Published in final edited form as:

Behav Res Ther. 2010 August ; 48(8): 761–769. doi:10.1016/j.brat.2010.05.001.

The Relationship Between Anxiety Sensitivity and Latent Symptoms of Emotional Problems: A Structural Equation Modeling Approach

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Abstract

A large body of research suggests that common and specific psychopathology dimensions underlie the symptoms that occur within mood and anxiety disorders. As of yet, it is unclear precisely how the facets of Anxiety Sensitivity (AS), or fear of the symptoms of fear and anxiety, relate to these latent factors. Using data from 606 adolescents participating in the baseline phase of a longitudinal study on risk factors for emotional disorders, we modeled the facets of AS as measured by the Anxiety Sensitivity Index-Expanded Form (ASI-X) and related these facets to a hierarchical model of latent symptoms of psychological distress. Results suggest that one facet of AS is associated with a broad General Distress factor underlying symptoms of most emotional disorders while others relate to intermediate-level and conceptually-meaningful narrow factors representing aspects of psychological distress specific to particular emotional disorders.

Keywords

Anxiety Sensitivity; anxiety; depression; hierarchical model

Anxiety Sensitivity (AS) has been defined as a fear of anxiety and physical sensations related to anxiety arising from beliefs that anxiety and its correlates have harmful somatic, psychological, and social consequences (Reiss, 1987; Reiss & McNally, 1985; Reiss, Peterson, Gursky, & McNally, 1986). A growing body of research suggests that AS is associated with a broad range of emotional disorders (Olatunji & Wolitzky-Taylor, 2009). Understanding the ways in which AS relates to different symptoms of mood and anxiety

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disorders may contribute to our understanding of the etiology and maintenance of such symptoms, perhaps paving the way for the development of more effective psychological treatments.

A number of factor-analytic studies suggest that the structure of the most common measure of AS, the Anxiety Sensitivity Index (ASI), includes three group factors (i.e., factors common to some but not all items) representing Physical, Social, and Mental-Incapacitation Concerns (e.g., Li & Zinbarg, 2007; Stewart, Taylor, & Baker, 1997; Zinbarg, Barlow, & Brown, 1997). The Physical Concerns factor reflects concerns that the physical symptoms of anxiety are signs of catastrophic physical illness, while the Social Concerns factor reflects concerns that others will notice one's anxiety symptoms. Finally, the Mental-Incapacitation Concerns factor reflects fears of the cognitive symptoms of anxiety and concerns that these symptoms are signs that one is going crazy or becoming mentally ill. The three group factors co-exist with a higher-order AS construct, and most emotional disorders are associated with significant elevations on at least some facets of AS (Zinbarg et al., 1997; Taylor, Koch, Woody, & McLean, 1996).

Although the facets of AS appear to be elevated in the context of several emotional disorders, individuals with different disorders differ in the degree to which they show elevations on particular AS facets. For example, Rector, Szacun-Shimizu, and Leybman (2007) found that panic disorder with agoraphobia (PDA) was associated with significantly greater elevations on the Physical Concerns facet than either social phobia (SP) or generalized anxiety disorder (GAD). Similarly, SP was associated with significantly higher elevations on AS Social Concerns than either PDA or GAD, and GAD was associated with significantly greater elevations on the Mental-Incapacitation Concerns facet than SP (for similar results see Zinbarg et al., 1997).

Regarding the prospective prediction of panic and anxiety symptoms, some research suggests that the AS Physical Concerns facet may be the best predictor of panic symptoms (Grant, Beck, & Davila, 2007; Hayward, Killen, Kraemer, & Taylor, 2000), although other research suggests that the Mental-Incapacitation Concerns facet may be a better predictor (Li & Zinbarg, 2007; Schmidt, et al., 1999). Unexpectedly, the only AS study that has attempted to prospectively predict social anxiety symptoms failed to find evidence that these symptoms are predicted by any AS facet (Grant et al., 2007). However, one should always be reluctant to accept the null hypothesis and this is especially true in this case given the poor psychometric properties of the Social Concerns subscale of the original ASI (e.g., Blais et al., 2001).

Research examining the differential associations of the facets of AS with depression has been largely cross-sectional in nature. This research suggests that the Mental-Incapacitation Concerns facet is more strongly related to the diagnosis and symptoms of depression than is any other AS facet (e.g., Cox, Enns, & Taylor, 2001; Taylor et al., 1996; Rector et al., 2007). Indeed, some researchers have speculated that the Mental-Incapacitation Concerns facet may represent "a depression-specific form of anxiety sensitivity" (Taylor et al., 1996, p. 478) that is more strongly related to depression than to anxiety disorders. Others have suggested that this facet may prompt rumination about potential signs of mental incapacitation and thereby promote subsequent depression (Cox et al., 2001). The few relevant longitudinal studies to date have yielded inconsistent results. Schmidt, Lerew, and Joiner (1998) found that the Mental-Incapacitation Concerns facet prospectively predicted hopelessness and exhibited an association with future depression symptoms that approached significance after partialling variance due to anxiety symptoms. However, Grant et al. (2007) found that only the Physical Concerns facet was prospectively predicted depression symptoms.

