Specific Associations between Anxiety Sensitivity Dimensions and Fear and Distress Dimensions of Emotional Distress Disorders

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Abstract Anxiety sensitivity (AS) comprises three lower-order dimensions, physical concerns, cognitive concerns, and social concerns, all of which are related to unipolar mood and anxiety disorders (emotional distress disorders). The pattern of these relations suggests that AS cognitive concerns might be best classified as associated with emotional distress disorders clustered together as distress disorders whereas AS physical concerns might be best classified as associated with emotional distress disorders clustered together as fear disorders. In contrast, AS social concerns appears to be generally associated with both fear and distress disorders. To test the specificity of lower-order AS dimensions, structural equation modeling was employed in a sample of 579 individuals (M age=36.87 years, SD=13.47; 51.6 % male) constituting a sample at risk for psychopathology as these individuals were seeking smoking cessation treatment. AS physical concerns was associated with the fear disorders dimension, even when controlling for negative affect (NA). AS cognitive concerns was associated with the distress disorder dimension, only when the effects of NA were not included. Finally, AS social concerns demonstrated non-specific relations with both the distress and fear disorders dimensions. Given that measures of AS and psychopathology were collected concurrently, these findings cannot address the role of lower-order AS dimensions as risk factors for specific psychopathology clusters. These results provide further support for the hierarchical model of emotional distress disorders as well as implicate AS cognitive and physical concerns as important variables at the intermediate level of this model.

Keywords Anxiety sensitivity cognitive concerns · Anxiety sensitivity physical concerns · Anxiety sensitivity social concerns · Emotional distress disorders · Fear and distress model

Anxiety sensitivity (AS) is a fundamental component of Reiss' (1991) expectancy theory, reflecting the extent to which an individual believes that autonomic arousal can have deleterious consequences (Reiss and McNally 1985). Those high in AS fear anxious arousal because they believe there will be adverse physical, cognitive, and/or social consequences associated with these symptoms (Zinbarg, Barlow, and Brown 1997). AS has been identified as a risk factor for the development and maintenance of numerous unipolar mood and anxiety disorders (i.e., emotional distress disorders) including major depressive disorder (MDD), panic disorder (PD), social anxiety disorder (SAD), and post-traumatic stress disorder (PTSD; Rodriguez, Bruce, Pagano, Spencer, and Keller 2004; Schmidt, Lerew, and Jackson 1997; Taylor, Koch, and McNally 1992; Taylor, Koch, Woody, and McLean 1996). Recent evidence suggests a degree of specificity between lower-order AS dimensions and specific emotional distress disorders (e.g., Allan, Capron, Raines, and Schmidt 2013; Naragon-Gainey 2010).

The Multidimensional Structure of Anxiety Sensitivity

AS has been established as a stable multidimensional construct, composed of three related but distinct dimensions, AS

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physical concerns, cognitive concerns, and social concerns (Taylor et al. 2007; Zinbarg et al. 1997). The AS physical concerns dimension reflects fears of physiological arousal, such as fearing that chest pains are indicative of heart problems. The AS cognitive concerns dimension reflects fears of mental incapacitation, such as fearing that "racing thoughts" are indicative of "going crazy". Finally, the AS social concerns dimension reflects fears of publically observable anxiety symptoms, such as fearing that perspiring in a social situation will lead to negative evaluations by others.

The Hierarchical Structure of Emotional Distress Disorders

A hierarchical model of emotional distress disorders (i.e., unipolar mood and anxiety disorders) has emerged in the literature, with growing empirical support (Kushner et al. 2013; Krueger 1999; Mineka, Watson, and Clark 1998; Sellbom, Ben-Porath, and Bagby 2008; Watson 2005). This integrated model specifies that each individual disorder is composed of facets that are shared with other emotional distress disorders as well as unique facets that are specific to each condition (Mineka et al. 1998; Watson 2005). At the intermediate level, the distress dimension, characterized by pervasive sadness and worry, comprises generalized anxiety disorder (GAD), MDD, dysthymia, and PTSD and the fear dimension, characterized by phobic avoidance of others and the external world, comprises PD, social anxiety disorder (SAD), specific phobia (SP), and agoraphobia (e.g., Krueger 1999; Seeley, Kosty, Farmer, and Lewinsohn 2011; Vollebergh et al. 2001). Although the placement of OCD within this model, much like the placement of OCD within the spectrum of psychopathology, has caused some debate (e.g., Sellbom et al. 2008; Tackett, Sellbom, Quilty, Rector, and Bagby 2008), the preponderance of evidence supports the inclusion of OCD as a fear disorder (e.g., Lahey et al. 2004; Miller, Fogler, Wolf, Kaloupek, and Keane 2008; Prenoveau et al. 2010; Seeley et al. 2011; Slade and Watson 2006).

The Relations Between Lower-Order AS Dimensions and the Hierarchical Model of Emotional Distress Disorders

Frameworks for examining psychiatric disorders, such as that employed by the hierarchical model of emotional distress disorders (Watson 2005), are appealing from a diagnostic framework such as that employed by the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5; American Psychiatric Association 2013) in that they offer a potential explanation as to why certain disorders have higher rates of comorbidity. Additionally, if risk factors that act at these higher-order levels of psychopathology can be identified, the amelioration of such risk factors should aid in the prevention and treatment of multiple disorders simultaneously. This framework is also appealing to recent research initiatives such as the National Institute of Mental Health's Research Domain Criteria (RDoC) project, which are relatively agnostic to diagnostic systems (Cuthbert 2014) in establishing the relations between and risks for higher-level nondiagnostic entities such as the fear and distress dimensions of emotional distress disorders. Therefore, an area that warrants further exploration across diagnostic classification systems (i.e., DSM-V) and nondiagnostic research programs alike (i.e., NIMH RDoC initiative) is the level at which lower-order AS dimensions convey risk for the emotional distress disorders.

