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Clarifying the Unique Associations among Intolerance of Uncertainty, Anxiety, and Depression

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Abstract

Increasing evidence suggests that intolerance of uncertainty (IU) may be a transdiagnostic factor across the anxiety disorders, and to a lesser extent, unipolar depression. Whereas anxiety inherently involves uncertainty regarding threat, depression has traditionally been associated with *certainty* (e.g., the hopelessness theory of depression). Some theorists posit that the observed relationship between depression and IU may be due to the relationship between depression and anxiety and the relationship between anxiety and IU. The present study sought to elucidate the unique relationships among trait anxiety, depression, and IU in undergraduate ($N = 554$) and clinical (generalized anxiety disorder; $N = 43$) samples. Findings suggest that IU may play a larger role in anxiety than depression, although some evidence indicates that inhibitory IU and depression may have a modest but independent relationship.

Keywords

intolerance of uncertainty; IU; transdiagnostic; anxiety; depression; comorbidity

Intolerance of uncertainty (IU), broadly conceptualized as a dispositional fear of the unknown (Carleton, 2012), has rapidly garnered academic interest and empirical support as a transdiagnostic factor across the anxiety disorders and, to some extent, unipolar depression. IU has been associated with generalized anxiety disorder (GAD; e.g., Dugas, Gagnon, Ladouceur, & Freeston, 1998; Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994; Gentes & Ruscio, 2011; Laugesen, Dugas, & Bukowski, 2003; Paulus, Talkovsky, Heggeness, & Norton, 2015), obsessive-compulsive disorder (OCD; e.g., Dugas, Gosselin, & Ladouceur, 2001; Gentes & Ruscio, 2011; Holaway, Heimberg, & Coles, 2006; Lind & Boschen, 2009; Paulus et al., 2015; Steketee, Frost, & Cohen, 1998; Tolin, Abramowitz,

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Brigidi, & Foa, 2003), social anxiety disorder (SAD; Boelen & Reijntjes, 2009; Carleton, Collimore, & Asmundson, 2010; Paulus et al., 2015; Riskind, Tzur, Williams, Mann, & Shahar, 2007), health anxiety (Fetzner et al., 2014), post traumatic stress disorder (Fetzner, Horswill, Boelen, & Carleton, 2013), and panic disorder (Carleton, Fetzner, Hackl, & McEvoy, 2013). Evidence for the relationship between IU and unipolar depression, however, is mixed, with some studies reporting strong associations (e.g., Carleton et al., 2012; de Jong-Meyer, Beck, & Riede, 2009; Dugas, Schwartz, & Francis, 2004; Mahoney & McEvoy, 2012; McEvoy & Mahoney, 2011, 2012; Miranda, Fontes, & Marroquín, 2008; Paulus et al., 2015; Yook, Kim, Suh, & Lee, 2010) and others indicating that the relationship may be accounted for by anxiety (Boelen & Reijntjes, 2009; Boelen, Vrinssen, & van Tulder, 2010; Khawaja & McMahon, 2011). Considering the high comorbidity rates between anxiety disorders and depression (e.g., 67.8% of individuals with 12-month major depressive disorder met the criteria for at least one anxiety disorder; Kessler et al., 2003; see Mineka, Watson, & Clark, 1998, for a review), it has been proposed that the relationship between IU and depression may reflect the relationships between IU and anxiety and between anxiety and depression, rather than a unique relationship between IU and depression (Carleton, 2012; Gentes & Ruscio, 2011).

From a theoretical perspective, the relationship between IU and anxiety follows much more easily than the relationship between IU and depression. Anxiety involves reaction to threat and one's unknown ability to cope with threat should it be realized (e.g., Barlow, 2002; Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014; Suárez, Bennett, Goldstein, & Barlow, 2009). Threat, by definition, is uncertain; it is a signifier of the *possibility* of future negative consequences (e.g., "Those clouds are threatening; it *may* rain"). Uncertainty is also implicated in one's beliefs regarding self-efficacy: should the threat be realized, will I be able to act to avoid it, or to cope with the repercussions? The research on anxiety and threat (e.g., Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007; Mathews & MacLeod, 1985) and self-efficacy (e.g., Bandura, 1988) is considerable; one would be hard pressed to find evidence that anxiety does not involve uncertainty on a fundamental level.