Additional research evaluating the associations of the facets of AS with mood and anxiety symptoms is clearly needed to better understand the role of these facets in the etiology and maintenance of various emotional problems. First, additional large-scale studies using more reliable measures of the various AS facets are needed to better evaluate the differential predictive power of these facets. Second, studies have yet to systematically examine the degree to which each facet relates to underlying dimensions that are common to multiple disorders (such as negative affect or general distress), and to dimensions specific to particular disorders. In light of the emerging consensus that symptoms of psychopathology are hierarchically structured (see Watson, 2005), studies are needed to examine the relationship between the facets of AS and a hierarchical model of the shared and unique features of anxiety and mood disorders.

Further, examining the relationship between the facets of AS and a hierarchical model of symptoms may provide valuable insights into the pattern of relationships between facets and emotional disorders found in previous studies. For example, such analyses may help to reconcile findings that the Mental-Incapacitation Concerns facet of AS is associated with depression and has also sometimes appeared to be more strongly associated with panic than either the Physical or Social Concerns facets. This pattern of findings suggests that the Mental-Incapacitation Concerns facet may actually be associated with a general distress psychopathology factor with which both depression and panic symptoms are saturated (as has also been hypothesized by Olatunji & Wolitzky-Taylor, 2009, p. 993).

The Northwestern-UCLA Youth Emotion Project (YEP) is well suited to examine how the various facets of AS relate to a hierarchical model of mood and anxiety symptoms. During the first wave of this longitudinal study on vulnerability factors for emotional disorders, participants were given an expanded version of the ASI designed to increase the reliability of the AS facet scales, the ASI-X (see Li & Zinbarg, 2007), along with symptom measures of different forms of anxiety and depression. Prenoveau et al. (2010) found that the YEP symptom data were best modeled by a tri-level hierarchical arrangement with a latent General Distress factor, two intermediate-level factors representing Anxious-Misery and Fears, and five conceptually-meaningful, narrow symptom group factors (see Figure 1). These conceptually meaningful narrow factors corresponded to symptoms at the core of MDD and several different types of anxiety disorders. Prenoveau et al. labeled these factors as Depression, Social Anxiety, Specific Phobia-like Fears, Interoceptive/Agoraphobic Fears, and Anxious Arousal. In the present research, we examined the factor structure of the ASI-X in our data before examining how the various facets of AS related to this hierarchical model of mood and anxiety symptoms. On the basis of the studies reviewed above, we formed several *a priori* hypotheses about the facets of AS and how they might relate to different levels of the symptom hierarchy.

First, we predicted that AS would be adequately modeled by a higher-order model consisting of a general AS factor that coexists with three lower-order factors representing Physical, Social, and Mental-Incapacitation Concerns. Second, it was hypothesized that Mental-Incapacitation Concerns would predict a latent General Distress factor. Third, if the Mental-Incapacitation Concerns facet is more strongly related to depression than to the other emotional disorders (as suggested by Taylor et al., 1996), then the Mental-Incapacitation Concerns facet could also be expected to predict the intermediate-level Anxious-Misery factor, the narrow Depression symptom factor, or both. Fourth, we hypothesized that the Physical Concerns facet would predict the intermediate-level Fears factor, the narrow Interoceptive/Agoraphobic Fears factor, or both. Though previous research suggests that Mental-Incapacitation Concerns are also associated with symptoms of panic and related anxiety disorders (Li & Zinbarg, 2007; Schmidt et al., 1999), this association is likely due to the general distress component underlying these symptoms. Fifth, in light of its association

with panic symptoms, we predicted that Physical Concerns would also predict the narrow Anxious Arousal symptoms factor. Sixth, we hypothesized that the Social Concerns facet would predict the narrow Social Anxiety symptoms factor.

Because Neuroticism (N) is associated with all mood and anxiety disorders (Claridge & Davis, 2001; Clark, Watson, & Mineka, 1994), we deemed it important to determine if facets of AS predicted General Distress above and beyond N. Although we were also interested in determining whether facets of AS had incremental power in predicting any lower order facets predicted by N, we had no a priori hypotheses that N would relate to particular lower-level symptom factors from which variance due to General Distress had been removed. Therefore, before evaluating the above hypotheses, we first tested a structural model in which General Distress, the two intermediate-level factors, and all lower-level symptom factors were regressed on N. Significant pathways between N and the various factors were retained in models designed to test our hypotheses.

METHODS

Participants

Participants were high school juniors recruited through one high school in suburban Los Angeles and one in suburban Chicago as part of the YEP. Over three years, all juniors in both schools were invited to participate in the initial screening phase of this study, and 1,976 invited participants completed the N scale of the Eysenck Personality Questionnaire–Revised (EPQ-R; S. B. Eysenck, Eysenck, & Barrett, 1985). Potential study participants were then invited to participate based on their scores on the EPQ-R N scale in an attempt to oversample individuals at risk for emotional disorders. Details of the selection procedure are provided elsewhere (Zinbarg et al., 2009). The final sample of invited participants who completed Time 1 (T1) interview and questionnaire data included 627 students, of whom 58.7% scored in the top third on the EPQ-R N scale, 23.1% scored in the middle third, and 18.2% scored in the bottom third. At T1, participants were 15–18 years old ($M = 16.9$, $SD = .39$) and slightly more than two thirds (68.9%) were female. As has been described elsewhere (e.g., Zinbarg et al.), this sample of participants was also socio-economically and racially diverse. Of these participants, 606 completed the measure of AS used in the present study.

