subscales of the Inventory of Depression and Anxiety Symptoms (Watson et al., 2007). Therefore, it is possible that cognitive and affective/somatic symptoms of depression might play different roles in explicating the relations between AS and suicidal ideation.

The current study sought to further test the DDAM by examining the interaction between AS cognitive concerns and depressive symptoms across the two most highly supported factors of depressive symptoms (i.e., cognitive symptoms and affective/somatic symptoms) in the prediction of suicidal ideation in sample of clinical outpatients. Further, we examined whether the interaction models provided superior fit to the data as compared to mediation models where depressive symptoms served to mediate the relationship between AS cognitive concerns and suicidal ideation, which would be consistent with conceptualizing AS

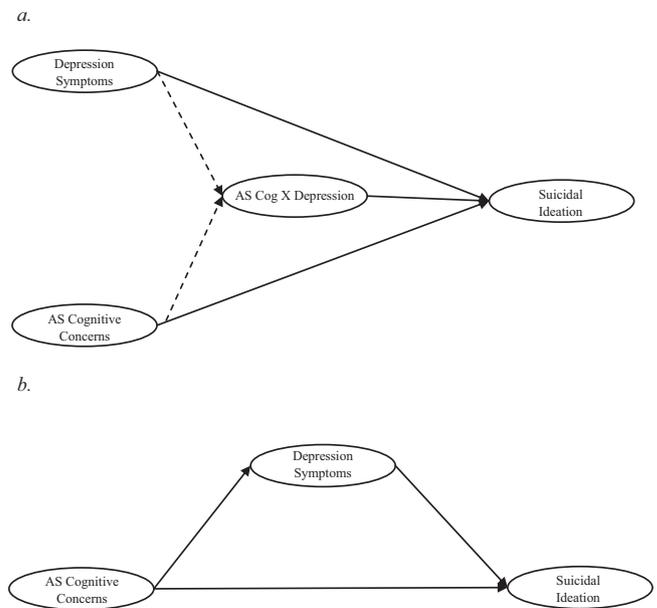


Fig. 1. (a) Comprises the DDAM as a latent variable interaction model between AS Cognitive Concerns and Depression Symptoms. (b) Comprises the latent mediation model including Depression Symptoms operating as the mediator. Indicators, variances, and residual variances are omitted for clarity.

cognitive concerns as a risk factor for depression (and in turn suicidal ideation), and not suicidal ideation, per se (see Fig. 1 for a visual depiction). We hypothesized that elevated AS cognitive concerns would interact with cognitive symptoms, but not affective/somatic symptoms, to significantly predict increased suicidal ideation. Further, we hypothesized that the interaction model would provide significantly better fit to the data when considering cognitive symptoms of depression, but not affective/somatic symptoms.

2. Methods

2.1. Participants and procedure

The sample for the current study consisted of 295 outpatients seeking services at a university-affiliated clinic. The clinic serves the greater community and only refers out cases where individuals are suffering from psychotic or bipolar-spectrum disorders and are not stabilized on medication, or if they are an immediate danger to themselves or others that requires immediate hospitalization. As such, the current sample contains a diverse array of presenting problems of ranging severity. All measures for the current study were collected at a baseline screening appointment prior to receiving psychological services. Primary diagnoses for the sample included: anxiety disorders (41.8%), mood disorders (16.3%), trauma and stressor related disorders (11.6%), obsessive-compulsive and related disorders (5.4%), substance use disorders (3.1%), eating disorders (2.0%), other (e.g., personality disorder, 2.2%), and no diagnosis (17.6%). Additionally, 28.1% of the sample reported current suicidal ideation. Written consent to participate in clinic research was obtained for all participants, and all policies and procedures were approved by the university's Institutional Review Board.

Participants' ages ranged from 18 to 82 years ($M=35.11$, $SD=15.59$) and the majority were female (60.3%). The racial breakdown of the sample was as follows: 64.7% Caucasian, 23.7% African-American, 1.4% Asian, 0.7% Native American, and 9.5% other (e.g., biracial). Additionally, 8.5% identified as Hispanic. With

regard to education, 3.4% did not complete high school, 14.2% high school degree, 2.4% trade or technical school degree, 53.9% some college, 17.6% four-year college degree, and 8.5% graduate school degree. Household annual income was relatively evenly distributed as 21.7% reported less than \$10,000, 22.7% \$10,000–25,000, 15.6% \$25,000–40,000, 14.9% \$40,000–75,000, 6.8% \$75,000–100,000, 8.5% \$100,000–150,000, 6.8% greater than \$150,000, and 3% declined to answer.