In terms of the hierarchical model of emotional distress disorders, there appears to be some specificity for the associations between lower-order AS dimensions and the fear and distress dimensions, although there is little empirical work exploring this relation directly. AS physical concerns have been most clearly associated with panic disorder (PD) and agoraphobia (Deacon and Abramowitz 2006; Olatunji and Wolitzky-Taylor 2009; Zinbarg, Brown, Barlow, and Rapee 2001). It has been suggested that the relation between PD and AS is specific to AS physical concerns due to findings that PD patients have higher AS physical scores than other anxiety patients (Rector, Szacun-Shimizu, and Leybman 2007; Rodriguez, Bruce, Pagano, Spencer, and Keller 2004; Zinbarg, Barlow, and Brown 1997). However, others have found PD to be similarly related to AS physical and AS cognitive concerns (Naragon-Gainey 2010). In a recent study, specifically examining the unique relations between lower-order AS dimensions and psychopathology, Allan et al. (2013) found that AS physical concerns was uniquely associated with PD as well as several other disorders classified as fear disorders (i.e., SAD, SP, and OCD).

AS cognitive concerns is usually discussed in association with GAD, due to the focus on fears of cognitive dyscontrol. In fact, the empirical evidence indicates a robust relation between AS cognitive concerns and GAD (Rector et al. 2007; Rodriguez et al. 2004; Zinbarg et al. 2001). Additionally, of the lower-order AS dimensions, AS cognitive concerns appears to be the most closely associated with MDD (Deacon, Abramowitz, Woods, and Tolin 2003; Rector et al. 2007) and PTSD (Lang, Kennedy, and Stein 2002; Vujanovic, Zvolensky, and Bernstein 2008). In support of this position, a meta-analysis conducted by Naragon-Gainey (2010) provided evidence that AS cognitive concerns is more strongly associated with GAD, PTSD, and MDD as compared to the associations between these disorders and AS physical or social concerns (Naragon-Gainey 2010). Further, Allan et al. (2013) reported that AS cognitive concerns was uniquely related to OCD as well as GAD, PTSD, and MDD.

AS social concerns are most often discussed in relation to SAD in the empirical literature (McWilliams, Stewart, and MacPherson 2000; Olatunji and Wolitzky-Taylor 2009; Zinbarg and Barlow 1996). Although it was originally believed that AS social concerns were only important in the context of SAD, extant work has shown AS social concerns to be related to GAD, OCD, PD, SP, and MDD as well (Naragon-Gainey 2010; Wheaton, Deacon, McGrath, Berman, and Abramowitz 2012). Further, results of a recent study indicated that, accounting for the other lower-order AS dimensions, AS social concerns was significantly related to SAD, GAD, OCD, and MDD (Allan et al. 2013). These results suggest that AS social concerns may confer a more general risk for anxiety and mood pathology than was originally believed (Allan et al. 2013).

One study explicitly looked at the relations between lower-order AS dimensions and the hierarchical model of emotional distress disorders (Lewis et al. 2010). In this study, Lewis et al. (2010) used structural equation modeling (SEM) to examine these relations in a sample of 606 adolescents who were at risk for the development of emotional distress disorders. The authors found some evidence of specificity with AS physical and social concerns being uniquely related to the intermediate fear factor, controlling for the general negative temperament characteristic, negative affect (NA) and global AS. However, there were several limitations to the Lewis et al. (2010) study suggesting further investigation is necessary. First, Lewis et al. used bifactor modeling to decompose the variance in AS and emotional distress disorders. Because of this, many of the models they tested failed to converge. Further, it is unclear what the lower-order AS dimensions represent when they are devoid of the common AS component, especially when they are then being used as predictors of levels of emotional distress disorders devoid of NA. Therefore, the relations between the lower-order AS dimensions and the intermediate emotional distress disorder factors (i.e., distress, fear) remains unclear.

The Current Study

There is now ample evidence that a hierarchical model of emotional distress disorders, with fear and distress factors comprising clusters of individual disorders at the intermediate level can best explain the covariation among the mood and anxiety disorders (Mineka et al. 1998; Slade and Watson 2006; Watson 2005). Whereas AS is often considered as a general risk factor for emotional disorders, several studies have demonstrated specificity between lower-order dimensions of AS (i.e., cognitive concerns, physical concerns, and social concerns) and the emotional distress disorders suggesting that the lower-order AS dimensions may best serve as risk factors at the level of fear and distress factors (e.g., Allan et al.

2013; Lewis et al. 2010). Identifying lower-order AS dimensions as specifically related to fear and distress disorder clusters could serve to expound upon the patterns of comorbidity found among emotional distress disorders as well as allow for targeted preventative and intervention efforts for multiple emotional distress disorders at once. The primary aim of the current study was to examine the unique predictive relations of the AS lower-order dimensions on the intermediate level fear and distress disorders of the emotional distress disorders. It was hypothesized that the AS cognitive concerns dimension would be specifically associated with the distress dimension and that the AS physical concerns dimension would be specifically associated with the fear dimension (e.g., Allan et al. 2013; Naragon-Gainey 2010; Rector et al. 2007). Evidence of specificity for the AS social concerns dimension is less clear. It was therefore hypothesized that AS social concerns would serve as a general risk factor for both the fear and distress dimensions. To determine whether these findings were robust beyond general risk factors (e.g., Lewis et al. 2010), an ancillary aim of the current study was to examine the specific relations between lower-order AS dimensions and the fear and distress clusters controlling for the effects of NA.