Depression, on the other hand, has been traditionally associated with certainty. The hopelessness theory of depression (Abramson, Metalsky, & Alloy, 1989), for example, posits a depression subtype of which hopelessness (i.e., certainty that conditions will not improve) is a sufficient cause. Furthermore, the helplessness-hopelessness model (Alloy, Kelly, Mineka, & Clements, 1990) posits that anxiety and depression lie on a continuum in which anxiety arises in response to uncertainty about one's ability to cope with negative events, mixed anxiety-depression arises in response to certainty about one's helplessness, and depression arises when one becomes hopeless regarding the future. Considerable evidence supports the relationship between depression and hopelessness/certainty (Abramson et al., 1989; Andersen, 1990; Beck, Weissman, Lester, & Trexler, 1974; Miranda & Mennin, 2007; Miranda et al., 2008). Recently, Miranda and Mennin (2007) found that depressive symptoms were associated with greater certainty regarding the presence of negative and absence of positive future outcomes, whereas symptoms of GAD were associated with greater certainty only regarding negative future outcomes. If it is the case that depression

involves certainty regarding negative and positive outcomes – in effect, all outcomes – there is little room left for uncertainty, and little room for intolerance of that uncertainty.

Interpretation of the literature on IU and depression is complicated by a host of methodological considerations. First, when examined as disorders as classified in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5; American Psychiatric Association [APA], 2013), anxiety and depression have considerable symptom overlap. For example, the criteria for a major depressive episode include psychomotor agitation, difficulty concentrating, fatigue, and sleep disturbance, all of which are also possible symptoms of GAD. Thus, studies comparing IU across different diagnostic groups may confound these relationships. Findings from a study examining individuals grouped by primary diagnosis only (e.g., GAD, SAD, major depressive disorder [MDD]) suggested that levels of IU were relatively comparable across anxiety disorders and MDD (Carleton et al., 2012); however, it may have been the case that the IU measured in the MDD group was due to co-occurring anxiety symptoms. Further, the sample was recruited from an anxiety disorders specialty clinic, which implies that all participants, including those in the MDD group, experienced at least some anxiety. Moreover, 92% of the patients in the MDD group had at least one comorbid anxiety disorder, which was not accounted for in analyses. Considering evidence suggesting that IU increases incrementally with additional anxiety diagnoses (Carleton et al., 2010; Holaway et al., 2006; Mahoney & McEvoy, 2012), it is difficult to determine whether the IU observed in the MDD group was truly related to depression or to comorbid anxiety disorders. In another study, Yook et al. (2010) examined levels of IU across groups diagnosed with “pure” (i.e., no comorbid diagnoses) GAD or MDD, and comorbid GAD/MDD. They found comparable levels of IU in both single-diagnosis groups; however, symptoms of anxiety and worry did not differ between the GAD and MDD groups. Further, the comorbid GAD/MDD group reported higher levels of anxiety, worry, and IU than both single-diagnosis groups. Similarly, Paulus and colleagues (2015) examined IU, anxiety, and depression using structural equation modeling in a large clinical sample ($N = 642$) and found associations between IU and latent variables; however, two of three indicator variables for the latent depression construct were based on diagnostic criteria for depression. Again, it is unclear whether there is a direct relationship between IU and depression or whether the relationship is better accounted for by anxiety.

Studies in which anxiety and depression are examined dimensionally provide little additional clarity. Though depressive symptoms are consistently associated with IU when examining IU and depression alone (e.g., Boelen & Reijntjes, 2009; Boelen et al., 2010; de Jong-Meyer, Beck, & Riede, 2009; Dugas, Schwartz, & Francis, 2004; Khawaja & McMahon, 2011; McEvoy & Mahoney, 2011, 2012; Paulus et al., 2015; Yook et al., 2010), many studies did not examine IU and depression with respect to coexisting anxiety, and those that did produced inconsistent findings. The relationship between IU and depressive symptoms remained when controlling for worry (Dugas, Schwartz, & Francis, 2004), but not when controlling for worry and rumination (Yook et al., 2010). One study found that IU was associated with symptoms of panic disorder with agoraphobia (PDA), SAD, OCD, GAD, and depression, even when controlling for other symptom measures and neuroticism (McEvoy & Mahoney, 2011), whereas others found no relationship between IU and depression when accounting for symptoms of SAD, OCD, and worry (Khawaja &

McMahon, 2011), GAD, SAD, and OCD (Boelen & Reijntjes, 2009), or SAD, worry, negative affect, age, and gender (Boelen et al., 2010).