Measures and Procedure

Personality Measures

Neuroticism: Four different measures were used to assess N. Standardized mean-item scores were calculated for all participants on each measure and were used as indicators of a latent N factor in all analyses involving this personality trait. A previous confirmatory factor analysis of these data suggested that a single-factor model provided an excellent fit to the observed covariances among these four scales (CFI=1.00, RMSEA= 0.013, SRMR= 0.008; see Zinbarg et al., 2009).

Behavioral Inhibition System (BIS) Scale: The seven-item BIS Scale (Carver & White, 1994) asked participants to evaluate how well statements applied to them on a 1 (very true for me) to 4 (very false for me) continuum. This scale primarily measures Trait Anxiety, an important facet of N, and exhibits better predictive validity than other trait anxiety measures (e.g., Carver & White, 1994). In the present sample, Cronbach's alpha (α) equaled 0.75.

Big 5 Mini-Markers Neuroticism Scale: The eight-item Big 5 Mini-Marker N Scale (Saucier, 1994) asked participants to rate how well different words described them on a 1

(extremely inaccurate) to 9 (extremely accurate) scale. In the present sample, α equaled 0.81.

Eysenck Personality Questionnaire-Revised (EPQ-R), Neuroticism Scale: The 23-item¹ EPQ-R (Eysenck et al., 1985) asked participants to respond to questions in a yes or no format. A previous factor analysis of this instrument in our sample (see Mor et al., 2008) suggested that one item, “Do you worry about your health,” did not load on any factor, and this item was excluded from the EPQ-R mean-item scores. In the present sample, α equaled 0.79 and ω_h equaled 0.68 (Mor et al., 2008).

International Personality Item Pool (IPIP) NEO-PI-R N Scale: The 60-item IPIP NEO-PI-R N scale (International Personality Item Pool, 2001) asked participants to rate how well statements described them on a 1 (very inaccurate) to 5 (very accurate) scale. A previous factor analysis of this instrument in our sample (Uliaszek et al., 2009) suggested using only 39 of the original 60-items. Accordingly, 21 items were excluded from our calculation of mean-item scores on this instrument. α equaled 0.95 and ω_h equaled .86 (Uliaszek et al., 2009).

Anxiety Sensitivity: AS was assessed using the 29-item Anxiety Sensitivity Index Expanded Form (ASI-X; Li & Zinbarg, 2007), consisting of the 16 original ASI items and 13 newer items (see Table 1). This measure requires participants to evaluate statements regarding fears and cognitions about symptoms of anxiety in terms of how well each statement applied to them on 1 (very little) to 5 (very much) scale. The reported psychometric properties of this scale and its facet scales (Li & Zinbarg, 2007) are comparable to those of other expanded measures of AS such as the ASI-R (Taylor & Cox, 1998) and the ASI-3 (Taylor et al., 2007). The factor structure and reliabilities of the three AS facet scales within the present sample are presented in the results section.

Self-report Measures of Anxiety and Depression—In addition to measures of personality, participants were concurrently given a battery of self-report measures designed to assess key symptoms of a number of DSM mood and anxiety disorders.² The present study used the hierarchical symptom structure reported by Prenoveau et al. (2010) to test the current hypotheses. Because items on the various symptom measures administered were used to form a hierarchical model of symptoms rather than individual scale scores, the internal consistency of individual scales are not reported in the present sample.

Symptom Measures

Albany Panic and Phobia Questionnaire (APPQ) Subscales: The Interoceptive and Agoraphobic Concerns subscales of the APPQ (Rapee, Craske, & Barlow, 1994/1995) were administered to assess fear of engaging in sensation producing activities and fear of common agoraphobic situations. These 22 items asked participants to rate the degree of fear that they would experience while engaging in different activities on a 0 (none) to 8 (extreme fear) scale.

¹The original EPQ Neuroticism Scale consists of 24 items. An item referring to suicidality was omitted to avoid potential ethical conflicts.

²One limitation of the YEP study is that we did not include symptom measures of several types of anxiety disorders, namely obsessive compulsive disorder and post-traumatic stress disorder (PTSD). Particularly, given that research by Olatunji and Wolitzky-Taylor (2009) suggests that total scores on measures of AS are as elevated in PTSD as in panic disorder, it is unfortunate that we are unable to look at the relationships between the facets of AS and symptoms of this disorder. Further, our only measure of generalized anxiety disorder, the Mood and Anxiety Symptom Questionnaire (MASQ, Watson et al., 1995), did not include questions assessing important features of this disorder (such as worry).

Fear Survey Schedule-II (FSS) Subscales: Three subscales of the 50-item FSS (Geer, 1965), consisting of 10 items total, were administered to assess common specific fears. Zinbarg and Barlow (1996) found these subscales to be excellent markers of specific fears. Items on these scales asked participants to rate the degree of fear that they would experience when faced with potentially frightening stimuli on a 0 (none) to 6 (terror) scale.

Inventory to Diagnose Depression (IDD): A 21-item version³ of the IDD (Zimmerman, Coryell, Corenthal, & Wilson, 1986) assessed symptoms of dysphoria, anhedonia, hopelessness, and self-deprecation, and is highly correlated with other measures of depression (Zimmerman et al., 1986). Each IDD item asked participants to select which of five statements best describes the way they have been feeling over the past week.

Mood and Anxiety Symptom Questionnaire: The MASQ (Watson et al., 1995) measured symptoms of several mood and anxiety disorders including GAD, panic, major depression, and dysthymia. This 90-item measure asked participants to indicate to what extent they have experienced each symptom during the past week on a 1 (not at all) to 5 (extremely) scale.