Methods

Participants

Participants included 579 adults, at baseline, recruited from the community to participate in a larger research study examining the effects of an anxiety-based smoking cessation treatment. To be eligible for inclusion participants had to be 18 years of age or older, a daily smoker for at least 1 year, smoke a minimum of 8 cigarettes per day, and report a motivation to quit. Individuals in this sample smoked, on average, 16.82 cigarettes ($SD=9.2$) per day, and had been daily smokers for 18.6 years ($SD=13.38$). Gender was fairly evenly distributed (51.6 % male) with ages ranging from 18 to 68 ($M=36.87$, $SD=13.47$). The racial/ethnic composition of the sample was distributed as such: 82.9 % were Caucasian, 9.8 % Black/Non-Hispanic, .9 % Black/Hispanic, 2.6 % Hispanic, 1 % Asian, and 2.8 % other (e.g., bi-racial).

Procedure

Participants who met initial requirements during a telephone screen and structured clinical interview were then scheduled to come in for a baseline appointment to complete various demographic, anxiety, substance use, and smoking assessments. The current study utilizes data collected from the baseline appointment, which took place prior to randomization and smoking cessation treatment. The study was

approved by the university's IRB, and informed consent was obtained from all participants.

Measures

Clinician Administered

Structured Clinical Interview for DSM-IV-TR (SCID) The SCID is a widely administered and well validated semi-structured interview for diagnosing major Axis I DSM-IV-TR disorders (First, Spitzer, Gibbon, and Williams 1996). All SCID's were administered by highly trained, advanced doctoral students. Rates of agreement between clinical interviewers examined for a subset of individuals (12.5 % of the sample) were 98 %.

Self-Report

Anxiety Sensitivity Index- 3 (ASI-3) The ASI-3 is a self-report questionnaire containing six items each (18 items total) measuring the lower-order AS dimensions of cognitive concerns, physical concerns, and social concerns. Respondents were asked to indicate the degree to which they agree with each item on a 5-point Likert-type scale ranging from 0 (very little) to 4 (very much). The ASI-3 has demonstrated to be a psychometrically sound and valid measure of anxiety sensitivity (Taylor et al. 2007). Within the current study, the cognitive, physical, and social concerns subscales demonstrated good internal consistency (α's=.91, .88 and .83, respectively).

Albany Panic and Phobia Questionnaire (APPQ) The APPQ is a 27-item self-report questionnaire assessing fear of situations and activities that are commonly avoided by individuals with agoraphobia and SAD. Respondents were asked to rate each item on a 9-point Likert-type scale ranging from 0 (No fear) to 8 (Extreme fear). Three subscale scores can be generated including agoraphobia, social phobia, and interoceptive. The APPQ has demonstrated good to excellent internal consistency and test-re-test reliability for each of the three subscales (Rapee, Craske, and Barlow 1994). In the present investigation, only the agoraphobia scale was used. The agoraphobia scale demonstrated good internal consistency (α=.86).

Inventory of Depression and Anxiety Symptoms (IDAS) The IDAS is a 64-item self-report questionnaire designed to assess specific symptom dimensions of major depression and anxiety related disorders. The symptom dimension subscales include: Suicidality, Lassitude, Insomnia, Appetite Loss, Appetite Gain, Ill Temper, Well-Being, Panic, Social Anxiety, and Traumatic Intrusions. In addition, the measure also includes two broader subscales of general depression and dysphoria.

Previous research has demonstrated that the scales display good internal consistency, content validity, and convergent validity (Watson et al. 2007). In the current investigation, only the broader depression, traumatic intrusions, and panic scales were used to assess MDD, PTSD, and PD symptoms, respectively. All three scales demonstrated good internal consistency (α's=.93, .84, and .88, respectively).

Obsessive Compulsive Inventory- Revised (OCI-R) The OCI-R is an 18-item self-report measure of obsessive compulsive symptoms. In addition to a total score, the measure yields six subscale scores including hoarding, checking, neutralizing, obsessing, ordering, and washing. Previous research has demonstrated that the OCI-R has good internal consistency, test-retest reliability, and convergent validity within both clinical and non-clinical samples (Foa et al. 2002). The OCI-R also demonstrated good internal consistency within the current investigation (α=.91).

Penn State Worry Questionnaire (PSWQ) The PSWQ is a 16-item self-report measure assessing the frequency, intensity, and uncontrollability of ones to worry. Items are rated using a 5-point Likert-type scale ranging from 1 (Not at all typical of me) to 5 (Very typical of me). The PSWQ has been shown to have good internal consistency and test re-test reliability across clinical and college samples (Meyer, Miller, Metzger, and Borkovec 1990). Within the present investigation, the PSWQ demonstrated excellent internal consistency (α=.94).

Positive and Negative Affect Schedule (PANAS) The PANAS is a 20-item self-report questionnaire assessing two global dimensions of affect: NA and positive affect (PA). Individuals were asked to read various words that describe different feelings and emotions and indicate to what degree they felt that way on average. The PANAS scales have demonstrated high internal consistency and stability over a 2 month time-frame (Watson, Clark, and Tellegen 1988). In the present investigation, only the NA scale was used. This scale demonstrated good internal consistency in the current sample (α=.90).