2.2. Measures

2.2.1. Beck Depression Inventory – 2 (BDI-2; Beck et al., 1996)

The BDI-II is a 21-item self-report measure of depressive symptoms. Respondents are asked to circle the item that best describes how they have felt over the past two weeks, with higher scores indicating greater levels of depression. Existing evidence suggests that the BDI-2 assesses two underlying factors: somatic-affective symptoms, and cognitive symptoms, with the former generally reflective of the anhedonic/vegetative features of depression, and the latter generally reflective of depressive symptoms characterized by maladaptive appraisals of one's self and future (Vanheule et al., 2008). The somatic-affective factor includes items addressing loss of interest/pleasure/energy/interest in sex, crying, agitation, indecisiveness, sleep problems, irritability, changes in appetite, difficulty concentrating, and fatigue. The cognitive factor includes items addressing sadness, pessimism, past failure, guilt, punishment feelings, self-dislike/criticalness, and feelings of worthlessness. The BDI-2 has good psychometric properties, including high internal consistency ($\alpha=0.85$) and good to excellent test-retest reliability (ICCs=0.73–0.96; Wang and Gorenstein, 2013). In the present study, the BDI-2 demonstrated good internal consistency ($\alpha=0.93$), as did the Affective/Somatic ($\alpha=0.90$) and Cognitive ($\alpha=0.88$) subfactors.

2.2.2. Anxiety Sensitivity Index – 3 (ASI-3; Taylor et al., 2007)

Developed based on the original ASI (Reiss et al., 1986), the ASI-3 is an 18-item self-report measure that assesses the fear of consequences associated with anxious arousal. Respondents are asked to report the degree to which they agree with each item on a 0 (*very little*) to 4 (*very much*) Likert-type scale. Previous research has found that the ASI-3 assesses three dissociable subfactors associated with different domains of feared consequences including physical concerns (e.g., heart attack), social concerns (e.g., fainting in public), and cognitive concerns (e.g., going “crazy”; $\alpha=0.76$ –0.91; Taylor et al., 2007). In the present study, the ASI-3 demonstrated good internal consistency ($\alpha=0.93$), as did the physical ($\alpha=0.87$), social ($\alpha=0.85$), and cognitive ($\alpha=0.92$) subfactors.

2.2.3. Depressive Symptom Inventory – Suicide Subscale (DSI-SS; Metalsky and Joiner, 1997)

The DSI-SS is a four-item self-report measure that assesses suicidal ideation over the past two weeks. Respondents indicate the frequency and intensity of suicidal thoughts on a 0–3 Likert-type scale, with higher scores indicating more severe suicidal ideation. The DSI-SS has demonstrated sound psychometric properties (Joiner and Rudd, 1996; Joiner et al., 2002), and demonstrated good internal consistency in the present study ($\alpha=0.88$).

2.3. Data analytic plan

A rarely addressed issue in studies investigating suicidal ideation is the skewed nature of this construct. Even in samples oversampling for psychopathology, suicidal ideation is rarely endorsed, leading to positively skewed and heavily leptokurtic distributions when composite scores are created from measures of

suicidal ideation (Delucchi and Bostrom, 2004; Sara, 2010). Further, this issue cannot be simply addressed through transforming variables as this does not address the large pile-up of individuals reporting no suicidal ideation (Delucchi and Bostrom, 2004). Latent variable modeling of suicidal ideation offers an ideal approach to address these concerns and is especially beneficial for the current investigation as it also capitalizes on the benefits of latent variable modeling including reduced measurement error and increased power to detect moderation effects (Jaccard and Wan, 1995).

Descriptive statistics were first computed and reported. The means and standard deviations were calculated as aggregated scores. BDI-2 item 9 (suicide item) was included in these calculations so as to make means comparable to past studies, but was not included (Kenny and McCoach, 2003) in any further analyses. Given that structural equation modeling (SEM) was conducted for the remainder of the analysis, a measurement model including all factors was used to provide correlations among the factors. All analyses were conducted in Mplus version 7.3. Confirmatory factor analysis (CFA) models of depression as a single factor was compared to a two-factor model of the depression symptom factors (i.e., Cognitive Symptoms, Affective/Somatic Symptoms) to verify that the two-factor solution fit the data better than the one-factor solution. Following this, CFAs were conducted, for the AS Cognitive Concerns and Suicidal Ideation factors to validate that the models fit the data well. All Suicidal Ideation items were treated as categorical. CFAs were primarily modeled using full information maximum likelihood (FIML), as this was the estimator needed to compare moderation and mediation models. The CFA for Suicidal Ideation was modeled using the default robust weighted least squares (WLSMV in Mplus). Model fit was assessed using the likelihood ratio test (LRT), based on the chi-square (χ^2) test statistic. A nonsignificant χ^2 indicates that the data fit the model well. However, as the LRT can be overly conservative in the case of models with many items representing scale scores (Kenny and McCoach, 2003; Moshagen, 2012), additional fit indices were examined, together, to provide an estimate of model fit. Specifically, comparative fit index (CFI) and Tucker-Lewis index (TLI) values greater than 0.95 and root mean square error of approximation (RMSEA) values less than 0.05 indicate good fit whereas RMSEA values less than 0.08 indicate adequate fit. In addition, the 90% confidence interval (CI) for the RMSEA was provided for which good fit cannot be rejected if the lower bound interval contains 0.05 and poor fit cannot be rejected if the upper bound interval contains 0.10 (MacCallum et al., 1996; Hu and Bentler, 1999; Kline, 2011). In addition, the nested depression models were compared using the χ^2 difference test, with the one-factor model nested in the two-factor model. Therefore, a significant χ^2 value indicated that the one-factor model fit worse than the two-factor model.