Self-Consciousness Subscale of the Social Phobia Scale (SPS): The self-consciousness subscale of the SPS (Mattick & Clarke, 1998; Zinbarg & Barlow, 1996) was administered to assess social anxiety. This 13-item subscale asked participants to rate the degree to which statements are typical of them on a 0 (not at all) to 4 (extremely) scale and is an excellent marker of a social anxiety factor (Zinbarg & Barlow, 1996).

Measurement Model: Treating items as categorical and excluding items that were redundant with each other, Prenoveau et al. (2010) constructed a three-level hierarchical measurement model of symptoms within the current data set (see Figure 1). As described above, conceptually meaningful narrow factors corresponded to symptoms of Depression, Social Anxiety, Specific Phobia-like Fears, Interoceptive/Agoraphobic Fears, and Anxious Arousal. Although all items loaded on the General Distress factor, only items loading on the Interoceptive/Agoraphobic Fears, Specific Phobia-like Fears, and the Social Fears factors also loaded on the intermediate-level Fears factor. Likewise, items loading on the Depression factor, items from the MASQ that did not load on any narrow factor, and some items on the Social Anxiety factor also loaded on the intermediate-level Anxious-Misery factor. This structure provided a better model fit on multiple indices (CFI=0.97, TLI=0.99, RMSEA=0.034) than either a six-factor orthogonal model or a two-factor hierarchical model without the intermediate-level factors. Prenoveau et al. also established the convergent validity of the psychopathology factors modeled by examining their relationship to clinical severity ratings (Di Nardo & Barlow, 1988) of conceptually related DSM diagnoses.

Data Analysis

All data analysis was conducted using Mplus version 5.2 statistical software (Muthén & Muthén, 1998–2009). In keeping with the analyses conducted by Prenoveau et al. (2010), both symptom questionnaire items and ASI-X items were treated as categorical. Missing data points were accommodated using full information maximum-likelihood and robust weighted least squares estimation (WLSMV) was used. Goodness of fit for all models was evaluated using the comparative fit index (CFI; Bentler, 2004), Tucker-Lewis Index (TLI; Tucker & Lewis, 1973), and Root Mean Square Error of Approximation (RMSEA; Steiger, 1989). According to Hu and Bentler (1999), cut-off values of 0.95 or higher for the CFI and TLI and of 0.06 or less for the RMSEA are needed to conclude that a model provides a good fit for data. However, Marsh, Hau, and Wen (2004) caution that such guidelines should not

³The original IDD consists of 22 items. An item referring to suicidality was omitted to avoid potential ethical conflicts.

be applied in an overly stringent way. For the purpose of this study, CFI and TLI values of 0.90 or above were considered acceptable and values of .95 or above were considered good. RMSEA values of 0.08 or below were considered acceptable and values of 0.06 or below were considered good. All difference tests of nested models were performed using a chi-square difference procedure described by Asparouhov and Muthén (2006). Model chi-square values and degrees of freedom are not reported as they are not interpretable when using WLSMV; only p-values are interpretable (Muthén, 2008).

RESULTS

ASI-X Measurement Model

To test that the structure of the ASI-X could be adequately modeled by a higher-order model consisting of a general factor coexisting with lower-order factors representing Physical, Social, and Mental-Incapacitation Concerns, a confirmatory factor analysis was conducted ($N=606$). However, because the ASI-X is relatively new, we also looked at modification indices to see if any of the 13 new items were introducing correlated residuals.

A new item was only excluded from analysis if a) modification indices suggested that the model would be improved by including a term modeling its correlated residual with another item and b) if a content analysis suggested the items introducing correlated residuals were redundant with each other. If modification indices suggested correlated residual terms between original ASI items, these error terms were only introduced to the model if they made conceptual sense. Refinements made to the scale and model were then cross-validated by examining the refined model in the original ASI-X data collected by Li and Zinbarg (2007).

An initial analysis suggested 7 of the 13 new ASI-X items were redundant with either original items or with other new items and were introducing correlated residuals into the model. Consequently, these items were excluded from future analyses. Further, modification indices suggested that correlated residual terms ought to be modeled between ASI items 3 and 4 and between items 1 and 5. Since items in each pair overlapped in terms of wording, with items 3 and 4 beginning with the stem “It scares me when I feel” and items 1 and 5 beginning with the stem “It is important to me,” correlated residual terms between these items were introduced. After these modifications, a higher-order model consisting of a general AS factor along with three lower-order factors representing Social, Physical, and Mental-Incapacitation concerns provided an acceptable fit to the data (CFI=0.90, TFI=0.97, RMSEA=0.067). This model also provided an acceptable fit of the data collected by Li and Zinbarg (2007) as indexed by two of the three fit indices used (CFI=0.88, TFI=0.94, RMSEA=0.080). Within the present sample, facet reliabilities calculated after redundant items were eliminated were good ($\alpha = 0.81$ for the Mental-Incapacitation Concerns facet; $\alpha = 0.76$ for the Social Concerns facet; $\alpha = 0.79$ for the Physical Concerns facet). Further, these reliabilities were higher relative to when only the original ASI items were used for the Mental-Incapacitation Concerns ($\alpha = 0.72$) and Social Concerns ($\alpha = 0.45$) facets (the Physical Concerns facet scale on the original ASI had an α of .79).