Social Interaction Anxiety Scale (SIAS) The SIAS is a 20-item self-report questionnaire assessing fears in various social interaction situations (Mattick and Clarke 1998). Individuals were asked to choose the response that best represents the extent to which they felt each item was characteristic or true of them using a 5-point Likert type scale ranging from 0 (Not at all) to 4 (Extremely). Previous research has demonstrated that the SIAS has good internal consistency and test-retest reliability (Mattick and Clarke 1998). Likewise in the current

investigation, the SIAS demonstrated very good internal consistency ($\alpha=.94$).

Data Analysis

Confirmatory factor analyses (CFAs) and then structural equation models (SEMs) were conducted in Mplus version 5.1 (Muthén and Muthén 2008) to examine the structure of and relations between the ASI-3 factors and emotional distress disorders. A three-factor CFA model of the ASI-3 and a two-factor model of the emotional distress disorders were first fit to the data. Following this, an SEM model was first conducted with all the ASI-3 factors as predictors of Fear and Distress factors. A model was then conducted controlling for the effects of NA on the Fear and Distress factors. With the exception of the CFA of emotional distress disorders, which was conducted using full information maximum likelihood with the Yuan-Bentler scaled χ^2, models were conducted using the robust weighted least squares estimator (WLSMV in Mplus) to account for the categorical nature of the ASI-3. Overall model fit was assessed by the χ^2 statistic, for which a nonsignificant value indicated good model fit. However, because there is disagreement regarding whether the χ^2 statistic can be too restrictive, especially with larger sample sizes (see Hu and Bentler 1999; Mulaik 2007; Yuan 2005 for reviews), the comparative fit index (CFI) and the root mean square error of approximation (RMSEA) were also used to determine model fit. There are no gold-standard cut-offs for these fit indices; however, rules-of-thumb suggest that CFI values greater than .95 and RMSEA values .06 or less indicate good model fit and CFI values greater than .90 and RMSEA values less than .10 indicate adequate fit (Brown 2006; Browne and Cudeck 1992; Hu and Bentler 1999; Yu 2002).

Results

Descriptive Statistics and Missing Data

Prevalence rates for anxiety and depressive disorders are provided in Table 1. Overall, 35.6 % had at least one emotional distress disorder diagnosis, and 11.9 % of individuals had at least two emotional distress disorder diagnoses. There were eight individuals who did not have diagnostic information available. Descriptive statistics and correlations for the ASI-3 Cognitive Concerns, Physical Concerns, and Social Concerns subscales, the NA scale of the PANAS, and emotional distress disorder symptoms are provided in Table 2. Significant intercorrelations in the expected directions for all ASI-3 subscales, NA, and the emotional distress disorders symptoms were found. No missing data were present for

Table 1 Prevalence Rates of Current Emotional Distress Disorders

Axis I disorder	Prevalence n (%)
Panic disorder	20 (3.5 %)
Social phobia	80 (14.0 %)
Obsessive compulsive disorder	15 (2.6 %)
Posttraumatic stress disorder	31 (5.4 %)
Generalized anxiety disorder	51 (8.9 %)
Specific phobia	57 (10.0 %)
Anxiety disorder-NOS	8 (1.4 %)
Major depressive disorder	45 (7.9 %)
Depressive disorder-seasonal	2 (0.3 %)
Dysthymic disorder	23 (4.0 %)
Depressive disorder-NOS	5 (0.9 %)

N 571, *NOS* Not otherwise specified

ASI-3 items. Missing data were present for between five and nine individuals for the NA scale and the emotional distress disorders symptoms. Because the estimators used are robust to missing data, all individuals were included in the SEM analyses.

Confirmatory Factor Analyses of the ASI-3 and Emotional Distress Disorders Symptoms

The three-factor model of the ASI-3, consisting of Cognitive Concerns, Physical Concerns, and Social Concerns factors demonstrated adequate model fit ($\chi^2=257.39$, $df=62$, $p<.05$, CFI=.95, RMSEA=.07). All items loaded significantly on their respective factors, with standardized factor loadings ranging from .57 to .91 (p's<.001). The baseline two factor model of emotional distress disorder symptoms, consisting of Fear and Distress factors did not demonstrate adequate model fit ($\chi^2=103.39$, $df=13$, $p<.05$, CFI=.94, RMSEA=.11). Examination of modification indices revealed that the model would be improved by allowing the residuals of PTSD and PD symptoms to covary. Given that these subscales were from the same scale, this residual covariance was included in the model. The model comprising Fear and Distress factors fit the data adequately once this residual covariance was included ($\chi^2=72.93$, $df=12$, $p<.05$, CFI=.96, RMSEA=.09). All scales loaded significantly on their respective factors, with standardized factor loadings ranging from .66 to .90 (p's<.001).

Structural Equation Models Examining the Associations ASI-3 and NA Share with the Emotional Distress Disorder Symptoms

An SEM including all ASI-3 factors predicting Fear and Distress factors provided adequate fit to the data ($\chi^2=302.16$, $df=80$, $p<.05$, CFI=.92, RMSEA=.07).