Following this, mediation and moderation SEMs examining the relations between AS Cognitive Concerns, depression symptoms, and Suicidal Ideation were conducted. Models were conducted separately for each depression symptoms factor as there were concerns that multicollinearity might influence the results. Models were also conducted modeling Depression as a second-order factor for comparison. Because this model is not identified, a restriction had to be placed on the model, in which the factor loadings of the two first-order factors was fixed to equality. In Mplus, latent variable interactions are carried out through a quasi-maximum likelihood design, which does not provide the typical fit indices as the inclusion of the interaction is considered a nonlinear extension of ordinary SEM and appropriate fit indices have yet to be developed and tested for this approach (Klein and Muthén, 2007). Therefore, to determine whether inclusion of the interaction term was necessary, models with interaction terms included

were compared to models without interaction terms using -2loglikelihood values as the $-2\log$ likelihood is approximately chi-square distributed (Klein and Muthén, 2007). The mediation model can be considered akin to the main effects model, as the interaction model is simply the main effects model, with AS Cognitive Concerns predicting depression symptoms instead of allowing these parameters to covary.

The model including the interaction term is the parent model and the mediation/main effects model is the nested model. Therefore, a significant difference between the main effects model and the model including the interaction term was seen as evidence that restricting the interaction term degraded model fit. In contrast, a nonsignificant difference was seen as evidence for the main effects model, and provided support for examining the mediation model. Because the mediation model could be conducted using a similar estimator to the latent variable moderation, but the latent variable moderation could only be conducted using the FIML estimator with random effects, all analyses were first conducted using this estimator. If the mediation model was deemed more appropriate than the moderation model, this model was re-estimated using robust maximum likelihood WLSMV to provide standard errors robust to nonnormality as well as asymmetric bootstrapped CIs. Resampling was conducted across 5000 samples to provide stable estimates.

3. Results

3.1. Descriptive statistics, correlations, and missing data

Descriptive statistics and correlations between all study variables are provided in Table 1. There was little missing data at the item-level. One individual was missing all data for AS Cognitive Concerns. Another individual was missing data for two items, and a third for a single item. For Cognitive Symptoms, two individuals were each missing a single item and one individual was missing two items. For Affective/Somatic Symptoms, seven participants were each missing a single item and another participant was missing all but one item. For Suicidal Ideation, two participants were missing one item and another three participants were missing all items. Because FIML was used, all cases were included.

3.2. Confirmatory factor analysis models

The two-factor CFA for Cognitive and Affective/Somatic Symptoms (of depression) provided adequate fit to the data ($\chi^2=407.97$, $p < 0.001$, $CFI=0.92$, $TLI=0.90$, $RMSEA=0.07$, $90\% CI [0.06, 0.08]$) with all items loading significantly on their respective factor ($\lambda \geq 0.43$). Further, the two-factor model fit significantly better than the one-factor model of depression ($\chi^2=197.51$, $df=1$, $p < 0.001$).¹ The CFA for AS Cognitive Concerns provided adequate fit to the data ($\chi^2=20.93$, $p=0.01$, $CFI=0.99$, $TLI=0.98$, $RMSEA=0.07$, $90\% CI [0.03, 0.11]$). All items loaded significantly on this factor (standardized factor loading $[\lambda] \geq 0.73$). Finally, the CFA for Suicidal Ideation provided good fit to the data ($\chi^2=5.32$, $p=0.07$, $CFI=1.00$, $TLI=1.00$, $RMSEA=0.08$, $90\% CI [0.00, 0.16]$) with all items loading significantly ($\lambda \geq 0.86$).

¹ Alternative two-, and three-factor BDI-2 models were compared, including a model in which Cognitive, Somatic, and Performance Difficulty factors were fit as separate factors according to Osman et al. (1997) and a model in which Cognitive-Affective and Somatic factors were fit according to Beck et al. (2002). However, these models did not provide better fit than the accepted two-factor Cognitive and Affective/Somatic Symptoms solution.

Table 1

Descriptive statistics and correlations for anxiety sensitivity cognitive concerns, depression, and suicidal ideation.