Structural Models

We began by evaluating a model in which all factors in the symptom hierarchy were regressed upon N. This model provided a good fit (CFI=0.95, TLI=0.97, RMSEA=0.039), and N was a significant associate of General Distress ($\beta = 0.66$, $t = 17.24$, $p < 0.001$), Anxious-Misery ($\beta = -0.17$, $t = -3.061$, $p < 0.005$), and Anxious Arousal ($\beta = -0.247$, $t = -2.29$, $p < 0.05$). Additionally, N's association with Specific Phobia-like Fears approached significance ($\beta = 0.13$, $t = 1.87$, $p < 0.061$). When the non-significant pathways between N and

other lower-order factors were removed, N was a significant predictor of Specific Phobia-like Fears ($\beta = 0.199$, $t = 3.128$, $p < 0.005$). Therefore, a pathway between N and Specific Phobia-like Fears was retained.

Next, to test our hypotheses about the relations of AS and its facets with the different levels of our hierarchy of latent symptoms, we evaluated the fit of a series of structural models. To determine if any AS facets had incremental power in predicting factors predicted by N, all models included pathways from N to General Distress, Anxious-Misery, Anxious Arousal, and Specific Phobia-like Fears. These analyses were conducted sequentially such that we did not test hypotheses about narrower factors in the hierarchy until after we had examined the relations of AS facets with broader latent factors upon which items loading on narrower factors also loaded.

If the chi-square difference procedure described by Asparouhov and Muthén (2006) suggested that the addition of pathways predicting a latent factor from the set of AS facets improved model fit relative to a comparison model that did not include those pathways, then we looked at the beta weights of the individual facets of AS. If any of these beta weights were significant, we conducted an additional chi-square difference test to determine if the set of other AS facets added to the predictive power of the facet(s) with significant beta weights. If so, it would suggest that the general AS factor was also a significant predictor of the latent factor.

Occasionally, models in which particular symptom factors were predicted from the set of AS facets failed to converge. In accordance with the suggestion of Gorsuch (1983, p. 199), we interpreted this as a sign of probable model misfit. However, given that we were particularly interested in the relationship between specific symptom factors and specific AS facets, in such cases, we conducted an additional analysis in which only the AS facet of interest (and, when appropriate, N) was modeled as a predictor of the relevant symptom factor. When such models converged and provided an improvement in model fit relative to a comparison model that did not include the pathway from the AS facet of interest to the relevant symptom factor, we interpreted this as suggesting that, although the general AS factor was not a significant predictor of the symptom factor in question, the AS facet of interest was.

Predicting General Distress—A model that included the three facets of AS as predictors of General Distress failed to converge. Consequently, to test our a priori hypothesis that the Mental-Incapacitation Concerns facet would predict General Distress, we evaluated a model in which only the Mental-Incapacitation Concerns facet and N were modeled as predictors of General Distress. This model provided a good fit for the data (CFI=0.95, TLI=0.97, RMSEA=0.038; see Table 2 for a summary of fit indices for various models), and significantly improved upon the fit of the model that only included pathways from N to symptom factors ($p < 0.005$). As hypothesized, the Mental-Incapacitation Concerns facet ($\beta = 0.20$, $t = 3.10$, $p < 0.005$) was a significant predictor of General Distress above and beyond N. In the final model of the relationship between facets of AS and the hierarchical model of symptoms, latent N accounted for approximately 14.1 percent of the variance in the General Distress factor while the AS Mental-Incapacitation Concerns facet accounted for an additional 3.0 percent of the variance.

Predicting Intermediate-Level Latent Variables—Next, we examined our hypotheses regarding the intermediate-level psychopathology factors by testing structural models in which, not only was General Distress predicted by N and Mental-Incapacitation Concerns, but intermediate-level factors were also predicted by the set of AS facets. A model that added pathways from all facets of AS (in addition to N) to the latent Anxious-Misery factor failed to converge, as did a model that only added a pathway from the Mental-Incapacitation

Concerns facet. These analyses failed to support our hypothesis that AS, and particularly Mental-Incapacitation Concerns, would predict the Anxious-Misery factor.

However, a chi-square difference test suggested that a model in which the facets of AS also predicted the intermediate-level Fears factor (CFI=0.95, TLI=0.98, RMSEA=0.037) provided a significantly better fit than a model that only included paths from N to symptom factors and from Mental-Incapacitation Concerns to latent General Distress ($p<0.001$). As hypothesized, Physical Concerns was a significant unique predictor of the Fears factor ($\beta=0.39$, $t=4.29$, $p<0.001$). In addition, the unique effect of Social Concerns facet ($\beta=-0.21$, $t=-1.70$, $p=0.089$) approached significance. A chi-square difference test suggested that including pathways from the Social and Mental-Incapacitation Concerns facet to the Fears factor significantly improved ($p<0.005$) upon the fit of a model in which only a pathway from the Physical Concerns facets to Fears was included (CFI=0.95, TLI=0.98, RMSEA=0.037). However, given that the association between Fears and the Social Concerns facet approached significance, an additional model was conducted in which only pathways from the Social and Physical Concerns facets to Fears were included. This model provided a good fit (CFI=0.95, TLI=0.98, RMSEA=0.037), and model fit was not significantly different from that of the model that included all three AS facets as predictors of Fears ($p>0.70$). Further, within this model, the negative association between Social Concerns and Fears reached significance.

