

Pathways from uncertainty to anxiety: An evaluation of a hierarchical model of trait and disorder-specific intolerance of uncertainty on anxiety disorder symptoms

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Abstract

Uncertainty is central to anxiety-related pathology and intolerance of uncertainty (IU) appears to be a transdiagnostic risk and maintaining factor. The aim of the present study was to evaluate a hierarchical model to identify the unique contributions of trait and disorder-specific IU (i.e., uncertainty specific to generalised anxiety disorder, social anxiety, obsessive-compulsive disorder, and panic disorder) to disorder-specific symptoms, beyond other disorder-specific cognitive vulnerabilities (i.e., negative metacognitive beliefs, fear of negative evaluation, inflated responsibility, and agoraphobic cognitions, respectively). Participants ($N = 506$) completed a battery of online questionnaires. Structural equation modelling was used to evaluate model fit, as well as direct and indirect pathways. Trait and disorder-specific IU were significantly associated with multiple cognitive vulnerability factors and disorder symptoms. Indirect effects between trait IU and symptoms were observed through disorder-specific IU and cognitive vulnerabilities. The relative contribution of trait IU and disorder-specific IU to symptoms varied and theoretical and clinical implications are highlighted. Limitations include the cross-sectional design and reliance on self-report. Avenues for further research include a need for replication and extension of the model in different samples and using experimental and multi-method research methods.

Keywords: intolerance of uncertainty, anxiety disorders, transdiagnostic, disorder-specific, cognitive vulnerability

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The development and maintenance of anxiety disorders can be attributed to both common and specific vulnerabilities (Barlow, 2000; Brown & Naragon-Gainey, 2013). Models of psychopathology suggest that intolerance of uncertainty (IU) is a core feature in anxiety-related experience (Carleton, 2016), and the past decade has seen IU gain considerable attention as a robust and common vulnerability factor implicated in multiple psychological disorders (Carleton, Mulvogue, et al., 2012; Mahoney & McEvoy, 2012a; Renjan, McEvoy, Handley, & Fursland, 2016; Shihata, McEvoy, Mullan, & Carleton, 2016). IU is conceptualised as a trait-like disposition that reflects a fundamental fear of the unknown and negative beliefs about uncertainty and its associated implications (Carleton, 2012; Dugas & Robichaud, 2007).

Initial research on IU focused primarily on its relationship with worry and generalised anxiety disorder (Dugas, Gagnon, Ladouceur, & Freeston, 1998; Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994); however, it has since been found to be associated with a range of emotional disorder symptoms, suggesting that it is transdiagnostic in nature (Carleton, 2012; Gentes & Ruscio, 2011; Hong & Cheung, 2015; Mahoney & McEvoy, 2012b). Measurement research suggests that IU comprises both prospective (i.e., cognitive appraisals) and inhibitory (i.e., behavioural apprehension) responses to uncertainty (Carleton, Sharpe, & Asmundson, 2007; McEvoy & Mahoney, 2011). Moreover, maladaptive cognitions (e.g., worry, obsessional doubt) and behaviours (e.g., avoidance, compulsions) evident in a range of psychological disorders may reflect attempts to gain certainty and control and, therein, may be driven by IU (Boswell, Thompson-Hollands, Farchione, & Barlow, 2013; Krohne, 1989). As such, IU may reflect a transdiagnostic or general psychological vulnerability that confers elevated risk to multiple

disorders (Carleton, Mulvogue, et al., 2012; Harvey, Watkins, Mansell, & Shafran, 2004) in line with Barlow's (2000) triple vulnerability model. Barlow (2000) posits that emotional disorders are a function of general biological and psychological mechanisms as well as more disorder-specific vulnerabilities. Whereas the general mechanisms increase vulnerability to multiple emotional disorders, the disorder-specific factors may influence the development and expression of different emotional disorders (Boswell et al., 2013). Although IU has been implicated in a wide range of disorders much less is known about how a general risk factor such as IU may lead to the development of multifinality (i.e., comorbidity) and divergent trajectories (i.e., expressions of different disorders; Nolen-Hoeksema & Watkins, 2011). Thibodeau et al. (2015, p. 55) suggested that disorder-specific IU may reflect "a theoretically proximal and explicit causal intermediary" between trait IU and symptoms of emotional disorders.

Current research highlights a conceptual distinction between dispositional trait IU (i.e., general experiences of uncertainty) and disorder-specific IU (i.e., the specific focus of uncertainty differs between emotional disorders; Boswell et al., 2013; Carleton, 2016; Carleton, Collimore, & Asmundson, 2010; Mahoney & McEvoy, 2012b). For example, the focus of uncertainty prevalent in panic disorder (e.g., uncertainty about when a panic attack may occur) may differ from the focus of uncertainty in obsessive-compulsive disorder (e.g., uncertainty about causing harm). Prior research demonstrates that clinical participants report higher disorder-specific IU relative to trait IU (Jensen & Heimberg, 2015; Mahoney & McEvoy, 2012b). Extending this work, Thibodeau et al. (2015) found strong associations between disorder-specific IU and trait IU, and that disorder-specific IU explained unique variance in respective disorder symptoms beyond trait IU. In contrast to previous research suggesting trait IU is comparable across emotional disorders (Carleton, Mulvogue, et al., 2012; Mahoney & McEvoy, 2012a),

Thibodeau et al. (2015) found that the generalisability of IU varied; trait IU displayed stronger associations with symptoms of generalised anxiety disorder and obsessive-compulsive disorder, while disorder-specific IU was found to be a stronger predictor of social anxiety and panic disorder symptoms. Trait and disorder-specific IU similarly predicted symptoms of depression and specific phobia. Inconsistencies in findings about the generalisability of IU may be due to analytical and methodological differences (e.g., use of different disorder-specific IU measures). Further, the research to date has typically focused on the relationships between trait IU, disorder-specific IU, and emotional disorder symptoms and, as such, the significance and differentiation of disorder-specific IU relative to other vulnerability factors has not been investigated.

Researchers suggest that emotional disorders may be best delineated within a structural framework of general and specific factors (Hong & Cheung, 2015; Taylor, 1998). In line with this, hierarchical conceptualisations of psychopathology that include IU have been supported such that overarching general traits are believed to influence emotional symptoms through intermediate disorder-specific vulnerability factors (Hong, 2013; Norton & Mehta, 2007; Paulus, Talkovsky, Heggeness, & Norton, 2015; Sexton, Norton, Walker, & Norton, 2003; van der Heiden et al., 2010). In their meta-analysis Hong and Cheung (2015) found that several vulnerabilities underlying depression and anxiety may share a common core of IU and, thereby, a fundamental fear of the unknown. Taken together, prior research underscores the importance of IU relative to other vulnerability processes (Carleton, 2016), and whilst considerable research has been conducted on trait IU, the role of disorder-specific IU remains less clear. No studies have examined the relationships between trait IU as a higher-order distal factor, and disorder-specific IU and disorder symptomology as intermediate- and lower-order factors, respectively, relative to other specific vulnerabilities.