Table 2 Descriptive Statistics and Correlations for ASI-3 Subscales and Emotional Distress Disorders

	1	2	3	4	5	6	7	8	9	10	11
ASI-3 Cognitive	–										
ASI-3 Physical	.67*	–									
ASI-3 Social	.67*	.62*	–								
PANAS NA	.62*	.53*	.58*	–							
APPQ Agoraphobia	.50*	.54*	.48*	.49*	–						
SIAS Social	.51*	.41*	.62*	.57*	.49*	–					
IDAS Panic	.48*	.54*	.46*	.58*	.49*	.42*	–				
OCI-R OCD	.55*	.53*	.52*	.55*	.50*	.48*	.61*	–			
IDAS PTSD	.41*	.35*	.38*	.55*	.44*	.38*	.63*	.52*	–		
PSWQ GAD	.47*	.45*	.49*	.71*	.50*	.54*	.48*	.50*	.51*	–	
IDAS Depression	.55*	.45*	.55*	.73*	.47*	.59*	.63*	.56*	.65*	.70*	–
Mean	3.47	4.82	7.32	19.22	9.12	22.38	11.18	10.42	6.00	43.78	41.07
Standard Deviation	4.55	4.87	5.24	7.53	10.74	15.38	4.37	9.99	2.87	14.23	13.49

PANAS NA Positive And Negative Affect Schedule Negative Affect Scalem, *APPQ Agoraphobia* Albany Panic And Phobia Questionnaire Agoraphobia Subscale, *SIAS Social* Social Interaction Anxiety Scale, *IDAS Panic* Inventory Of Depression And Anxiety Symptoms Panic Subscale, *OCI-R OCD* Obsessive-Compulsive Inventory-Revised, *IDAS PTSD* Inventory Of Depression And Anxiety Symptoms Trauma Subscale, *PSWQ GAD* Penn State Worry Questionnaire, *IDAS Depression* Inventory Of Depression And Anxiety Symptoms Depression Subscale, *M* Mean, *SD* Standard Deviation

* $p<.05$

Model parameters are provided in Fig. 1. The relation between the Cognitive Concerns factor and the Distress factor was significant, indicating that a 1 standard deviation (*SD*) increase in Cognitive Concerns was associated with a .34 *SD* increase in Distress. The relation between the Physical Concerns factor and the Fear factor was significant, indicating that a 1 *SD* increase in Physical Concerns was associated with a .29 *SD* increase in Fear. Finally, the Social Concerns factor was significantly associated with the Fear factor, indicating that a 1 *SD* increase in Social Concerns was associated with a .43 *SD* increase in Fear, and with the Distress factor, indicating that a 1 *SD* increase in Social Concerns was associated with a .34 increase in Distress. The lower-order factors accounted for a significant amount of variance in the Fear ($R^2=.62$, $p<.001$) and Distress ($R^2=.46$, $p<.001$) factors.

A SEM including all ASI-3 factors as well as NA predicting Fear and Distress factors was then examined in order to determine whether the effects of the ASI-3 factors were robust to the effects of NA on the Fear and Distress factors. This model demonstrated marginal fit ($\chi^2=479.77$, $df=127$, $p<.05$, CFI=.89, RMSEA=.07), suggesting that the results of this model should be interpreted with caution. Model parameters are provided in Fig. 2. As expected, NA was significantly associated with the Distress factor ($\beta=.74$, $p<.001$) and the Fear factor ($\beta=.43$, $p<.001$). The relation between the Cognitive Concerns factor and the Distress factor was no longer significant ($\beta=.04$, $p>.05$). The relation between the Social Concerns factor and the Distress factor remained significant ($\beta=.12$, $p<.05$). The relation between the Physical Concerns factor

and the Fear factor remained significant ($\beta=.27$, $p<.001$) as did the relation between the Social Concerns factor and the Fear factor ($\beta=.30$, $p<.001$). The lower-order factors and the NA factor accounted for a significant amount of variance in the Fear ($R^2=.71$, $p<.001$) and Distress ($R^2=.73$, $p<.001$) factors.