Predicting Lower-Level Latent Variables—Next, we tested our hypotheses regarding the lower-level conceptually-meaningful latent factors. We compared models that included pathways between the facets of AS and lower-level factors to a model that included pathways from N to various symptom factors, from Mental-Incapacitation Concerns to General Distress, and from Physical and Social Concerns to Fears.

Failing to support our hypothesis that Physical Concerns would predict the lower-level Anxious Arousal factor, neither a model that included pathways from all AS facets to Anxious Arousal nor a model that included only a pathway from Physical Concerns (and a pathway from N) to this factor converged. Likewise, both models that included pathways between the facets of AS and the latent Interoceptive/Agoraphobic Fears factor and a model that only included a pathway from the AS Physical Concerns facet to this factor also failed to converge. Similarly, a test of whether model fit was improved by including pathways from AS facets to the lower-level Social Anxiety factor suggested that any improvements in model fit were not significant ($p>0.10$), failing to support our hypothesis that Social Concerns would predict this factor.

In contrast, including pathways between the AS facets and the narrow Depression factor resulted in a significant improvement in model fit (CFI=0.96, TLI=0.98, RMSEA=0.036; $p<0.001$). Contrary to our hypothesis, the Mental-Incapacitation Concerns facet was not a significant unique predictor ($p>0.80$) of latent Depression, and the Physical Concerns facet was a significant unique negative predictor ($\beta=-0.66$, $t=-3.73$, $p<0.001$). However, including pathways from the Social ($\beta=0.30$, $t=1.21$, $p>0.20$) and Mental-Incapacitation Concerns facets ($\beta=0.07$, $t=0.21$, $p>0.80$) improved upon the fit of a model that included only Physical Concerns as a predictor (CFI=0.95, TLI=0.98, RMSEA=0.037) at a level that approached significance ($p<0.056$), suggesting that the general AS factor may also predict variance in depressive symptoms. To further investigate this possibility and determine the direction in which the general AS factor predicts the Depression factor, both the higher-order AS factor and Physical Concerns facet were entered as predictors of latent Depression. Within this model, the higher-order factor was a significant positive predictor ($\beta=0.51$, $t=2.56$, $p<0.05$) while the Physical Concerns facet was a significant negative predictor ($\beta=-0.79$, $t=-4.16$, $p<0.001$).

Given that the general AS factor appears to predict latent Depression, pathways from Social and Mental-Incapacitation Concerns to the narrow Depression factor were retained in our final structural model. This model included pathways from N and Mental-Incapacitation Concerns to latent General Distress, from Physical and Social Concerns to latent Fears, from N to Anxious Misery, from the set of three AS facets to the narrow latent Depression factor, and from N to Anxious Arousal and Specific Phobia-like Fears. This model provided a good fit (CFI=0.96, TLI=0.98, RMSEA=0.036), and within this model, all significant beta weights from previous models remained significant.

Discussion

Analyses suggested that the ASI-X items could be modeled by a three factor higher-order model consisting of Physical, Social, and Mental-Incapacitation Concerns facets coexisting with a higher-order AS factor, and that the facets of AS relate to latent factors of a hierarchical model of the symptoms in a variety of ways. Importantly, the Mental-Incapacitation Concerns facet of AS appears to relate to a latent General Distress factor that underlies symptoms of most mood and anxiety disorders. This finding is consistent with research suggesting that Mental-Incapacitation Concerns are associated with symptoms of both depression (Cox et al., 2001; Schmidt et al., 1998; Taylor et al., 1996) and panic (Li & Zinbarg, 2007; Schmidt et al., 1999). It suggests that this facet is associated with a general tendency to experience negative emotions and/or broader difficulties regulating negative emotions and cognitions. Such a dispositional tendency to experience a wide variety of aversive emotional states defines the construct of N (Watson & Clark, 1984). However, although the Mental-Incapacitation Concerns facet was correlated with the composite measure of N used in this study, including a pathway from this facet improved upon the fit of a model using latent N to predict General Distress. Therefore, the Mental-Incapacitation Concerns facet of AS may, in fact, represent an important facet of N that has been not adequately captured by traditional N measures. (To clarify, we are not suggesting that this facet of AS is redundant with N as currently conceptualized, but rather that, given the definition of N as a tendency to experience General Distress, the construct of N should be re-conceptualized as including a Mental-Incapacitation Concerns facet.)

Contrary to our initial hypothesis, the Mental-Incapacitation Concerns facet of AS was not a unique associate of either the intermediate-level Anxious-Misery factor or the narrow latent Depression factor. Additionally, the general factor of AS was associated with the narrow latent Depression factor. In the sense that the Mental-Incapacitation Concerns facet was not a unique associate of the unique aspects of depression but was of General Distress, our findings run contrary to the idea that Mental-Incapacitation Concerns are a depression-specific form of Anxiety Sensitivity (see Taylor et al., 1996).

In light of previous findings suggesting that this facet of AS is more strongly associated with depression than with different types of anxiety disorders, it is possible that the depression measures used in previous studies may simply have been more highly saturated with general distress than were the anxiety measures. This possibility is consistent with the work of Prenoveau et al. (2010). In establishing the symptom hierarchy used in the present study, they found that those items that loaded on the narrow Depression factor also had some of the highest loadings on the broad General Distress factor. It is also consistent with previous genetic and phenotypic studies suggesting that, in general, measures of depression contain a large amount of general distress variance whereas measures of social and specific phobia appear to contain more modest general distress components (see Mineka, Watson, & Clark, 1998, for a review).