The aim of the present study was to evaluate a hierarchical model of transdiagnostic and disorder-specific vulnerabilities for symptoms of generalised anxiety disorder, social anxiety disorder, obsessive-compulsive disorder¹, and panic disorder. For each symptom measure an additional key cognitive vulnerability factor articulated in disorder-specific cognitive models was selected and evaluated in this study: negative metacognitions in generalised anxiety disorder (Wells, 2005); fear of negative evaluation in social anxiety disorder (Rapee & Heimberg, 1997); inflated responsibility in obsessive-compulsive disorder (Salkovskis, 1985); and agoraphobic cognitions in panic disorder (Goldstein & Chambless, 1978). Further, we aimed to extend previous work (Norton & Mehta, 2007; van der Heiden et al., 2010) by employing structural equation modelling (SEM) techniques to examine the direct and specific indirect effects between the constructs of interest. Our first hypothesis was that trait IU would significantly predict each of the disorder-specific IU subscales, disorder-specific cognitive vulnerabilities, and anxiety disorder symptoms. Our second hypothesis was that disorder-specific IU would account for unique variance in disorder-specific vulnerabilities and concordant disorder symptoms, beyond trait IU. Our third hypothesis was that each of the disorder-specific vulnerabilities would significantly predict their concordant disorder symptoms. Our fourth hypothesis was that each of the disorder-specific IU subscales and other vulnerabilities would carry significant indirect effects between trait IU and disorder-specific symptoms.

Method

Participants

Participants were 506 undergraduate psychology students (80.20% female) aged between 18 and 55 years ($M = 21$; $SD = 4.91$) who were recruited via the university's research participant

¹ Obsessive compulsive disorder was included to assess a broader array of emotional disorder symptoms, although it is acknowledged that it is not considered an anxiety disorder in current nosology.

pool. The majority of the sample identified as Caucasian (68.20%). Eligibility criteria required participants to be over 18 years of age. Based on moderate correlations found in previous studies investigating relationships between disorder-specific IU and symptom measures (Thibodeau et al., 2015), this sample size was adequate to investigate the final structural model (MacCallum, Browne, & Sugawara, 1996). Taxometric research provides support for the dimensionality of disorder symptoms and associated vulnerability factors, including IU (Carleton, Weeks, et al., 2012; Haslam, Williams, Kyrios, McKay, & Taylor, 2005; Weeks, Norton, & Heimberg, 2009), and therefore we recruited an unselected sample.

Measures

Intolerance of Uncertainty Scale, Short Form (IUS-12; Carleton, Norton, & Asmundson, 2007). The 12-item IUS-12, adapted from the original 27-item IUS (Freeston et al., 1994) and designed to assess negative beliefs about uncertainty, was employed as a measure of trait IU. Participants responded to each item on a five-point scale from *not at all characteristic of me* (1) to *entirely characteristic of me* (5). The IUS-12 has a high correlation with the IUS ($r = .96$; Carleton, Norton, et al., 2007) and strong psychometric properties (Khawaja & Yu, 2010). Internal consistencies for all measures were high and are reported in Table 1.

Disorder-Specific Intolerance of Uncertainty Scale (DSIU; Thibodeau et al., 2015). The 24-item DSIU comprises eight three-item subscales that assess disorder-specific IU pertaining to different disorders including generalised anxiety disorder (IU-GAD), social anxiety (IU-SAD), obsessive-compulsive disorder (IU-OCD), panic disorder (IU-PD), health anxiety, specific phobia, posttraumatic stress disorder, and depressive disorder. Participants responded to items on a five-point scale ranging from *not at all* (0) to *extremely* (4). Psychometric evidence

indicates convergent and criterion validity. The disorder-specific IU-GAD, IU-SAD, IU-OCD, and IU-PD subscales were used in the present study.

Meta-cognitions Questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004).

The short form MCQ-30 was used as a measure of metacognitive beliefs and monitoring (Cartwright-Hatton & Wells, 1997). Participants indicated their level of agreement with each item on a four-point scale from *do not agree* (1) to *agree very much* (4). The MCQ-30 comprises five subscales; positive beliefs about worry, negative metacognitions about the uncontrollability and danger of worry, cognitive confidence, need to control thoughts, and cognitive self-consciousness. Research evidence indicates the MCQ-30 has good temporal stability, and factorial and convergent validity (McEvoy, Moulds, & Mahoney, 2013; Wells & Cartwright-Hatton, 2004). The six-item negative metacognitions subscale was employed in the present study.

Brief Fear of Negative Evaluation Scale, Straightforward Items (BFNE-S; Rodebaugh et al., 2004). The adapted 8-item BFNE-S is a widely used measure designed to measure fears pertaining to negative evaluation from others and comprises only the straightforward-worded items (Carleton, Sharpe, et al., 2007; Weeks et al., 2005). Respondents rated items on a five-point scale ranging from *not at all characteristic of me* (1) to *extremely characteristic of me* (5). The BFNE-S is reported to be a more reliable and valid indicator of fear of negative evaluation than the alternative measure comprising reverse-scored items (Rodebaugh et al., 2004; Weeks et al., 2005). Psychometric research indicates good construct and factorial validity (Carleton, Collimore, & Asmundson, 2007; Rodebaugh et al., 2004).

Obsessive-Beliefs Questionnaire-44 (OBQ-44; Obsessive Compulsive Cognitions Working Group [OCCWG], 2005). The OBQ-44, revised from the original lengthier OBQ

(OCCWG, 2001), was designed to assess dysfunctional belief domains related to obsessive-compulsive disorder. The OBQ-44 comprises three factors; responsibility/threat estimation (OBQ-RT), importance/control of thoughts, and perfectionism/certainty. Participants rated items on a seven-point scale from *disagree very much* (1) to *agree very much* (7). Psychometric evidence demonstrates temporal stability and construct validity (OCCWG, 2005). This study used only the 16-item OBQ-RT subscale. However, measurement research suggests that the responsibility and overestimation of threat items load on two distinct factors (Myers, Fisher, & Wells, 2008) and that overestimation of threat may be representative of a general anxious pathology (Sookman & Pinard, 2002); as such, we were interested in examining inflated responsibility as a specific vulnerability of obsessive-compulsive disorder and thereby analyses were conducted using only the eight responsibility items (Myers et al., 2008).

Agoraphobic Cognitions Questionnaire (ACQ; Chambless, Caputo, Bright, & Gallagher, 1984). The 14-item ACQ measures the frequency of catastrophic, negative thoughts about the consequences of anxiety and comprises two subscales pertinent to physical concerns and social/behavioural concerns. Participants indicated how often a thought occurred during an anxiety-provoking experience on a five-point scale ranging from *thought never occurs* (1) to *thought always occurs* (5). Psychometric research indicates temporal stability and construct validity (Chambless et al., 1984).

Generalised Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006). The 7-item GAD-7 assesses the severity of generalised anxiety disorder symptoms. Participants responded to each symptom statement indicating how often, in the last two weeks, they felt bothered by such symptoms along a four-point scale from *not at all* (0) to *nearly every*

day (3). The GAD-7 demonstrates good construct, discriminant, and factorial validity (Carleton, Mulvogue, et al., 2012; Löwe et al., 2008).

Social Interaction Phobia Scale (SIPS; Carleton et al., 2009). The 14-item SIPS assesses social phobia symptoms reflecting cognitive, behavioural, and affective responses to social interactions (Carleton et al., 2009). Participants indicated the extent to which they felt bothered by symptoms on a five-point scale ranging from *not at all characteristic of me* (0) to *extremely characteristic of me* (4). Psychometric support indicates the SIPS has good factorial, convergent, and discriminant validity (Carleton et al., 2009; Reilly, Carleton, & Weeks, 2012).

Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). The 18-item short-form OCI-R was adapted from the original OCI (Foa, Kozak, Salkovskis, Coles, & Amir, 1998) and designed to assess obsessive-compulsive symptom severity. Respondents indicated the degree to which they felt distressed or bothered by obsessive-compulsive symptoms in the last month on a five-point scale from *not at all* (0) to *extremely* (4). The OCI-R comprises six three-item subscales; washing, checking, obsessions, mental neutralising, ordering, and hoarding. Psychometric support indicates evidence of acceptable reliability and validity (Foa et al., 2002).

Panic Disorder Severity Scale-Self Report (PDSS-SR; Houck, Spiegel, Shear, & Rucci, 2002). The 5-item PDSS-SR measures panic symptoms and was developed through a two-item removal process from the original, clinician administered PDSS (Shear et al., 2001). Participants responded to each item on a five-point scale from *none* (0) to *extreme* (4). Research evidence indicates acceptable validity (Houck et al., 2002; Wuyek, Antony, & McCabe, 2011).

Procedure

Participants were recruited from the undergraduate psychology research pool through an online experiment database (SONA) to participate in a study of “Uncertainty and Emotion”.

After reading an information statement and consent form, participants were directed to an online survey hosted by Qualtrics. All participants provided informed consent. Participants completed demographic information and the standardised self-report questionnaires. The IUS-12 and DSIU were presented first; thereafter, the measures were randomised to minimise potential order effects of fatigue and carelessness in responding. Participants were debriefed and granted coursework credit for participation. Prior to the commencement of this study, institutional ethics approval was obtained (HR34/2015).

Data Analysis

Preliminary analyses were conducted in SPSS 22.0 to screen the data for missing values, outliers, and normality, and to calculate basic descriptive and internal reliability statistics. Assessment of the measurement models for each measure using confirmatory factor analysis (CFA) and the hypothesised model using SEM with maximum likelihood estimation were performed in Mplus 7.4 (Muthén & Muthén, 1998-2015). To determine model fit for the measurement and structural model, fit statistics, factor loadings, and modification indices were examined. Model fit indices included the chi-square goodness of fit statistic where a non-significant value indicates an acceptable fit; however, the chi-square statistic is sensitive to sample size and often rejects the model in large samples (Tabachnick & Fidell, 2013). For a more comprehensive assessment of model fit, supplementary incremental indices included the comparative fit index (CFI) and the Tucker-Lewis index (TLI), as well as absolute indices such as the root mean square error of approximation (RMSEA) with 90% confidence intervals, and the standardised root mean square residual (SRMR). For the CFI and TLI, values greater than .90 and .95 generally indicate an acceptable and excellent fit to the data, respectively (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004). For the RMSEA and SRMR values close to .08 are indicative

of an acceptable fit, and values close to .06 and .05, respectively, are indicative of a close fit (Hu & Bentler, 1999; Marsh et al., 2004). Standardised estimates were used to assess the strength of structural pathways. Further to evaluating direct pathways, the strength of the total and specific indirect effects and their 95% confidence intervals (CIs) were estimated using bootstrapping with at least 1000 repeated samples. Bootstrapping accounts for non-normality of the sampling distribution and the indirect effects were considered meaningful if the upper and lower limits of the CI did not encompass zero (Hayes, 2009).

Results

Preliminary analyses

Participants ($n = 91$) were excluded if more than 5% of their data were missing, they completed the survey more than once (only the earliest response was analysed), and/or they failed to meet eligibility criteria (under 18 years), thereby resulting in a final sample size of 506 participants. Missing values analysis, using Little's MCAR test, indicated that data was missing completely at random, $\chi^2(4) = 5.33, p = .255$. Accordingly, missing data were replaced using the expectation maximization method (Muthén & Muthén, 1998-2015; Tabachnick & Fidell, 2013). Data screening indicated no problematic distributional properties as evidenced by acceptable levels of skewness (i.e., < 2) and kurtosis (i.e., < 7) values, and inspection of histograms (Curran, West, & Finch, 1996; Tabachnick & Fidell, 2013). There were no multivariate outliers (i.e., using a $p < .001$ criterion for Mahalanobis D^2) and multicollinearity was not an issue. Descriptive statistics and correlations for all study variables are depicted in Table 1. Inspection of the bivariate correlations indicated moderate to large significant associations between trait IU, all disorder-specific IU subscales, cognitive vulnerabilities, and disorder symptoms. Cronbach's alphas for all measures were high (Table 1).

[Table 1 near here].

Measurement models

An independent CFA was conducted to evaluate the measurement model of each individual measure used in the final structural model. For models that displayed a poor fit, an inspection of the modification indices suggested inclusion of an error covariance between items that were similarly worded or overlapped in content. The factor loadings of the models were significant and ranged from .47 to .95. For a detailed summary of the measurement model, including fit values and modifications, interested readers can refer to Supplementary Material.

Structural model

An examination of the fit statistics revealed that the structural model provided an acceptable fit to the data, $\chi^2 (2278) = 4809.70, p < .001$, CFI = .92, TLI = .92, SRMR = .06, and RMSEA = .05 (90% CI [.045 to .049]). The standardised parameter estimates for the structural pathways are displayed in Figure 1.

[Figure 1 near here].

Generalised Anxiety Disorder symptoms. The total effect of trait IU on GAD symptoms was significant ($\beta = 0.78, SE = .02, p < .001, 95\% CI = .73 \text{ to } .82$): the direct effect ($\beta = .33, SE = .10, p = .001, 95\% CI = .13 \text{ to } .52$) and total indirect effect ($\beta = .46, SE = .09, p < .001, 95\% CI = .28 \text{ to } .62$) were both significant. Within the indirect effect, negative metacognitions made a significant contribution ($\beta = .34, SE = .06, p < .001, 95\% CI = .22 \text{ to } .47$), but disorder-specific IU-GAD did not ($\beta = .00, SE = .08, p = .957, 95\% CI = -.15 \text{ to } .16$). There was also a significant indirect path between trait IU and symptoms through IU-GAD and negative metacognitions, respectively ($\beta = .11, SE = .05, p = .028, 95\% CI = .02 \text{ to } .22$).

Social Anxiety Disorder symptoms. The total effect of trait IU on social anxiety disorder symptoms was significant ($\beta = .75$, $SE = .03$, $p < .001$, 95% CI = .70 to .80): both the direct effect ($\beta = .20$, $SE = .06$, $p = .001$, 95% CI = .09 to .32) and total indirect effect ($\beta = .56$, $SE = .05$, $p < .001$, 95% CI = .46 - .64) were significant. Within the indirect effect, disorder-specific IU-SAD ($\beta = .35$, $SE = .05$, $p < .001$, 95% CI = .26 to .44) and fear of negative evaluation ($\beta = .09$, $SE = .03$, $p < .001$, 95% CI = .04 to .14) made significant contributions. An additional significant indirect effect was found from trait IU symptoms through IU-SAD and fear of negative evaluation, respectively ($\beta = .12$, $SE = .03$, $p < .001$, 95% CI = .06 to .17).