Discussion

In the current study, it was proposed that the lower-order AS cognitive concerns and physical concerns dimensions would demonstrate specific relations with the intermediate-level fear and distress dimensions of emotional distress disorders such that AS cognitive concerns would be specifically associated with the distress disorder dimension and AS physical concerns would be specifically associated with the fear disorder dimension. This pattern was found with the exception of AS cognitive concerns and the distress dimension of emotional distress disorders when NA was included in the model. The AS social concerns dimension demonstrated less specificity, as predicted, as this lower-order AS dimension was uniquely associated with both fear and distress disorders; this pattern of findings suggests that AS social concerns may be a more general predictor of emotional distress disorders than are AS physical and cognitive concerns. These results provide a conceptual framework relating lower-order AS dimensions to emotional distress disorders at the intermediate fear and distress dimensions of the hierarchical model of emotional distress disorders.
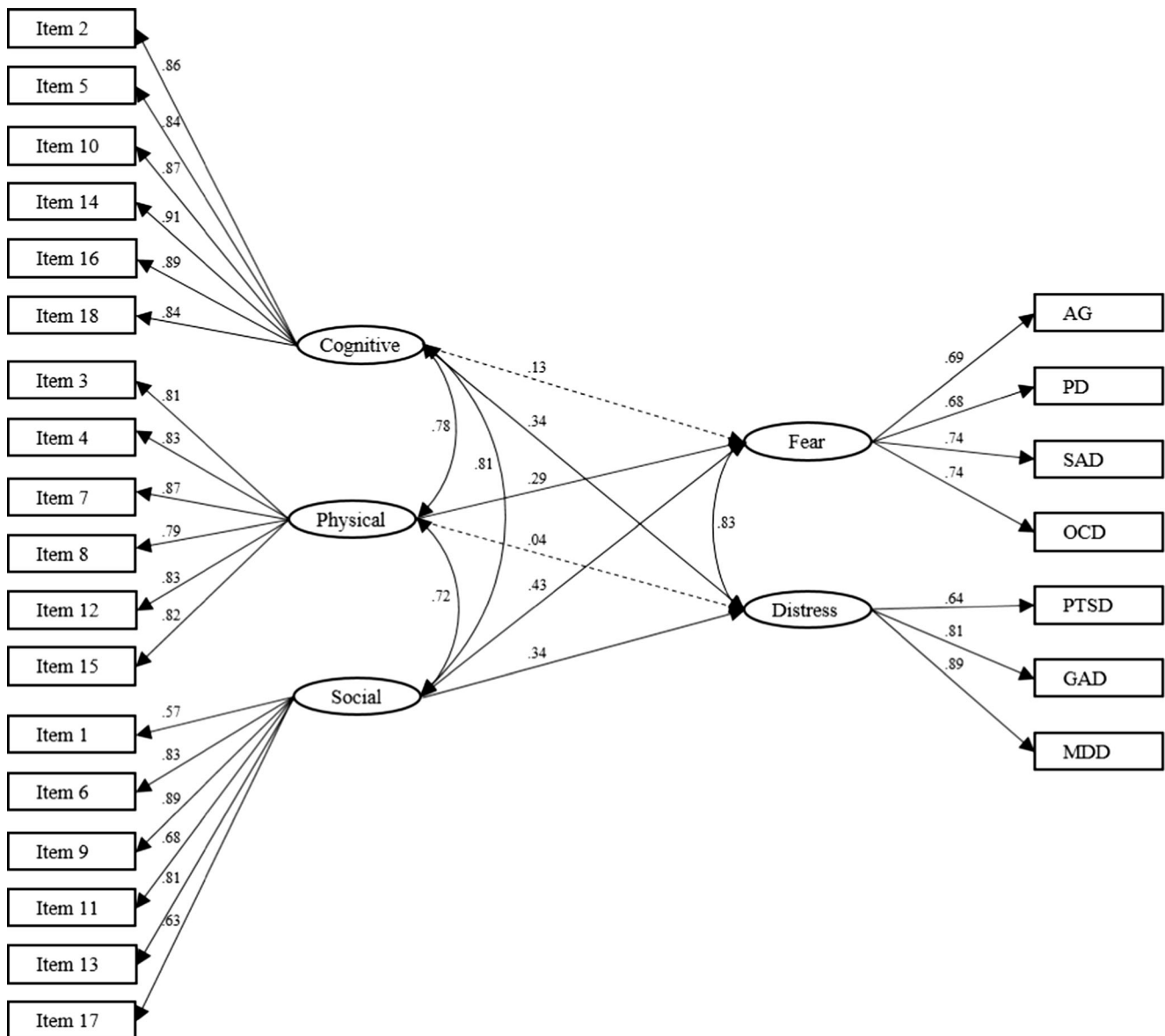
Fig. 1 Structural equation model predicting Fear and Distress factors from ASI-3 factors. All values are standardized. Residuals and error terms are omitted. Solid lines indicate significant path estimates. AG = Agoraphobia.

PD = Panic Disorder. SAD = Social Anxiety Disorder. OCD = Obsessive Compulsive Disorder. PTSD = Post-Traumatic Stress Disorder. GAD = Generalized Anxiety Disorder. MDD = Major Depressive Disorder

Further, these results inform the level of emotional distress disorders hierarchy (i.e., fear and distress dimensions level) at which AS cognitive and physical concerns may be most impactful, which could benefit future prevention and intervention efforts.

The results of the current study support specific links between AS cognitive concerns and the distress disorders dimension. Although no prior studies have examined the relations between AS and emotional distress disorders at this particular level of the hierarchy of disorders, similar findings have been reported between AS cognitive concerns and specific disorders classified as distress disorders (i.e., GAD, MDD, PTSD; e.g., Allan et al. 2013; Cox, Enns, and Taylor