	1	2	3	4
1. AS Cognitive Concerns	–			
2. Dep-Cognitive	0.65***	–		
3. Dep-Affective/Somatic	0.60***	0.80***	–	
4. Suicidal Ideation	0.41***	0.61***	0.39***	–
Mean	31.25	9.27	13.34	0.81
Standard deviation	15.87	5.86	7.81	1.69

Note. AS=Anxiety Sensitivity. Dep=Depression. Correlations are latent variable correlations. Means and standard deviations were calculated from the scale scores.

*** $p < 0.001$.

3.3. Comparison of mediation and moderation models of anxiety sensitivity cognitive concerns, depression symptoms, and suicidal ideation

A main effects model including Cognitive Symptoms was first estimated using WLSMV as model fit indices are not provided when estimating a model using MR or MLR. This model provided adequate fit to the data ($\chi^2=194.10$, $p < 0.001$, $CFI=0.98$, $TLI=0.97$, $RMSEA=0.04$, $90\% CI [0.03, 0.05]$). This model was then re-analyzed using ML with random effects allowed to estimate the -2loglikelihood value to compare to the latent variable interaction model, representing an empirical test of the DDAM. Model parameters in this main effects model and the main effects model estimated using WLSMV did not differ substantively. Following this, the latent variable interaction model was conducted. Table 2 contains model parameters for this model. Comparison of -2loglikelihood values revealed no difference between the main effects model and the interaction model ($\chi^2=0.07$, $p=0.79$), which was supported by the nonsignificant interaction term ($p > 0.05$).

Model parameters for the mediation model including the effects of AS Cognitive Concerns on Suicidal Ideation through Cognitive Symptoms are provided in Table 3. In this model, AS Cognitive Concerns was not directly associated with Suicidal Ideation ($B=0.05$, $95\% CI [-0.23, 0.28]$). The Cognitive Symptoms factor was associated with Suicidal Ideation ($B=0.57$, $95\% CI [0.33, 0.82]$). Further, there was a significant indirect effect ($B=0.49$, $95\% CI [0.29, 0.70]$).

Table 2

Interaction model parameters for anxiety sensitivity cognitive concerns and cognitive and affective/somatic depression symptoms on suicidal ideation.

Factors	DSI-SS Suicidal Ideation	
	B	SE
AS Cognitive Concerns	0.06	0.13
Depression-Cognitive Symptoms	0.75*	0.14
AS Cognitive \times Cognitive	-0.03	0.10
AS Cognitive Concerns	0.37***	0.11
Depression-Affective/Somatic Symptoms	0.30*	0.11
AS Cognitive \times Affective/Somatic	-0.14	0.10
AS Cognitive Concerns	0.11	0.14
Depression Symptoms	0.66***	0.16
AS Cognitive \times Depression	-0.10	0.11

Note. AS=Anxiety Sensitivity. AS Cognitive \times Cognitive=Interaction term for AS Cognitive Concerns by Cognitive Symptoms (of Depression). AS Cognitive \times Affective/Somatic=Interaction term for AS Cognitive Concerns by Affective/Somatic Symptom (of Depression).

* $p < 0.05$.

*** $p < 0.001$.

Table 3
Mediation models of anxiety sensitivity cognitive concerns predicting suicidal ideation through symptoms of depression.

	DSI-SS Suicidal Ideation		
	B	95% CI	
		LL	UL
Cognitive Symptoms Model			
AS Cognitive Concerns	0.05	−0.23	0.28
Depression-Cognitive Symptoms	0.57	0.33	0.82
Indirect	0.49	0.29	0.70
Affective/Somatic Symptoms Model			
AS Cognitive Concerns	0.35	0.11	0.58
Depression-Affective/Somatic Symptoms	0.17	−0.02	0.33
Indirect	0.13	−0.02	0.26
Depression Symptoms Model			
AS Cognitive Concerns	0.06	−0.17	0.28
Depression Symptoms	0.52	0.28	0.73
Indirect	0.44	0.23	0.68

Note. DSI-SS=Depressive Symptom Inventory-Suicidality Subscale. CI=Confidence Interval. LL=Lower Limit. UL=Upper Limit. All significant results are in bold.

The main effects model including Affective/Somatic Symptoms provided adequate fit to the data ($\chi^2=288.64$, $p < 0.001$, $CFI=0.97$, $TLI=0.96$, $RMSEA=0.04$, 90% CI [0.03, 0.05]). The interaction model was then examined (model parameters are available in Table 2) and the $-2\log$ likelihood values were compared. Comparison of $-2\log$ likelihood values revealed no difference between the main effects model and the interaction model ($\chi^2=1.88$, $p=0.17$), which was supported by the nonsignificant interaction term ($p > 0.05$).