Obsessive-compulsive Disorder symptoms. An examination of the total effect of trait IU on symptoms of obsessive-compulsive disorder was significant ($\beta = .74$, $SE = .03$, $p < .001$, 95% CI = .68 to .80): the direct effect ($\beta = .57$, $SE = .06$, $p < .001$, 95% CI = .45 to .69) and total indirect effect ($\beta = .18$, $SE = .05$, $p < .001$, 95% CI = .10 to .26) were both significant. Within the indirect effect, disorder-specific IU-OCD made a significant contribution ($\beta = .14$, $SE = .04$, $p < .001$, 95% CI = .07 to .22), but inflated responsibility did not ($\beta = .02$, $SE = .02$, $p = .285$, 95% CI = -.02 to .06).

Panic Disorder symptoms. The total effect of trait IU on panic disorder symptoms was significant ($\beta = .65$, $SE = .04$, $p < .001$, 95% CI = .57 to .72); interestingly, the direct effect was not significant ($\beta = .13$, $SE = .08$, $p = .124$, 95% CI = -.04 to .29). The total indirect effect of trait IU on panic disorder symptoms was significant ($\beta = .53$, $SE = .07$, $p < .001$, 95% CI = .39 to .66). Within the indirect effect both disorder-specific IU-PD ($\beta = .25$, $SE = .05$, $p < .001$, 95% CI = .16 to .34) and agoraphobic cognitions ($\beta = .21$, $SE = .06$, $p = .001$, 95% CI = .09 to .34) made significant contributions. An additional significant indirect effect of IU on panic disorder

symptoms was found through IU-PD and agoraphobic cognitions, respectively ($\beta = .07$, $SE = .02$, $p = .01$, 95% CI = .02 to .12).

The model explained more variance in disorder-specific IU-GAD compared to disorder-specific IU-SAD, IU-OCD, and IU-PD (see Table 2). The model explained a greater proportion of variance in fear of negative evaluation, negative metacognitions, and agoraphobic cognitions than inflated responsibility. Further, the model explained a substantial proportion of variance in all symptom measures (59 to 75%).

[Table 2 near here].

Discussion

Theory and evidence suggest that transdiagnostic and disorder-specific vulnerabilities contribute to the development and maintenance of anxiety-related pathology (Barlow, 2000; Norton & Mehta, 2007). While accumulating literature underscores the transdiagnostic significance of IU, recent findings suggest a distinction between trait and disorder-specific manifestations of IU. The present study evaluated a hierarchical model to identify the unique contributions of trait and disorder-specific IU to symptoms of multiple disorders, after controlling for other established disorder-specific cognitive vulnerabilities.

Trait IU was robustly associated with each of the disorder-specific IU subscales, as well as disorder-specific vulnerabilities (i.e., negative metacognitions, fear of negative evaluation, inflated responsibility, and agoraphobic cognitions), and disorder symptoms (i.e., generalised anxiety disorder, social anxiety, and obsessive-compulsive disorder). These results contribute to a sizeable body of research indicating that IU is associated with a host of other vulnerabilities and a broad range of disorder symptomology and, therein, lend support to conceptualisations of IU as transdiagnostic and a general vulnerability for anxiety (Carleton, 2012; Gentes & Ruscio, 2011;

Hong & Cheung, 2015; Mahoney & McEvoy, 2012a). Contrary to our hypothesis, when disorder-specific IU-PD and agoraphobic cognitions were taken into account, trait IU did not have a direct effect on panic disorder. This is inconsistent with research demonstrating direct effects and associations between IU and panic symptoms (Boswell et al., 2013; Carleton et al., 2014); however, it is important to note that these studies only assessed trait IU, but not disorder-specific IU, within the context of panic disorder. Our findings align with prior work that examines both trait and disorder-specific IU in panic symptoms and that suggests that trait IU has lesser influence than disorder-specific IU on panic disorder relative to other disorders (Mahoney & McEvoy, 2012b; Thibodeau et al., 2015). Our findings suggest that a core cognitive maintaining factor for panic disorder may be a disorder-specific uncertainty about the potentially catastrophic consequences of one's bodily sensations and physical symptoms, rather than a more generalised trait IU.

Each disorder-specific IU subscale was found to predict its concordant disorder-specific vulnerabilities and disorder symptoms with the exception of IU-GAD. Trait IU but not disorder-specific IU-GAD predicted generalised anxiety disorder symptoms. A possible explanation for this finding is that the measure of disorder-specific IU-GAD assesses broad uncertainty (i.e., uncertainty about everything), and therefore it may not account for unique variance beyond that captured by the IUS-12 which is a measure of general trait IU. Nevertheless, these findings extend prior work suggesting that IU has disorder-specific facets and that context may be a critical component of perceiving and responding to uncertainty, and perhaps more so for disorders other than generalised anxiety disorder (Jensen & Heimberg, 2015; Mahoney & McEvoy, 2012b; Thibodeau et al., 2015). The results revealed that the relative contributions of trait IU and disorder-specific IU to symptoms varied; trait IU had stronger associations with

symptoms of generalised anxiety disorder and obsessive-compulsive disorder, whereas disorder-specific IU was found to be a stronger predictor of symptoms of social anxiety and panic disorder. These findings are highly consistent with previous research investigating the generalisability of IU to various emotional disorder symptoms (Mahoney & McEvoy, 2012b; Thibodeau et al., 2015). This study extends our knowledge of the direct and indirect role of trait and disorder-specific IU to disorder symptoms beyond key disorder-specific cognitive vulnerability factors.

Each disorder-specific vulnerability factor significantly predicted concordant emotional disorder symptoms (e.g., fear of negative evaluation predicted social anxiety disorder). These results converge with the original conceptual models of each disorder that underscore the primacy of key disorder-specific variables in predicting symptoms (Goldstein & Chambless, 1978; Rapee & Heimberg, 1997; Salkovskis, 1985; Wells, 2005). In contrast, inflated responsibility did not emerge as a significant predictor of obsessive-compulsive symptoms. This finding differs from past work that attests to the central role of responsibility in obsessive-compulsive disorder symptoms (Shafran, 1997; Smari & Holmsteinsson, 2001; Taylor et al., 2010), but it is broadly consistent with studies that have found responsibility does not uniquely contribute to symptoms when taking into account additional belief domains (Gwilliam, Wells, & Cartwright-Hatton, 2004; Myers et al., 2008; Myers & Wells, 2005). Our findings suggest that if individuals are able to tolerate uncertainty in general and with respect to obsessive-compulsive concerns, then they may not need to assume responsibility for preventing harm. Thus, IU may have a more primary role in obsessive-compulsive disorder symptoms than responsibility. While there are inconsistencies in the literature regarding the role of different belief domains in obsessive-compulsive symptoms, other research highlights the primacy of metacognitive beliefs

(e.g., importance and control of thoughts; Myers et al., 2008; Myers & Wells, 2005). Thus, the relative independent contribution of IU and other metacognitive beliefs to obsessive-compulsive symptoms requires further exploration.