One plausible explanation for these discrepant findings is that IU may be related primarily to trait anxiety and not any anxiety component in particular (e.g., worry). Carleton (2016a, 2016b) posits that fear of the unknown, a construct closely related to IU, may be the core fundamental fear underlying anxiety pathology. If this is the case, findings regarding IU may vary due to inconsistent capturing of trait anxiety in assessment and statistical models across samples. For example, although worry is strongly associated with trait anxiety, it is not a part of all anxiety pathology (Barlow, 2002); thus, studies in which worry is the only symptom of anxiety assessed (e.g., Dugas et al., 2004; Yook et al., 2010) may not sufficiently address the relationship between IU and trait anxiety. Similarly, in McEvoy and Mahoney's study (2011) involving participants from an anxiety disorders specialty clinic, 28% of the sample had a diagnosis of specific phobia and 6% of the sample had a diagnosis of post-traumatic stress disorder (PTSD); although both disorders have an anxiety component, anxiety itself was not examined. In sum, evidence for the association between IU and depression is itself uncertain, warranting further examination. Because anxiety is a broad transdiagnostic phenomenon, examining trait anxiety rather than disorder-specific anxiety or anxiety components may help to clarify the findings of a somewhat inconsistent literature.

Although IU was initially conceptualized as a unitary construct, two factors have been identified that may have utility in clarifying IU's associations with anxiety and depression: *prospective IU*, referring to the desire for predictability, and *inhibitory IU*, referring to difficulty acting in the face of uncertainty (e.g., Carleton, Norton, & Asmundson, 2007). Some preliminary evidence suggests that diagnoses are differentially associated with IU factors; however, findings again have been inconsistent. In one study, McEvoy and Mahoney (2011) found that prospective IU was uniquely associated with symptoms of GAD and OCD, whereas inhibitory IU was uniquely associated with symptoms of SAD, panic disorder, agoraphobia, and depression. In another study, however, Mahoney and McEvoy (2011) found no significant differences in prospective IU across participants with principal diagnoses of GAD, SAD, or panic disorder with/without agoraphobia, and positive associations between number of diagnoses and inhibitory IU for SAD, GAD, depressive disorders, and OCD. In addition, Mahoney and McEvoy found significant associations between inhibitory IU and depression, OCD, panic related to GAD, and SAD when controlling for all symptom measures and number of diagnoses. A third study (Carleton et al., 2012) found no differences in prospective IU and inhibitory IU across individuals with primary diagnoses of SAD, PDA, GAD, OCD, or MDD, except for a small difference in inhibitory IU between individuals with primary diagnoses of SAD and PDA, in which individuals with primary SAD reported higher levels. In sum, the relationship of the two IU factors to anxiety and depression requires further study.

The present study utilized hierarchical regression to investigate the relationships among trait anxiety, depressive symptoms, and IU and its factors (i.e., prospective and inhibitory) in an undergraduate sample and a clinical sample with primary GAD. By investigating trait anxiety and depressive symptoms as predictors of IU, we aimed to clarify the unique associations of anxiety and depression with IU and its factors. Use of a clinical sample with

primary GAD is apt given GAD's robust association with IU, the considerable comorbidity between GAD and depression, and findings suggesting that, of all anxiety disorders, individuals with GAD have the highest likelihood of developing MDD (Hirschfeld, 2001). We hypothesized that trait anxiety and depression would both predict IU when examined separately. However, given the theoretical associations between uncertainty and anxiety and between certainty and depression, we predicted that the relationship between depressive symptoms and IU would no longer be significant when controlling for trait anxiety in both samples. Moreover, we hypothesized that trait anxiety and depression would both predict inhibitory IU and prospective IU when examined separately; further, considering inconsistent evidence regarding the discriminatory merit of the IU factors, we hypothesized that the relationships between depression and prospective IU and between depression and inhibitory IU would no longer be significant when controlling for trait anxiety.