Consistent with our a priori hypothesis, the AS Physical Concerns facet was uniquely associated with the latent Fears factor underlying symptoms of social phobia, panic disorder

with agoraphobia (PDA), and specific phobias. While it did not appear to be related to the variance in PDA symptoms that is unshared with specific phobia and social anxiety symptoms, the idea that it broadly relates to an underlying Fears factor is consistent with Reiss's original conceptualization of AS. In developing the original ASI, half of which consisted of Physical Concerns items, Reiss (1987) emphasized that although fear of anxiety appears to be a prominent symptom of PDA, it has also been theoretically related to a broader range of phenomena. Further, the physical symptoms of fear that occur in PDA, such as tachycardia and shortness of breath, can also occur in social and specific phobia (APA, 2000). Hence, it is reasonable that disorders other than PDA, although defined by anxiety about other things, would also involve catastrophic interpretations of such symptoms and subsequent anxiety.

In light of previous findings suggesting that Physical Concerns are elevated in PDA relative to other anxiety disorders such as social phobia, it is possible that PDA may simply be a more severe fear disorder than those disorders to which it has been compared. Indeed, symptoms of PDA appear to be more saturated with the underlying latent Fears factor measured in this study than symptoms of disorders such as social phobia (Prenoveau et al., 2010). Further, there is evidence that the experience of physical symptoms of anxiety, such as tachycardia and shortness of breath, may be more prominent in the context of PDA than in the other disorders in which they occur (e.g., Brown, Chorpita, & Barlow, 1998). If the intermediate-level Fears factor is related to such physical symptoms, then this provides further support for the idea that the diagnosis of PDA may be particularly saturated with the underlying Fears factor that was predicted by the Physical Concerns facet in our study. Alternately, the Physical Concerns facet may still be related to aspects of PDA that are unshared with other fear disorders, but these aspects may not have been adequately measured within our study. Indeed, one limitation of the current study is that participants were assessed for mood and anxiety disorder symptoms before the modal age(s) of onset of some disorders, including PDA (APA, 2000).

In addition to predicting the intermediate Fears factor, the Physical Concerns facet of AS was also a significant negative predictor of the narrow latent Depression factor. Given that this narrow Depression factor represents those aspects of depression that remain after variance due to General Distress and the intermediate level Anxious-Misery factor have been partialled out, it is possible that Physical Concerns may somehow protect against anhedonia or other aspects of depression that are not shared with anxiety. However, this finding may also be due to Type I error and replication studies are needed before it should be interpreted.

The Social Concerns facet of AS was also associated with the intermediate Fears factor, although in a reverse direction. This finding was unexpected, particularly because the symptoms of social anxiety loaded upon this Fears factor. Hence, it is possible that this result is also due to possible Type I error. A further surprising finding was that the Social Concerns facet of AS was not predictive of the narrow latent Social Anxiety factor, in spite of the fact that the Social Concerns facet was measured more reliably than in previous studies. However, this null finding is consistent with recent work suggesting that Social Concerns items poorly discriminate individuals at risk for emotional disorders (Bernstein et al., 2007) and are no more strongly related to concerns about negative evaluation than are AS items reflecting Physical and Mental-Incapacitation Concerns (McWilliams, Stewart, & MacPherson, 2000).

In summary, although both conceptually and empirically related as part of a higher-order construct, the different facets of AS also have different external correlates and relate to symptoms at different levels of a symptom hierarchy of emotional disorders. While the

Mental-Incapacitations Concerns facet appears to be predictive of a very broad General Distress factor, adding to the predictive power of traditional measures of N, the Physical Concerns facet uniquely predicts latent Fears symptoms underlying those disorders that the original ASI was designed to predict (see Reiss, 1987). Unexpectedly, the Social Concerns facet failed to predict those aspects of social anxiety that are not shared with other disorders, and counter intuitively, inversely predicted latent Fear symptoms.

One limitation of this study is that we did not conduct a taxometric analysis of AS and, if a taxon class were found, examine the relationship between the taxonic form of AS and a hierarchical structure of symptoms. Although some taxometric research suggests that the underlying structure of AS may be dimensional (Broman-Fulks et al., in press; Broman-Fulks et al., 2008), other studies suggest that discrete maladaptive and adaptive latent classes may underlie AS (Bernstein et al., 2006; Bernstein et al., 2007). If the structure of AS were, in fact, taxonic, then based on previous research, we expect that 80 to 90 percent of our young, non-clinical sample would fall into the complement (e.g., adaptive) class (Bernstein, Zvolensky, Stewart, & Comeau, 2007). Thus, while including participants in both AS taxon and complement classes may have attenuated our current results, we would not have had enough participants in the taxon class to power (or estimate parameters in) analyses examining the relationship between the taxonic form of AS and a hierarchical structure of mood and anxiety symptoms.

Notably, this study also differed from previous studies looking at the relationship between AS and emotional disorder symptoms in that it oversampled participants with high levels of N. However, initial simulations that we have conducted (Hauner, Zinbarg, & Revelle, 2010) suggest that the degree of oversampling used should not have resulted in meaningful changes in the size of the effect of the oversampled variable nor in greater increases in power for the effects of neuroticism relative to the effects of AS. A final limitation is that the conclusions that can be drawn on the basis of its results are limited by its cross-sectional nature. Future work will need to prospectively examine the relationship between AS and factors underlying emotional disorders.