In addition to its direct effect on symptoms, trait IU was also found to have a modest indirect effect on emotional disorder symptomology. As the current study was cross-sectional causal inferences cannot be made, nonetheless the pattern of significant indirect effects provides some initial empirical evidence that trait IU may influence disorder symptoms through its effect on disorder-specific IU (i.e., IU-SAD, IU-OCD, and IU-PD) and disorder-specific vulnerabilities (i.e., negative metacognitions, fear of negative evaluation, and agoraphobic cognitions). Furthermore, indirect effects also indicated that panic and social anxiety-related disorder-specific IU may also increase the risk of agoraphobic cognitions and fear of negative evaluation, respectively. For example, trait IU may influence or interact with disorder-specific social-evaluative IU (e.g., uncertainty about the thoughts of others in social situations), and reinforce negative beliefs about social catastrophe (e.g., *“I am afraid that others will not approve of me”*, *“I often worry that I will say or do wrong things”*) and, in turn, social anxiety symptoms. Similarly, panic-related IU (e.g., uncertainty about the implications of a physical sensation) may reinforce agoraphobic cognitions (e.g., *“I am going to pass out”*, *“I will have a heart attack”*) and, in turn, panic symptoms. Together, these findings support the conceptualisation of disorder-specific IU as a proximal and unique pathway between trait IU and particular disorder symptoms (e.g., panic disorder; Thibodeau et al., 2015), and highlight the need to incorporate IU into models of psychopathology.

These findings also have clinical implications. IU is posited to be a potential transdiagnostic treatment target (Boswell et al., 2013; Dugas & Ladouceur, 2000), and more

recently, a trans-therapy mechanism (McEvoy & Erceg-Hurn, 2016). The robust relationships found in this study highlight the potential value of explicitly incorporating IU into treatment protocols. Cognitive-behavioural or exposure-based interventions with the aim of restructuring beliefs about or building tolerance of uncertainty may be of benefit. Our findings suggest that individuals with generalised anxiety disorder may benefit from challenging thoughts about uncertainty in general, whereas individuals with panic disorder may require a focus on uncertainty about the potential implications of physical sensations. For example, traditional interventions target the threat-appraisal (e.g., “my chest tightness is a definite sign of a heart attack”) via methods such as interoceptive exposure (e.g., Andrews et al., 2003). Our findings suggest that it may be important to explicitly and directly target tolerance of the inherent uncertainty about the meaning of physical symptoms for individuals with panic disorder. For instance, clients may be encouraged to acknowledge that a heart attack is only one of many potential outcomes of the physical symptom, consider more benign alternatives, and/or acknowledge that we cannot be completely sure about the correct interpretation. The focus would then shift to strengthening clients’ capacity to adopt a more curious stance towards their ability to manage the uncomfortable physical and emotional symptoms associated with this uncertainty. The goal in therapy would shift from immediately seeking certainty about the meaning of a particular symptom to building acceptance and tolerance for uncertainty. Our results suggest that for individuals with social anxiety disorder and obsessive-compulsive disorder, targeting general and disorder-specific IU in therapy may be complementary and additive. Interestingly, the fact that inflated responsibility did not have a direct effect on obsessive-compulsive disorder symptoms after controlling for trait and disorder-specific IU, invites the intriguing speculation that if individuals can tolerate uncertainty related to their obsessions then they do not tend to

assume responsibility for preventing their feared outcomes. This finding suggests that targeting IU may be more critical in obsessive-compulsive disorder than responsibility. Future intervention studies are required to verify these possibilities.

The current findings should be interpreted with study limitations in mind, which also offer additional avenues for future research. Although SEM incorporates directional hypotheses, the cross-sectional design precludes causal inferences. Future research in this area would benefit from experimental, longitudinal, and treatment studies. It is important to note that the model rejected the null hypothesis for an exact fit and that while the fit indices were good there was room for improvement. An issue in SEM is the possibility of alternative models and while the modification indices suggested improvements could be made we opted to accept our current model. Researchers recommend that modifications be based on statistical and theoretical considerations (Bryne, 2012); as such, the suggested modifications were not deemed theoretically defensible. Further research is warranted to replicate, extend, and explore improvements to the model. Although research supports the dimensional conceptualisation of anxiety constructs and thus we aimed to obtain a comprehensive range of severity scores (Carleton, Weeks, et al., 2012; Sexton et al., 2003), future research needs to examine whether the current results generalise to other community samples as well as clinical populations. Consistent with research in this area, we relied solely on subjective self-report data and future studies should aim to employ multi-method approaches (e.g., clinical interviews; Hong, 2013). A related limitation is that this study did not include specific items to assess for respondent carelessness and/or fatigue. This study extended extant research by investigating a comprehensive set of vulnerabilities as well as disorder-specific factors. The disorder-specific cognitive vulnerabilities were selected on the basis that they are key maintaining factors in contemporary cognitive

theories for each disorder. However, it is important to acknowledge that additional factors within each theory were not assessed and were therefore excluded from the model. Future research should investigate the contribution that trait and disorder-specific IU make to the prediction of disorder symptoms beyond other maintaining vulnerability factors included within these models. Incorporating additional symptom and intermediary variables (e.g., avoidance, anxiety sensitivity) is critical for increasing our understanding of how common and distinct mechanisms interact to influence multifinality and divergent trajectories to emotional disorders.

Notwithstanding these limitations, the current study makes an important contribution to the emotional disorder literature by examining the role of distal transdiagnostic and more proximal disorder-specific vulnerabilities. The results of this study indicate different pathways from uncertainty to anxiety, with trait IU representing a general anxiety vulnerability that influences disorder-specific IU, as well as a range of other disorder-specific vulnerabilities and emotional disorder symptomology. Indirect effects highlight the significance of differentiating between trait and disorder-specific manifestations of IU. Delineating the mechanisms by which IU exerts influence on psychopathology presents an important avenue for theoretical and clinical advancement.

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Table 1

Descriptive statistics, Cronbach's alpha, and bivariate correlations between all study variables.

| | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|-------------|-------|-------|------|------|------|------|------|------|------|-------|------|------|------|------|-----|
| 1. IUS-12 | 33.25 | 9.80 | .92 | | | | | | | | | | | | |
| 2. IU-GAD | 5.68 | 3.31 | .78* | .91 | | | | | | | | | | | |
| 3. IU-SAD | 5.31 | 3.59 | .64* | .61* | .92 | | | | | | | | | | |
| 4. IU-OCD | 5.60 | 2.96 | .55* | .52* | .48* | .85 | | | | | | | | | |
| 5. IU-PD | 2.39 | 3.30 | .53* | .47* | .49* | .41* | .96 | | | | | | | | |
| 6. MCQ-neg | 12.44 | 5.26 | .66* | .69* | .56* | .44* | .52* | .93 | | | | | | | |
| 7. BFNE-S | 15.42 | 9.45 | .62* | .62* | .76* | .42* | .41* | .64* | .97 | | | | | | |
| 8. OBQ-Res | 31.01 | 10.95 | .51* | .46* | .43* | .47* | .33* | .43* | .46* | .91 | | | | | |
| 9. ACQ | 24.20 | 9.69 | .55* | .50* | .50* | .38* | .58* | .69* | .58* | .44* | .91 | | | | |
| 10. GAD-7 | 7.06 | 5.38 | .62* | .64* | .53* | .44* | .55* | .77* | .59* | .44* | .68* | .92 | | | |
| 11. SIPS | 17.21 | 13.85 | .62* | .56* | .79* | .42* | .47* | .62* | .76* | .46* | .64* | .62* | .96 | | |
| 12. OCI-R | 16.90 | 13.28 | .61* | .56* | .49* | .54* | .51* | .59* | .49* | .48* | .62* | .59* | .58* | .93 | |
| 13. PDSS-SR | 2.36 | 2.99 | .44* | .47* | .45* | .30* | .62* | .60* | .47* | .35** | .59* | .45* | .48* | .45* | .85 |