2001; Rector et al. 2007). Whereas the findings in the current study support a specific relation between AS cognitive concerns and distress disorders, other studies have also found associations between AS cognitive concerns and disorders classified as fear disorders (e.g., Allan et al. 2013; Deacon and Abramowitz 2006; Rector et al. 2007; Wheaton et al. 2012). There were several differences between this study and these past studies that likely account for this discrepancy. For example, several prior studies examining the relations between AS and emotional distress disorders were not concerned with specificity of AS dimensions (e.g., Wheaton et al. 2012; Deacon and Abramowitz 2006). However, the most likely explanation for the difference between this study and
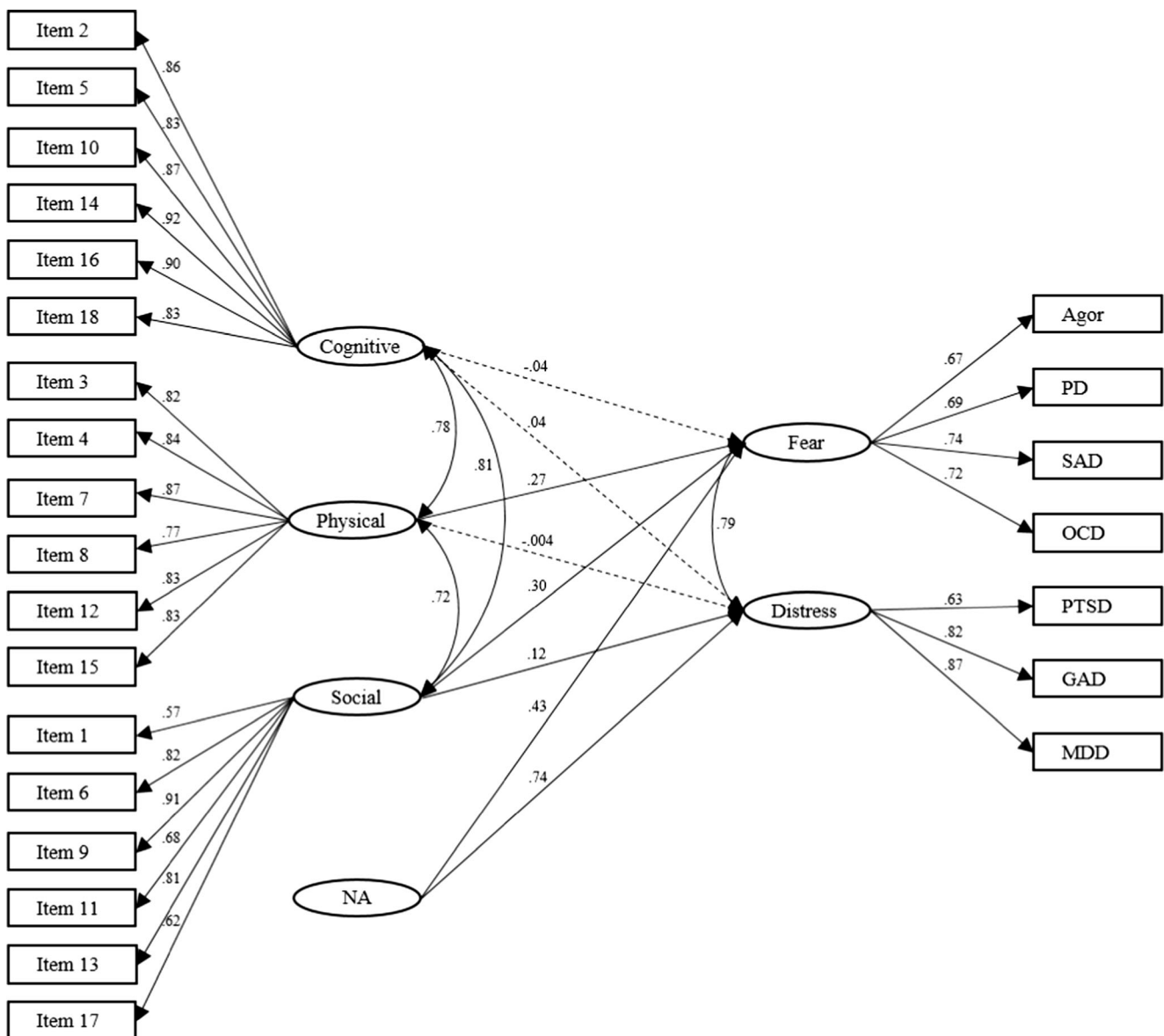
Fig. 2 Structural equation model predicting symptom-level Fear and Distress factors from ASI-3 factors and NA. All values are standardized. NA items and residual and error terms are omitted. Loadings for NA items ranged from .66 to .88. Solid lines indicate significant path estimates. AG = Agoraphobia. PD = Panic Disorder. SAD = Social Anxiety Disorder. OCD = Obsessive Compulsive Disorder. PTSD = Post-Traumatic Stress Disorder. GAD = Generalized Anxiety Disorder. MDD = Major Depressive Disorder

other studies was the focus on examining the relations between lower-order AS dimensions and fear and distress dimensions of disorders. The current study targeted the commonality among the distress disorders and the commonality among the fear disorders. In contrast, prior studies investigated these relations at the disorder-level, a level at which AS cognitive concerns may still influence specific disorders.

In this study, AS cognitive concerns was not associated with the distress dimension, when NA was included in the model. In their bifactor modeling of both AS and emotional distress disorders in adolescents, Lewis et al. (2010) did not find specificity for AS cognitive concerns at the distress

disorders level. Lewis et al. did find a relation between AS cognitive concerns and a factor they labeled General Distress, which accounted for variance common to all emotional distress disorders. Lewis et al. suggested that AS cognitive concerns might be associated with the tendency to experience negative emotions that is central to NA and all emotional distress disorders. However, only limited evidence for this can be found in the current study, as the supposition of Lewis et al. implies that AS cognitive concerns and the fear dimension of emotional distress disorders should have also been related. Future studies are needed to determine the level of convergent and discriminant validity between AS cognitive

concerns and NA, and how the relations between these two facets impact their relations with emotional distress disorders.

The results of the current study also support specific links between AS physical concerns and fear disorders. These relations were found above and beyond the influence of NA. These findings are consistent with several prior studies that have found specific associations between AS physical concerns and the lower-order dimensions that comprise the fear disorders (i.e., PD, SAD, OCD; e.g., Allan et al. 2013; Rector et al. 2007; Rodriguez et al. 2004). These findings are also in line with those of Lewis et al. (2010), who found that AS physical concerns was uniquely associated with an intermediate fear factor, controlling for NA and general AS. Together, these findings suggest that AS physical concerns has a particularly unique and robust relation with the fear dimension of emotional distress disorders.