Model parameters for the mediation model including the effects of AS Cognitive Concerns on Suicidal Ideation through Affective/Somatic Symptoms are provided in Table 3. In this model, AS Cognitive Concerns was directly associated with Suicidal Ideation ($B=0.35$, 95% CI [0.11, 0.58]). The Affective/Somatic Symptoms factor was not associated with Suicidal Ideation ($B=0.17$, 95% CI [−0.02, 0.26]) and there was not a significant indirect effect ($B=0.13$, 95% CI [−0.02, 0.26]).

The main effects model including Depression as a second-order factor also provided adequate fit to the data ($\chi^2=615.001$, $p < 0.001$, $CFI=0.93$, $TLI=0.92$, $RMSEA=0.04$, 90% CI [0.04, 0.05]). The interaction model was then examined (model parameters are available in Table 2) and compared using $-2\log$ likelihood values. Comparison of $-2\log$ likelihood values revealed no difference between the main effects model and the interaction model ($\chi^2=0.78$, $p=0.38$), which was supported by the nonsignificant interaction term ($p > 0.05$).

Model parameters for the mediation model including the effects of AS Cognitive Concerns on Suicidal Ideation through Depression Symptoms are provided in Table 3. In this model, AS cognitive concerns was not directly associated with Suicidal Ideation ($B=0.06$, 95% CI [−0.17, 0.28]). The Depression Symptoms factor was associated with Suicidal Ideation ($B=0.52$, 95% CI [0.28, 0.73]). Further, there was a significant indirect effect ($B=0.44$, 95% CI [0.23, 0.68]).

4. Discussion

The current study provided an empirical test of the DDAM across the two most highly supported factors of depressive symptoms in a treatment seeking outpatient sample. Counter to our initial hypotheses, and inconsistent with the DDAM, there was not a significant interaction between AS cognitive concerns and depressive symptoms in the prediction of suicidal ideation for

either cognitive or affective/somatic symptoms. These results are also contrary to previous work reporting significant associations between suicidal ideation and the interaction of AS cognitive concerns and depressive symptoms in clinical outpatients, at risk young adults, and adolescents (Capron et al., 2013b; Capron et al., 2014; Capron et al., 2015). One possible explanation for this discrepancy is that previous work examining the DDAM may be limited by the use of statistical approaches that do not sufficiently remedy the well-documented issues with highly skewed variables (e.g., Delucchi and Bostrom, 2004) such as suicidal ideation. As the current examination provides a superior statistical test by modeling suicidal ideation as a normally distributed continuous variable (Bollen, 1989), these data suggest that researchers need to reconsider theoretical models of how AS cognitive concerns contributes to elevated levels of suicidal ideation.

Although the results of the current study do not support an interaction between symptoms of depression and AS cognitive concerns in the development of suicidal ideation, it is still possible that the DDAM provides insight into individuals who go on to attempt to die by suicide. Given that AS is known to amplify anxiety, and increased agitation/anxiety is a strong risk factor for suicidal behaviors (e.g., Busch et al., 2003), it is possible that increases in distress caused by elevated levels of AS interact with symptoms of depression to predict who will attempt to die by suicide. Therefore, future work should examine this interaction in the context of suicidal behaviors.

The mediation models provide further insight into the nature of the AS cognitive concerns and suicidal ideation relationship. A significant direct effect of AS cognitive concerns in the prediction of suicidal ideation was found when accounting for affective/somatic symptoms, but not cognitive symptoms, of depression. This discrepancy may help explain some of the inconsistencies in the literature in which some studies find a significant relationship between AS cognitive concerns and suicidal ideation controlling for depressive symptoms (Capron et al., 2013b, 2014, 2015) and other studies do not find this relationship (Allan et al., 2015). However, it should be noted that a significant portion of the AS cognitive and suicidal ideation work has controlled for the presence of an MDD diagnosis, or negative affect, and not depressive symptoms, per se (e.g., Schmidt et al., 2001; Capron et al., 2012a, 2012b, 2013a). The use of the presence/absence of MDD diagnosis rather than depressive symptoms could also help explain this discrepancy in the literature as MDD diagnosis contains less variability than severity of depressive symptoms, potentially leaving more variability in suicidal ideation to be explained by AS cognitive concerns.

Results revealed a significant indirect effect of AS cognitive concerns through cognitive symptoms of depression, but not through affective/somatic symptoms, in the prediction of suicidal ideation. Therefore, it appears that the presence of cognitive symptoms of depression completely accounts for the relationship between AS cognitive concerns and suicidal ideation, as the direct effect between AS cognitive concerns and suicidal ideation was no longer significant in the presence of the indirect effect. These results are consistent with a previously suggested model (Allan et al., 2015) in which elevated levels of AS cognitive concerns may increase risk for suicidal ideation via increases in cognitive symptoms of depression, which is consistent with previously demonstrated causal links between AS and depression (Zavos et al., 2012) as well as depression and suicidal ideation (e.g., Mazza and Reynolds, 1998).