Note: Cronbach's alphas are on the diagonal. SD, standard deviation; IUS-12, Intolerance of Uncertainty Scale, Short Form; IU, intolerance of uncertainty; GAD, generalised anxiety disorder; SAD, social anxiety disorder; OCD, obsessive-compulsive disorder; PD, panic disorder; MCQ-neg, negative metacognitions subscale from the Meta-cognitive Beliefs Questionnaire-30; BFNE-S, Brief Fear of Negative Evaluation Scale, Straightforward Items; OBQ-Res, responsibility subscale from the Obsessive-Beliefs Questionnaire-44; ACQ, Agoraphobic Cognitions Questionnaire; GAD-7, Generalised Anxiety Disorder Assessment; SIPS, Social Interaction Phobia Scale; OCI-R, Obsessive-Compulsive Inventory-Revised; PDSS-SR, Panic Disorder Severity Scale, Self-Report.

* $p < .001$.

Table 2

Proportion of variance (R^2) in each construct explained by the final structural model.

| Disorder | Disorder-specific IU | Cognitive Vulnerability | Symptoms |
|-------------------------------|----------------------|-----------------------------------|----------|
| Generalised anxiety disorder | 76% | 68% (negative metacognitions) | 71% |
| Social anxiety disorder | 57% | 70% (fear of negative evaluation) | 75% |
| Obsessive-compulsive disorder | 40% | 42% (inflated responsibility) | 71% |
| Panic disorder | 39% | 63% (agoraphobic cognitions) | 63% |

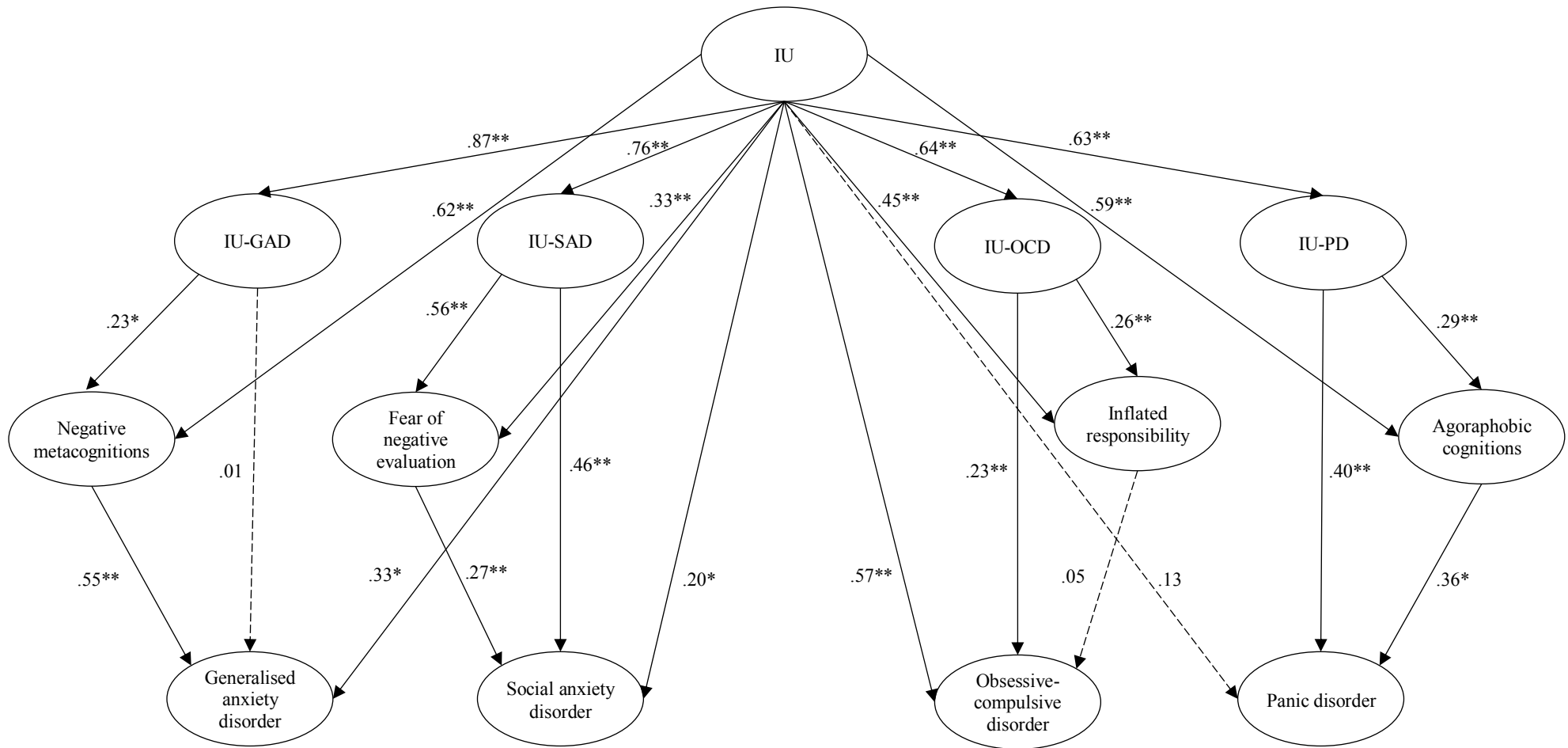


Figure 1. Structural model with direct pathways. Standardised path coefficients are shown. Significant pathways are continuous, whereas non-significant pathways are dashed. * $p < .05$. ** $p < .001$.

Supplementary Material

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Supplementary Material

Measurement Models

Structural equation modelling (SEM) is a statistical technique that comprises testing both a measurement model and a structural model (Bryne, 2012). Prior research asserts that the strength of SEM is captured when each latent variable and its indicators is first evaluated through confirmatory factor analysis (CFA; Schreiber, Stage, King, Nora, & Barlow, 2006). Testing the measurement model of each individual measure lends support to the conceptual reliability of the underlying factors prior to inclusion in, and assessment of, the final structural model (Schreiber et al., 2006). Thus, in line with such recommendations, an independent CFA was conducted to assess the measurement model of each latent variable in Mplus 7.4 (Muthen & Muthen, 1998-2015). A range of fit indices as well as factor loadings and modification indices (MIs) were examined to evaluate the model fit for the measurement models. Model fit statistics included the chi-square goodness of fit statistic where a non-significant value suggests an acceptable fit; however, the chi-square statistic is influenced by the size of the sample. In addition, the comparative fit index (CFI) and the Tucker-Lewis index (TLI) were used and values greater than .90 and .95 typically suggest an acceptable and excellent fit to the data, respectively (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004). The root mean square error of approximation (RMSEA) with 90% confidence intervals (CIs) and the standardised root mean square residual (SRMR) were also used and values close to .08 indicate an acceptable fit, and values close to .06 and .05, respectively, indicate a close fit to the data (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004).