Despite its limitations, the current study is the first to relate the facets of AS to a hierarchical model of symptoms using structural equation modeling. As such, it expands upon and enhances our understanding of previous studies relating the AS facets to different disorders, suggesting that the relationships between facets and particular disorders may often be due to the relationship between these facets and broader factors underlying multiple emotional disorders.

Acknowledgments

This research was supported by National Institute of Mental Health Grants R01 MH65651 to Richard Zinbarg and Susan Mineka (NU) and R01 MH65652 to Michelle Craske (UCLA). Richard Zinbarg was also supported by the Patricia M Nielsen Research Chair of the Family Institute at Northwestern University. All data were collected at Northwestern University and at the University of California, Los Angeles.

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Figure 1.

Three-level hierarchical model of anxiety and mood symptoms. GD = General Distress; A-M = anxious-misery; SPF = specific-phobia-like fears; I/AF = interoceptive/ agoraphobic fears; SocA = social anxiety; Dep = depression; AA = anxious arousal; FSS = Fear Survey Schedule II; APPQ = Albany Panic and Phobia Questionnaire; SPS = Social Phobia Scale; MASQ = mood and anxiety symptom questionnaire; IDD = Inventory to Diagnose Depression. For clarity of presentation, error terms and methods factor incorporated by Prenoveau et al. (2009) have not been shown, and only 18 questionnaire items have been represented rather than all 67.

Table 1**Items and Corresponding Facets of the ASI-X**

Items	Facets
1. It is important to me not to appear nervous.	Social Concerns
2. When I cannot keep my mind on a task, I worry that I might be going crazy.	Mental-Incapacitation Concerns
3. It scares me when I feel shaky.	Physical Concerns
4. It scares me when I feel faint.	Physical Concerns
5. It is important to me to stay in control of my emotions.	Social Concerns
6. It scares me when my heart beats rapidly.	Physical Concerns
7. It embarrasses me when my stomach growls.	Social Concerns
8. It scares me when I am nauseous.	Physical Concerns
9. When I notice my heart is beating rapidly, I worry that I might have a heart attack.	Physical Concerns
10. It scares me when I become short of breath.	Physical Concerns
11. When my stomach is upset, I worry that I might be seriously ill.	Physical Concerns
12. It scares me when I am unable to keep my mind on a task.	Mental-Incapacitation Concerns
13. Other people notice when I feel shaky.	Social Concerns
14. Unusual body sensations scare me.	Physical Concerns
15. When I am nervous, I worry that I might be mentally ill.	Mental-Incapacitation Concerns
16. It scares me when I am nervous.	Mental-Incapacitation Concerns
17. I worry that people notice when I am nervous.	Social Concerns
18. When I have racing thoughts, I worry that I might be going crazy.*	Mental-Incapacitation Concerns
19. I worry that others would pity me if they were to notice my anxiety.	Social Concerns
20. Once I begin to get anxious, I worry that I might never recover.	Mental-Incapacitation Concerns
21. When I feel anxious, I worry that people will judge me.	Social Concerns
22. I am afraid that if I am noticeably anxious, people will dislike me.*	Social Concerns
23. When I notice feeling shaky, I worry that I might be seriously mentally ill.*	Mental-Incapacitation Concerns
24. I worry that people will judge me if my voice trembles.	Social Concerns
25. When my chest feels tight, I worry that I won't be able to breathe properly.*	Physical Concerns
26. When I feel pain in my chest, I worry that I'm going to have a heart attack.*	Physical Concerns
27. When I have trouble thinking clearly, I worry that there is something terribly wrong with me.	Mental-Incapacitation Concerns
28. When I notice my heart skip a beat, I worry that it could be a serious heart disease.*	Physical Concerns
29. When my mind goes blank, I worry there is something terribly wrong with me.*	Mental-Incapacitation Concerns

Note. ASI-X = Anxiety Sensitivity Index–Expanded Form;

* item excluded from structural models on the basis of the factor analysis.

Table 2**Model Fit Indices for Structural Models Predicting Symptoms of Anxiety and Depression**

	Model	CFI	TLI	RMSEA
I.	General Distress on N; Anxious-Misery on N; Anxious Arousal on N; Specific Phobia-like Fears on N	0.950	0.973	0.038
II.	General Distress on N and Mental-Incapacitation Concerns; Anxious-Misery on N; Anxious Arousal on N; Specific Phobia-like Fears on N	0.951	0.974	0.038
III.	General Distress on N and Mental-Incapacitation Concerns; Anxious-Misery on N; Fears on Physical and Social Concerns; Anxious Arousal on N; Specific Phobia-like Fears on N	0.953	0.975	0.037
IV.	General Distress on N and Mental-Incapacitation Concerns; Fears on Physical and Social Concerns; Anxious Arousal on N; Specific Phobia-like Fears on N; Narrow Depression on all AS facets	0.955	0.976	0.036

Note. N = Neuroticism; AS = Anxiety Sensitivity; CFI = Bentler's (2004) robust comparative fit index; TLI = Tucker-Lewis Index (Tucker & Lewis, 1973); RMSEA = root mean squared error of approximation (Steiger, 1989). Modified chi-square difference tests suggested that each model presented here provided a significantly better fit than the model above it.