Interestingly, in the context of the mediation models, there was no direct effect of affective/somatic symptoms in the prediction of suicidal ideation in the presence of AS cognitive concerns. Given that suicidal ideation is considered a cognitive symptom of depression (Vanheule et al., 2008; American Psychiatric Association,

2013), not an affective/somatic symptom, these results are not necessarily surprising. However, this specificity promotes the importance of separating out depression factors in empirical work examining the relationships between depressive symptoms and other constructs as factor analysis has continually demonstrated depression is a multifaceted construct (see Quilty et al. (2010), for a review). Given that the vast majority of the current literature ignores this factor structure, it is quite possible that analyzing depressive symptoms factors separately will help shed light on the relationships between depression and other constructs, as was the case with the AS cognitive concerns and suicidal ideation relationship examined in the current study.

The current study also has some clinical implications. First, the current results suggest that clinicians should pay more attention to the presence of cognitive symptoms of depression, rather than AS cognitive concerns, when considering risk for suicidal ideation as AS cognitive concerns does not appear to confer additional risk above and beyond cognitive symptoms of depression. Additionally, the current study suggests that targeting AS cognitive concerns in treatment could yield benefits for both cognitive symptoms of depression broadly, as well as suicidal ideation. In fact, one RCT found that a computerized AS cognitive concerns treatment successfully reduced AS cognitive concerns, depressive symptoms, and suicidal ideation (Schmidt et al., 2014).

The results of the current study should be considered in light of several limitations. First, due to a cross sectional design the current study cannot speak to causality with regard to the AS cognitive concerns, depressive symptoms, and suicidal ideation relationships. Moreover, since DDAM is relevant for the development of suicidal symptoms, this interplay may not be accurately captured by a cross sectional “snap shot” of this clinical sample. Future work should investigate these models in a longitudinal framework to elucidate temporal precedence. Second, the current study examined the relationship between AS cognitive concerns and suicidal ideation, but not suicidal behaviors. Given that estimates suggest far less than half of individuals who experience suicidal ideation escalate to suicidal behaviors (Nock et al., 2008) future work should attempt to further disentangle the nature of the relationship between AS cognitive concerns and suicidal behaviors. Finally, the current study was limited by the self-report nature of the variables. Future work should integrate a multi-method approach to help researchers better clarify the nature of these relationships.

Despite these limitations the current study significantly adds to the literature by investigating the DDAM (interaction between AS cognitive concerns and depressive symptoms) in a clinical outpatient sample using latent variable modeling that allows for the elimination of statistical concerns associated with the heavily skewed distribution of suicidal ideation. The results from the current study suggest that the DDAM may not be an accurate depiction of the process through which AS cognitive concerns may confer additional risk for suicidal ideation. Rather, the current study suggests that AS cognitive concerns may increase risk for suicidal ideation through cognitive symptoms of depression.

Acknowledgement

This research was supported in part by the American Foundation for Suicide Prevention (DIG-10-030-12) and the Military Suicide Research Consortium (MSRC), funded through the Office of the Assistant Secretary of Defense for Health Affairs (W81XWH-10-2-0181/FSU 030969). Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the MSRC or the Department of Defense.