Intolerance of Uncertainty Scale, Short Form (IUS-12; Carleton, Norton, & Asmundson, 2007). The measurement model of the IUS-12 was assessed and a unidimensional,

single-factor model was compared to the established two-factor structure. Inspection of the fit statistics revealed that the unidimensional, single-factor model displayed a marginal fit to the data, $\chi^2(54) = 367.43, p < .001, CFI = .91, TLI = .89, SRMR = .05, \text{ and } RMSEA = .11$ (90% CI [.10 to .12]). The factor loadings were all statistically significant (all $ps < .001$) and ranged from .54 to .79. The latent variable explained between 29% to 62% of the variance in the items. The established two-factor IUS-12 structure was then assessed and there was a significant improvement in model fit $\Delta\chi^2(1) = 69.91, p < .001$. An examination of the fit statistics indicated an acceptable fit, $\chi^2(53) = 297.52, p < .001, CFI = .93, TLI = .91, SRMR = .04, \text{ and } RMSEA = .10$ (90% CI [.09 to .11]). The factor loadings were all statistically significant (all $ps < .001$) and strong ranging from .57 to .76 for the prospective IU subscale and .76 to .81 for the inhibitory IU subscale. The latent variable explained between 33% to 65% of the variance in the items. Thus, the two-factor model was preferred and the subscale scores were used as separate indicators of the general trait IU latent variable in the final structural model. Due to the complexity of the structural model, the aim of this study was to identify the differential relationships between general trait IU (rather than the components of IU) and other disorder-specific factors and disorders symptoms.

Disorder-Specific Intolerance of Uncertainty Scale (DSIU; Thibodeau et al., 2015).

The DSIU measurement model was assessed with four distinct latent factors (i.e., IU-GAD, IU-SAD, IU-OCD, and IU-PD) as we were interested in examining the independent contribution of each disorder-specific IU area. Covariances between the DSIU latent variables were freed in this model because previous research has found the DSIU scales to be correlated (Thibodeau et al., 2015), which reflects the common origin of the items from the same scale and shared assessment of the general IU construct reflect the common IU construct. Correlations

among the DSIU factors were all statistically significant (all $ps < .001$) and ranged from .43 to .66. The measurement model of the DSIU subscales displayed an excellent fit to the data, $\chi^2(48) = 153.88, p < .001, CFI = .98, TLI = .97, SRMR = .04,$ and $RMSEA = .07$ (90% CI [.05 to .08]). The standardised factor loadings for all subscales were significant (all $ps < .001$) and ranged from .83 to .90 for the IU-GAD subscale, .87 to .91 for the IU-SAD subscale, .78 to .84 for the IU-OCD subscale, and .93 to .95 for the IU-PD subscale. The latent variable explained between 60% to 90% of the variance in the items.

Meta-cognitions Questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004).

The measurement model of the negative metacognitions subscale of the MCQ-30 demonstrated a marginal fit to the data, $\chi^2(9) = 192.61, p < .001, CFI = .92, TLI = .87, SRMR = .04,$ and $RMSEA = .20$ (90% CI [.18 to .23]). The standardised factor loadings were statistically significant (all $ps < .001$) and ranged from .78 to .89. The latent variable explained between 60% to 79% of the variance in the items. Inspection of the MIs indicated a strong covariance between items 5 and 6 (MI = 129.65), which could be explained by similar wording and content overlap. Items 5 (“*My worrying could make me go mad*”) and 6 (“*My worrying is dangerous for me*”) both begin with “my worrying” and assess the negative and harmful consequences of worrying. An error covariance between these items were added and model fit significantly improved as indicated by a chi-square difference test, $\Delta\chi^2(1) = 131.34, p < .001$. The revised model displayed a good fit, $\chi^2(8) = 61.27, p < .001, CFI = .98, TLI = .96, SRMR = .03,$ and $RMSEA = .12$ (90% CI [.09 to .14]). Although there was only a modest improvement in the RMSEA, no further modifications were deemed theoretically defensible. The factor loadings were significant and ranged from .73 to .90 (all $ps < .001$). The latent variable explained between 53% and 82% of the variance in the items.

Brief Fear of Negative Evaluation Scale, Straightforward Items (BFNE-S; Rodebaugh et al., 2004). The measurement model of the BFNE-S demonstrated a good fit to the data, $\chi^2(20) = 137.18, p < .001$, CFI = .98, TLI = .97, SRMR = .02, and RMSEA = .11 (90% CI [.09 to .13]). The standardised factor loadings were statistically significant and ranged from .88 to .93 (all $ps < .001$). The latent variable accounted for 71% to 86% of the variance in the items. Given the RMSEA was high, the MIs were examined and suggested that items 3 and 4 (MI = 74.30) had a strong covariance. This could be explained by item wording and conceptual similarities. Items 3 (“*I am afraid that others will not approve of me*”) and 4 (“*I am afraid that other people will find fault with me*”) both measured fears regarding disapproval from others and begin with “I am afraid”. These items were freed to covary and, accordingly, model fit significantly improved $\Delta\chi^2(1) = 67.43, p < .001$. An examination of the fit statistics revealed that the revised model displayed an excellent fit, $\chi^2(19) = 69.75, p < .001$, CFI = .99, TLI = .98, SRMR = .01, and RMSEA = .07 (90% CI [.06 to .09]). The standardised factor loadings were strong, ranging from .85 to .91, and were statistically significant (all $ps < .001$). The latent variable explained 72% to 83% of the variance in the items.

Obsessive-Beliefs Questionnaire-44 (OBQ-44; Obsessive Compulsive Cognitions Working Group [OCCWG], 2005). The measurement model of the OBQ-RT, comprising only items pertaining to responsibility, displayed a poor fit to the data, $\chi^2(20) = 304.81, p < .001$, CFI = .88, TLI = .83, SRMR = .06, and RMSEA = .17 (90% CI [.15 to .19]). Inspection of the MIs indicated a strong covariance between items 1 (“*When I see any opportunity to do so, I must act to prevent bad things from happening*”) and 2 (“*Even if harm is very unlikely, I should try to prevent it at any cost*”; MI = 76.00); items 4 (“*In all kinds of daily situations, failing to prevent harm is just as bad as deliberately causing harm*”) and 5 (“*For me, not preventing harm is as*

bad as causing harm”; MI = 89.40); and, items 5 and 8 (“*To me, failing to prevent a disaster is as bad as causing it*”; MI = 14.350). These sets of items overlapped conceptually in assessing responsibility to prevent harm. The modifications were made and the sets of items were freed to covary and there was a significant improvement in model fit, $\Delta\chi^2(3) = 165.77, p < .001$.

However, the fit statistics demonstrated a marginal fit to the data, $\chi^2(17) = 139.04, p < .001$, CFI = .95, TLI = .92, SRMR = .04, and RMSEA = .12 (90% CI [.10 to .14]). Further inspection of the MIs suggested a strong covariance between items 4 and 8 (MI = 49.64) which could also be explained by an overlap in content. These items were freed to covary and model fit significantly improved, $\Delta\chi^2(1) = 46.54, p < .001$. The fit statistics indicated an acceptable fit to the data, $\chi^2(16) = 92.50, p < .001$, CFI = .97, TLI = .94, SRMR = .03, and RMSEA = .10 (90% CI [.08 to .12]). Although there was only a modest reduction in the RMSEA value, no further modifications were made. The standardised factor loadings were statistically significant (all $ps < .001$) and ranged from .65 to .81. The latent variable explained between 43% to 66% of the variance in the items.