In contrast to the specific links between the other lower-order AS dimensions and the emotional distress disorder dimensions, AS social concerns demonstrated non-specific relations with these dimensions. AS social concerns was uniquely associated with both fear and distress dimensions, even accounting for NA. These findings reflect the lack of specificity in previous studies examining the relations among the lower-order AS dimensions and the emotional distress disorders (e.g., Allan et al. 2013; Naragon-Gainey 2010; Wheaton et al. 2012). These findings also suggest that relations between AS social concerns and the emotional distress disorders may be better quantified at a different level of the hierarchical model of emotional distress disorders. An alternate hypothesis that has been posited about AS social concerns is that this dimension does not capture AS, or "fear of fear" alone, but rather encapsulates AS as well as concerns about negative evaluations by others (Lewis et al. 2010; McWilliams et al. 2000), which is conceptualized as a distinct risk factor in theories such as Reiss' (1991) expectancy theory.

Altogether, these findings suggest that the AS cognitive and physical concerns dimensions can inform conceptual models of emotional distress disorders. Specifically, these lower-order AS dimensions demonstrate specific relations with emotional distress disorders that support the hierarchical model of emotional distress disorders (Mineka et al. 1998; Watson 2005; Clark and Watson 2006). The results of the present study suggest that there is a degree of specificity accounting for the aspects of these disorders in common with other emotional distress disorders. Based on these findings, a determining factor regarding an individual's propensity to develop a specific type of mood or anxiety disorder (i.e., fear versus distress) might be an individual's susceptibility to view particular symptoms (i.e., cognitive dyscontrol, physiological responding) as more harmful than others.

The specificity of lower-order AS dimensions has important treatment implications. Whereas treatments aimed at emotional disorders broadly instead of particular disorders more specifically have already been designed and implemented (e.g., Barlow, Allen, and Choate 2004; Harvey 2004), intervention and prevention efforts aimed at ameliorating specific lower-order AS dimensions may be more effective for specific lower-order emotional distress disorders dimensions. Interventions targeting AS globally have already proven effective, not only in reducing AS levels, but also in reducing incidence rates of psychopathology (Gardenswartz and Craske 2001; Keough and Schmidt 2012; Schmidt et al. 2007; Schmidt, Capron, Raines, and Allan 2014). Several studies have also reported results suggesting that targeting specific lower-order AS dimensions lead to greater reductions or more permanent reductions in these dimensions as compared to the effects on the other lower-order AS dimensions (Keough and Schmidt 2012; Schmidt et al. 2007, 2014). For example, Schmidt et al. (2014) designed an AS intervention explicitly targeting AS cognitive concerns symptoms. Although all AS dimensions demonstrated initial reductions, only AS cognitive concerns reductions were maintained 1 month later. Further, only AS cognitive concerns mediated the impact of the intervention on anxiety, depression, and suicidality. Although interventions by Keough and Schmidt (2012) and Schmidt et al. (2007) did not state that they were targeting one particular lower-order dimension, their interventions focused on normalizing physiological arousal, which is central to AS physical concerns. The reduction in AS levels across dimensions was not compared in that study, however, there were qualitative differences indicating that the AS physical concerns dimension was impacted more than the other AS dimensions. Therefore, it would seem pertinent to examine the impact of targeting AS physical concerns for individuals at-risk for fear-related disorders and to examine the impact of targeting AS cognitive concerns for individuals at-risk for distress-related disorders. In addition, interventions targeting AS physical concerns and cognitive concerns simultaneously might prove particularly effective in reducing emotional distress disorders and associated symptoms.

There are several limitations to consider when interpreting these findings. First, whereas it was a strength that this study was measured in a sample with a high degree of emotional distress disorders, the sample was also at-risk because of their status as cigarette smokers. Higher prevalence rates of emotional distress disorders have been found in nicotine-dependent individuals compared to individuals not nicotine-dependent (e.g., Grant, Hasin, Chou, Stinson, and Dawson 2004; Kessler, Chiu, Demler, and Walters 2005). In addition, higher rates of AS have been linked to an increased risk for smoking (Morrissette et al. 2007). However, as of yet it is unclear whether these elevated rates of psychopathology and AS would lead to differential relations between lower-order dimensions of AS and dimensions of emotional distress disorders. Another limitation is that this study was

conducted using concurrent data. Therefore, no conclusions about the lower-order dimensions of AS as specific risk factors for emotional distress disorders can be drawn. However, experimental studies have demonstrated some specificity for fear versus distress disorder symptoms when the interventions implicitly or explicitly target AS physical versus AS cognitive concerns domains (Gardenswartz and Craske 2001; Schmidt et al. 2014). A final limitation is the use of self-report measures to assess AS and psychopathology, which could lead to somewhat inflated estimates.

Conclusion

This study demonstrated that AS physical and cognitive concerns were uniquely associated with emotional distress disorders at the intermediate level (i.e., fear and distress) of the hierarchical model of emotional distress disorders in a sample of individuals at risk for emotional distress disorders (i.e., individuals seeking smoking cessation treatment; Lasser et al. 2000). In contrast, AS social concerns did not appear to operate at this level of specificity. The effects of these lower-order AS dimensions on the fear and distress disorders were medium to large in magnitude (e.g., Cohen 1992), accounting for 62 % of the variance in the fear dimension and 46 % of the variance in the distress dimension. The implication of intermediate-specific (i.e., AS physical and cognitive concerns) and intermediate-general (i.e., AS social concerns) risk factors for emotional distress disorders may serve as a useful bridge from models of psychopathology advocating specific disorders (i.e., DSM-V approach) to the recent RDoC initiative (Morris and Cuthbert 2012; Cuthbert 2014) that relies less on the conceptualization of specific disorders and more on dimensional models of risk for impairment.

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