References

- AFSP, 2013. Facts about suicide. In: AFSP (Ed.), American Foundation for Suicide Prevention: The Truth about Suicide Fact Sheet. Retrieved from: (<http://www.afsp.org/understanding-suicide/facts-and-figures>).
- Allan, N.P., Norr, A.M., Boffa, J.W., Durmaz, D.A., Raines, A.M., Schmidt, N.B., 2015. Examining the unique relations between anxiety sensitivity factors and suicidal ideation and past suicide attempts. *Psychiatry Res.* 230, 441–447.
- American Psychiatric Association, 2013. *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed. American Psychiatric Publishing, Arlington, Virginia.
- Beck, A., Steer, R., Brown, G., Van der Does, A., 2002. BDI-II-NL Handleiding [BDI-II-Dutch Manual]. Psychological Corporation, Lisse, the Netherlands.
- Beck, A.T., Steer, R., Brown, G.K., 1996. Beck Depression Inventory-II. the Psychological Corporation, San Antonio, Texas.
- Beck, A.T., Steer, R.A., Kovacs, M., Garrison, B., 1985. Hopelessness and eventual suicide: A 10-year prospective study of patients hospitalized with suicidal ideation. *Am. J. Psychiatry* 142, 559–563.
- Bollen, K.A., 1989. *Structural Equations with Latent Variables*. John Wiley & Sons, New York, New York.
- Bolton, J.M., Robinson, J., 2010. Population-attributable fractions of Axis I and Axis II mental disorders for suicide attempts: findings from a representative sample of the adult, noninstitutionalized US population. *Am. J. Public Health* 100, 2473–2480.
- Busch, K.A., Fawcett, J., Jacobs, D.G., 2003. Clinical correlates of inpatient suicide. *J. Clin. Psychiatry* 64, 14–19.
- Capron, D.W., Allan, N.P., Ialongo, N.S., Leen-Feldner, E., Schmidt, N.B., 2015. The depression distress amplification model in adolescents: a longitudinal examination of anxiety sensitivity cognitive concerns, depression and suicidal ideation. *J. Adolesc.* 41, 17–24.
- Capron, D.W., Blumenthal, H., Medley, A.M., Lewis, S., Feldner, M.T., Zvolensky, M.J., Schmidt, N.B., 2012a. Anxiety sensitivity cognitive concerns predict suicidality among smokers. *J. Affect. Disord.* 138, 239–246.
- Capron, D.W., Coughle, J.R., Ribeiro, J.D., Joiner, T.E., Schmidt, N.B., 2012b. An interactive model of anxiety sensitivity relevant to suicide attempt history and future suicidal ideation. *J. Psychiatr. Res.* 46, 174–180.
- Capron, D.W., Fitch, K.E., Medley, A., Blagg, C., Mallott, M., Joiner, T., 2012c. Role of anxiety sensitivity subfactors in suicidal ideation and suicide attempt history. *Depress. Anxiety* 29, 195–201.
- Capron, D.W., Kotov, R., Schmidt, N.B., 2013a. A cross-cultural replication of An interactive model of anxiety sensitivity relevant to suicide. *Psychiatry Res.* 205, 74–78.
- Capron, D.W., Lamis, D.A., Schmidt, N.B., 2014. Test of the depression distress amplification model in young adults with elevated risk of current suicidality. *Psychiatry Res.* 219, 531–535.
- Capron, D.W., Norr, A.M., Macatee, R.J., Schmidt, N.B., 2013b. Distress tolerance and anxiety sensitivity cognitive concerns: testing the incremental contributions of affect dysregulation constructs on suicidal ideation and suicide attempt. *Behav. Ther.* 44, 349–358.
- Delucchi, K.L., Bostrom, A., 2004. Methods for analysis of skewed data distributions in psychiatric clinical studies: working with many zero values. *Am. J. Psychiatry* 161, 1159–1168.
- Hu, L.T., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model.: Multidiscip. J.* 6, 1–55.
- Jaccard, J., Wan, C.K., 1995. Measurement error in the analysis of interaction effects between continuous predictors using multiple regression: multiple indicator and structural equation approaches. *Psychol. Bull.* 117, 348–357.
- Joiner, T.E., Brown, J.S., Wingate, L.R., 2005. The psychology and neurobiology of suicidal behavior. *Annu. Rev. Psychol.* 56, 287–314.
- Joiner, T.E., Pfaff, J.J., Acres, J.G., Johnson, F., 2002. Birth month and suicidal and depressive symptoms in Australians born in the Southern vs. the Northern hemisphere. *Psychiatry Res.* 112, 89–92.
- Joiner, T.E., Rudd, M.D., 1996. Disentangling the interrelations between hopelessness, loneliness, and suicidal ideation. *Suicide Life Threat. Behav.* 26, 19–26.
- Kenny, D.A., McCoach, D.B., 2003. Effect of the number of variables on measures of fit in structural equation modeling. *Struct. Equ. Model.* 10, 333–351.
- Kessler, R., Borges, G., Walters, E.E., 1999. Prevalence of and risk factors for lifetime suicide attempts in the national comorbidity survey. *Arch. Gen. Psychiatry* 56, 617–626.
- Klein, A.G., Muthén, B.O., 2007. Quasi-maximum likelihood estimation of structural equation models with multiple interaction and quadratic effects. *Multivar. Behav. Res.* 42, 647–673.
- Kline, R.B., 2011. *Principles and Practice of Structural Equation Modeling*, 3rd ed. Guilford press, New York, New York.
- Kojima, M., Furukawa, T.A., Takahashi, H., Kawai, M., Nagaya, T., Tokudome, S., 2002. Cross-cultural validation of the Beck Depression Inventory-II in Japan. *Psychiatry Res.* 110, 291–299.
- MacCallum, R.C., Browne, M.W., Sugawara, H.M., 1996. Power analysis and determination of sample size for covariance structure modeling. *Psychol. Methods* 1, 130–149.
- Mazza, J.J., Reynolds, W.M., 1998. A longitudinal investigation of depression, hopelessness, social support, and major and minor life events and their relation to suicidal ideation in adolescents. *Suicide Life Threat. Behav.* 28, 358–374.
- Metalsky, G.I., Joiner, T.E., 1997. The hopelessness depression symptom questionnaire. *Cognit. Ther. Res.* 21, 359–384.