Agoraphobic Cognitions Questionnaire (ACQ; Chambless, Caputo, Bright, & Gallagher, 1984). The measurement model of the ACQ was evaluated and a unidimensional, single-factor model was compared to a two-factor model. The unidimensional measurement model demonstrated a poor fit to the data, $\chi^2(77) = 820.01, p < .001$, CFI = .80, TLI = .76, SRMR = .08, and RMSEA = .14 (90% CI [.13 to .15]). The factor loadings were all statistically significant (all $ps < .001$) and ranged from .52 to .79. The variance in the items explained by the latent variable ranged from 27% to 62%. A two-factor model with subscales (i.e., social concerns and physical concerns) was compared and displayed a marginal fit to the data, $\chi^2(76) = 482.88, p < .001$, CFI = .89, TLI = .87, SRMR = .06, and RMSEA = .10 (90% CI [.09 to .11]). However,

a chi-square difference test indicated a significant improvement in model fit $\Delta\chi^2(1) = 337.13, p < .001$. The standardised factor loadings were all statistically significant (all $ps < .001$) and moderate to strong, ranging from .62 to .83 for the social concerns subscale and .47 to .84 for the physical concerns subscale. The latent variable explained between 23% to 71% of the variance in the items. Thus, the two-factor model was preferred and the subscale scores were used as separate indicators of the general agoraphobic cognitions latent variable in the structural model. Due to the complexity of the final structural model, the aim of this study was to examine agoraphobic cognitions as a general latent variable, rather than investigate the differential relations between the components of agoraphobic cognitions.

Generalised Anxiety Disorder-7 (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006). The measurement model of the GAD-7 demonstrated a marginal fit to the data, $\chi^2(14) = 143.40, p < .001$, CFI = .95, TLI = .92, SRMR = .04, and RMSEA = .14 (90% CI [.12 to .16]). The factor loadings were strong ranging from .70 to .90 and were statistically significant (all $ps < .001$). The latent variable was found to explain between 49% to 81% of the variance in the items. Inspection of the MIs suggested that items 4 and 5 (MI = 89.72) had a strong covariance. Items 4 (“*Having trouble relaxing*”) and 5 (“*Being so restless that it’s hard to sit still*”) both assess the physical symptoms of hyperarousal and therefore are conceptually similar. These items were freed to covary and model fit was significantly improved $\Delta\chi^2(1) = 91.69, p < .001$. The revised model displayed an excellent fit, $\chi^2(13) = 51.71, p < .001$, CFI = .98, TLI = .97, SRMR = .02, and RMSEA = .08 (90% CI [.06 to .10]). The standardised factor loadings were statistically significant (all $ps < .001$) and strong, ranging from .67 to .91. The latent variable explained 45% to 83% of the variance in the items.

Social Interaction Phobia Scale (SIPS; Carleton et al., 2009). The measurement model of the SIPS was assessed and a unidimensional, single-factor model was compared to a unidimensional model with covariations freed between the items based on their relevant subscales. The unidimensional model demonstrated a poor fit to the data, $\chi^2(77) = 1365.29$, $p < .001$, CFI = .81, TLI = .78, SRMR = .07, and RMSEA = .18 (90% CI [.17 to .19]). The factor loadings were all statistically significant (all $ps < .001$) and ranged from .72 to .85. The latent variable was found to account for 52% to 73% of the variance in the items. Inspection of the MIs suggested strong covariations between items that load onto the same subscales of the SIPS based on prior research. Thus, a measurement model was run wherein the items were freed to covary based on their established loadings on the three subscales of the SIPS (i.e., social interaction anxiety, fear of overt evaluation, and fear of attracting attention). This model demonstrated a significant improvement in fit, $\Delta\chi^2(28) = 1145.62$, $p < .001$. An examination of the fit indices revealed an excellent fit $\chi^2(49) = 219.67$, $p < .001$, CFI = .98, TLI = .95, SRMR = .03, and RMSEA = .08 (90% CI [.07 to .09]). The standardised factor loadings were statistically significant (all $ps < .001$) and strong, ranging from .68 to .89. The latent variable explained between 47% to 79% of the variance in the items.

Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). The measurement model of the OCI-R was evaluated and the six subscale scores were used as separate indicators of general latent obsessive compulsive disorder symptoms. The model displayed a good fit to the data, $\chi^2(9) = 52.78$, $p < .001$, CFI = .97, TLI = .95, SRMR = .03, and RMSEA = .10 (90% CI [.07 to .12]). Although the RMSEA was considered high, no modifications were deemed theoretically defensible. The standardised factor loadings were

statistically significant (all $ps < .001$) and strong, ranging from .66 to .78. The latent variable explained between 44% and 61% of the variance in the items.

Panic Disorder Severity Scale-Self Report (PDSS-SR; Houck, Spiegel, Shear, & Rucci, 2002). The measurement model of the PDSS-SR demonstrated a marginal fit to the data, $\chi^2(5) = 116.08, p < .001, CFI = .91, TLI = .81, SRMR = .06,$ and $RMSEA = .21$ (90% CI [.18 to .24]). The standardised factor loadings were significant and ranged from .58 to .87 (all $ps < .001$). The latent variable was found to account for 34% to 75% of the variance in the items. Examination of the MIs indicated a strong covariance between items 1 and 2 ($MI = 105.35$) and items 4 and 5 ($MI = 71.96$) which could be explained by conceptual similarities. Items 1 (“*How many panic and limited symptom attacks did you have during the past week*”) and 2 (“*If you had any panic attacks or limited symptom attacks during the past week, how distressing [uncomfortable, frightening] were they while they were happening? If you had more than one, give an average rating*”) both assess the frequency of acute panic symptoms and distress regarding panic symptoms. Items 4 (“*During the past week, were there any places or situations [e.g., public transportation, movie theatres, crowds, bridges, tunnels, shopping malls, being alone] you avoided, or felt afraid of [uncomfortable in, wanted to avoid or leave], because of fear of having a panic attack? Please rate your level of fear and avoidance this past week*”) and 5 (“*During the past week, were there any activities [e.g., physical exertion, sexual relations, taking a hot shower or bath, drinking coffee, watching an exciting or scary movie] that you avoided, or felt afraid of, because they caused physical sensations like those you feel during panic attacks or that you were afraid might trigger a panic attack? Please rate your level of fear and avoidance of those activities this past week*”) both measure avoidance of places, situations, and activities related to panic attacks. These sets of items were freed to covary and resulted in a

significant improvement in model fit, $\Delta\chi^2(2) = 113.67, p < .001$. The revised model demonstrated an excellent fit, $\chi^2(3) = 2.41, p = .492$, CFI = 1.00, TLI = 1.00, SRMR = .01, and RMSEA = .00 (90% CI [.00 to .07]). The standardised factor loadings were significant (all p s < .001) and strong, ranging from .61 to .78. The latent variable explained between 37% to 61% of the variance in the items.

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