Method

Participants

Undergraduate sample—Undergraduate participants were 573 students enrolled at Temple University who were recruited into the study from a larger subject pool via the university's research participation website. However, of the initial sample, some participants did not complete the full battery of questionnaires and were thus excluded from analyses; these participants did not differ from the rest of the sample on available measures of interest or on demographic characteristics. The final sample consisted of 554 participants (64.1% female; $M_{age} = 20.75$, $SD = 3.06$). The sample was somewhat racially and ethnically diverse (61.2% self-identified as Caucasian/European-American, 14.4% as Asian/Asian-American, 13.2% as African/African-American, 4.2% as having mixed ethnic background, 4.0% as Hispanic/Latino, and 2.0% as some other race). All procedures were approved by the university's institutional review board and participants were given partial course credit for their involvement in the study.

Clinical sample—The clinical sample consisted of 52 patients who participated in either an open trial or randomized controlled trial of Emotion Regulation Therapy for GAD (for a review of the treatment protocol, see Fresco, Mennin, Heimberg, & Ritter, 2013, or Mennin, Fresco, Ritter, & Heimberg, 2015) at the Adult Anxiety Clinic of Temple University. Some participants did not fully complete the measures of interest, bringing the final clinical sample to 43 (69.8% female; $M_{age} = 32.28$, $SD = 12.00$). Excluded participants did not differ from the rest of the sample on available measures of interest or demographic characteristics. The sample was predominantly white: 81.4% of the sample self-identified as Caucasian or white, 4.7% as African-American or black, 4.7% as Asian/Pacific Islander, and 7.0% as some other race; 9.3% also identified as Hispanic.

Participants underwent a semi-structured diagnostic interview and were included in the open or randomized trials if they met DSM-IV (APA, 1994) criteria for GAD. Participants were excluded from the trials if they had a primary DSM-IV diagnosis other than or in addition to GAD or had prominent active suicidal ideation that posed a significant threat to the patient; a DSM-IV diagnosis of substance abuse or dependence within the previous 6 months; a

current DSM-IV diagnosis of organic mental disorder, schizophrenia, psychotic disorder, bipolar I disorder, dementia, borderline or narcissistic personality disorder; or had their psychotropic medication regimen changed within the last three months. All other non-primary comorbid diagnoses were included. In the final sample, 46.5% of participants also met criteria for at least one DSM-IV mood disorder and 65.1% met criteria for at least one additional DSM-IV anxiety disorder. Given that reliability is not high in the diagnosis of GAD, all participants who met diagnostic criteria for GAD on initial interview were re-interviewed by an independent assessor. Only in cases for which there was diagnostic consensus was the participant included in the treatment trials (only one patient was excluded from this study as a result). All procedures were approved by the university's institutional review board, and all patients included in the trials received at least \$75 for their time.

Measures

Diagnostic interview—All participants in the clinical sample were administered the Anxiety Disorders Interview Schedule for the DSM-IV: Lifetime Version (ADIS-IV-L; Di Nardo, Brown, & Barlow, 1994). The ADIS-IV-L is a semi-structured interview that provides psychometrically sound diagnostics for past and current Axis I disorders with a 0-8 rating of the severity of each diagnosis and its associated impairment. A kappa coefficient of .67 for a principal diagnosis of GAD was found in two independent ADIS-IV-L interviews in a sample of 362 individuals (Brown, Di Nardo, Lehman, & Campbell, 2001). The ADIS-IV-L has also been shown to have strong construct validity (Brown, Campbell, Lehman, Grishan, & Mancill, 2001; Brown, Di Nardo et al., 2001).