- Moshagen, M., 2012. The model size effect in SEM: inflated goodness-of-fit statistics are due to the size of the covariance matrix. *Struct. Equ. Model.: Multidiscip. J.* 19, 86–98.
- Naragon-Gainey, K., 2010. Meta-analysis of the relations of anxiety sensitivity to the depressive and anxiety disorders. *Psychol. Bull.* 136, 128–150.
- Nock, M.K., Borges, G., Bromet, E.J., Cha, C.B., Kessler, R.C., Lee, S., 2008. Suicide and suicidal behavior. *Epidemiol. Rev.* 30, 133–154.
- Osman, A., Downs, W.R., Barrios, F.X., Kopper, B.A., Gutierrez, P.M., Chiro, C.E., 1997. Factor structure and psychometric characteristics of the Beck Depression Inventory-II. *J. Psychopathol. Behav. Assess.* 19, 359–376.
- Osman, A., Gutierrez, P.M., Smith, K., Fang, Q., Lozano, G., Devine, A., 2010. The anxiety sensitivity Index-3: analyses of dimensions, reliability estimates, and correlates in nonclinical samples. *J. Personal. Assess.* 92, 45–52.
- Quilty, L.C., Zhang, K.A., Bagby, R.M., 2010. The latent symptom structure of the Beck Depression Inventory-II in outpatients with major depression. *Psychol. Assess.* 22, 603.
- Reiss, S., Peterson, R., Gursky, D., McNally, R., 1986. Anxiety sensitivity, anxiety frequency and the prediction of fearfulness. *Behav. Res. Ther.* 24, 1–8.
- Sara, G., 2010. What's normal anyway? Normal and non-normal distributions in psychiatry. *Acta Neuropsychiatr.* 22, 305–310.
- Schmidt, N.B., Capron, D.W., Raines, A.M., Allan, N.P., 2014. Randomized clinical trial evaluating the efficacy of a brief intervention targeting anxiety sensitivity cognitive concerns. *J. Consult. Clin. Psychol.* 82, 1023–1033.
- Schmidt, N.B., Maner, J.K., Zvolensky, M.J., 2007. Reactivity to challenge with carbon dioxide as a prospective predictor of panic attacks. *Psychiatry Res.* 151, 173–176.
- Schmidt, N.B., Woolaway-Bickel, K., Bates, M., 2001. Evaluating panic-specific factors in the relationship between suicide and panic disorder. *Behav. Res. Ther.* 39, 635–649.
- Steer, R.A., Ball, R., Ranieri, W.F., 1999. Dimensions of the Beck Depression Inventory-II in clinically depressed outpatients. *J. Clin. Psychol.* 55, 117–128.
- Taylor, S., Zvolensky, M.J., Cox, B.J., Deacon, B., Heimberg, R.G., Ledley, D.R., Cardenas, S.J., 2007. Robust dimensions of anxiety sensitivity: development and initial validation of the anxiety sensitivity Index-3. *Psychol. Assess.* 19, 176–188.
- Valentiner, D.P., Gutierrez, P.M., Blacker, D., 2002. Anxiety measures and their relationship to adolescent suicidal ideation and behavior. *J. Anxiety Disord.* 16, 11–32.
- Vanheule, S., Desmet, M., Groenvynck, H., Rosseel, Y., Fontaine, J., 2008. The factor structure of the Beck Depression Inventory-II: an evaluation. *Assessment* 15, 177–187.
- Vanheule, S., Desmet, M., Verhaeghe, P., Bogaerts, S., 2007. Alexithymic depression: evidence for a depression subtype? *Psychother. Psychosom.* 76, 315–316.
- Wang, Y.P., Gorenstein, C., 2013. Psychometric properties of the beck depression Inventory-II: a comprehensive review. *Rev. Bras. Psiquiatr.* 35, 416–431.
- Watson, D., O'Hara, M.W., Simms, L.J., Kotov, R., Chmielewski, M., McDade-Montez, E.A., Gamez, W., Stuart, S., 2007. Development of the inventory of depression and anxiety symptoms. *Psychol. Assess.* 19 (253), 268.
- Weissman, M., Klerman, G.L., Markowitz, J.S., Ouellette, R., 1989. Suicide ideation and suicide attempts in panic disorder and attacks. *N. Engl. J. Med.* 321, 1209–1214.
- Whisman, M.A., Perez, J.E., Ramel, W., 2000. Factor structure of the Beck Depression Inventory-Second Edition (BDI-II) in a student sample. *J. of Clin. Psychol.* 56, 545–551.
- Zavos, H.M., Rijdsdijk, F.V., Eley, T.C., 2012. A longitudinal, genetically informative, study of associations between anxiety sensitivity, anxiety and depression. *Behav. Genet.* 42, 592–602.
- Zinbarg, R.E., Barlow, D.H., Brown, T.A., 1997. Hierarchical structure and general factor saturation of the anxiety sensitivity index: evidence and implications. *Psychol. Assess.* 9, 277–284.