Depression—The Beck Depression Inventory, second edition (BDI-II; Beck, Steer, & Brown, 1991) is a 21-item self-report instrument designed to measure the cognitive, affective, and somatic symptoms of depression. Individuals are asked to rate each item based on their previous two weeks on a scale from 0 (e.g., "I am not discouraged about my future") to 3 (e.g., "I feel my future is hopeless and will only get worse"). A total score is calculated by summing item responses; total scores range from 0-63 wherein higher scores indicate a greater severity of depression. The BDI-II has demonstrated excellent internal consistency in both clinical ($\alpha = .92$; Beck et al., 1996) and non-clinical populations ($\alpha = .90$; Storch, Roberti, & Roth, 2004). In the current sample, internal consistency of the BDI-II was good in both the undergraduate ($\alpha = .92$) and clinical ($\alpha = .89$) samples.

Trait anxiety—The State-Trait Anxiety Inventory (STAI) is a measure of state and trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The state anxiety subscale assesses how anxious an individual feels at the time of filling out the scale, whereas the trait anxiety subscale assesses dispositional anxiety. Because the present study aimed to examine the unique contributions of trait anxiety and depression, we used the seven items of the STAI-Trait subscale (STAI-A) that a factor analysis (Bieling, Antony, & Swinson, 1998) identified as loading more strongly on trait anxiety than depression. For each item, participants rated statements such as "I feel nervous and restless" and "I get in a state of tension or turmoil as I think over my recent concerns and interests" from one ("Almost Never") to four ("Almost Always").

The STAI-A has demonstrated significant reductions in response to treatment for GAD (Mennin et al., 2015) and stronger correlations with measures of other anxiety-related constructs (obsessive-compulsive symptoms, Aldea, Geffken, Jacob, Goodman, & Storch, 2009; worry, Roth, Coles, & Heimberg, 2002; anxiety sensitivity, Smári, Erlendsdóttir, Björgvinsdóttir, & Ágústssdóttir, 2003) than the items of the STAI that load on the depression factor. The STAI-A has also demonstrated adequate to good internal consistency in undergraduate ($\alpha = .84$, Roth et al., 2002; $\alpha = .82$, Storch et al., 2004) and clinical samples ($\alpha = .71$, Aldea et al., 2009). In the current sample, internal consistency of the STAI-A was good in both the undergraduate ($\alpha = .84$) and clinical ($\alpha = .81$) samples.

Intolerance of uncertainty—The Intolerance of Uncertainty Scale 12-item version (IUS-12; Carleton et al., 2007) is a shortened version of the Intolerance of Uncertainty Scale (IUS; Freeston et al., 1994). The IUS was designed to measure emotional, cognitive, and behavioral reactions to uncertain situations and the experience of feeling uncertain (e.g., "I always want to know what the future has in store for me"). The IUS-12 is highly correlated with the original IUS ($r = .94$; Carleton et al., 2007). Items on the IUS-12 are rated on a Likert-type scale ranging from 1 ("Not at all characteristic of me") to 5 ("Entirely characteristic of me"). The IUS and the IUS-12 have good internal consistency in undergraduate (Freeston et al., 1994) and clinical samples (Laposa, Collimore, Hawley, & Rector, 2015).

The IUS-12 has been shown to have two distinct factors: *prospective IU* (e.g., "I can't stand being taken by surprise") and *inhibitory IU* (e.g., "When it's time to act, uncertainty paralyzes me"). Both factors have similarly good internal consistency ($\alpha = .85$; Carleton et al., 2007). Internal consistency for the total score and both subscales was high in both samples (undergraduate: total IU, $\alpha = .88$; prospective IU, $\alpha = .83$; inhibitory IU, $\alpha = .89$; clinical: total IU, $\alpha = .92$; prospective IU, $\alpha = .88$; inhibitory IU, $\alpha = .88$).

Procedure

Data for this study were collected online for the undergraduate sample via the university's research participation website and in-person as part of pre-treatment assessment for the clinical sample. Participants from both samples provided informed consent before completing their battery of questionnaires and assessments, which included items assessing demographic characteristics as well as the BDI-II, STAI-A, and IUS-12.

Data Analyses

We used multiple regression to examine the unique associations between trait anxiety and depression and IU. All analyses were conducted separately in each sample. First, we examined trait anxiety and depression as individual predictors of IU. Next, we entered trait anxiety and depression as simultaneous predictors of IU to examine the unique variance accounted for by each. We repeated these analyses with prospective and inhibitory IU as the dependent variables.

Results

Means, standard deviations, and intercorrelations among study variables are presented in Table 1. Gender and racial minority status (Caucasian/European-American, all other races) were examined as potential covariates in each sample. Gender was unrelated to all outcome variables (i.e., IUS-12, prospective IU, inhibitory IU) in both samples and was not considered further. In the clinical sample, racial minority status was unrelated to all outcome variables. In the undergraduate sample, however, racial minority status was associated with significantly higher scores on the IUS-12 ($t[552] = 3.75, p < .001, M_{\text{diff}} = 2.79, SE_{\text{diff}} = 0.74$) and its subscales (inhibitory IU: $t[552] = 3.88, p < .001, M_{\text{diff}} = 1.54, SE_{\text{diff}} = 0.40$; prospective IU: $t[552] = 2.74, p = .006, M_{\text{diff}} = 1.26, SE_{\text{diff}} = 0.46$)¹.

Undergraduate Sample

Trait anxiety and depression each predicted total IU when entered as individual predictors (trait anxiety, $R^2 = .611, F[1, 552] = 329.15, p < .001$; depression, $R^2 = .445, F[1, 552] = 136.36, p < .001$). When entered as simultaneous predictors, trait anxiety predicted IU ($R^2 = .614, F[2, 551] = 166.80, p < .001; \beta = .56; p < .001$), but depression did not ($\beta = .079; p = .076$).

When predicting prospective IU, trait anxiety and depression were each significant predictors when entered individually (trait anxiety, $R^2 = .470, F[1, 552] = 156.80, p < .001$; depression, $R^2 = .302, F[1, 552] = 55.38, p < .001$); this was also true when predicting inhibitory IU (trait anxiety, $R^2 = .606, F[1, 552] = 320.11, p < .001$; depression, $R^2 = .488, F[1, 552] = 172.33, p < .001$). When entered as simultaneous predictors, trait anxiety predicted prospective IU ($R^2 = .470, F[2, 551] = 78.29, p < .001; \beta = .48; p < .001$), but depression did not ($\beta = -.01; p = .84$). When entered simultaneously using inhibitory IU as the dependent variable, however, both trait anxiety and depression were significant predictors ($R^2 = .618, F[2, 551] = 170.05, p < .001$; trait anxiety: $\beta = .50; p < .001$; depression: $\beta = .16; p < .001$).

Clinical Sample

The pattern of findings for the clinical sample was similar to that reported for the undergraduate sample. Trait anxiety and depression each predicted total IU when entered as individual predictors (trait anxiety, $R^2 = .659, F[1, 41] = 31.55, p < .001$; depression, $R^2 = .454, F[1, 41] = 10.63, p = .002$). When entered as simultaneous predictors, trait anxiety predicted IU ($R^2 = .672, F[2, 40] = 16.49, p < .001; \beta = .58; p < .001$), but depression did not ($\beta = .15; p = .271$).

When predicting prospective IU, trait anxiety and depression were each significant predictors when entered individually (trait anxiety, $R^2 = .669, F[1, 41] = 33.13, p < .001$; depression, $R^2 = .385, F[1, 41] = 7.12, p = .011$); this was also true when predicting inhibitory IU (trait anxiety, $R^2 = .529, F[1, 41] = 15.90, p < .001$; depression, $R^2 = .455, F[1,$

¹Analyses in the undergraduate sample were conducted with and without controlling for racial minority status. No differences in results emerged. Thus, analyses without controlling for the race are reported herein. A detailed report of the analyses controlling for race in the undergraduate sample is available upon request.

41] = 10.68, $p = .002$). When entered as simultaneous predictors, trait anxiety predicted prospective IU ($R^2 = .670$, $F[2, 40] = 16.29$, $p < .001$; $\beta = .64$; $p < .001$), but depression did not ($\beta = .052$; $p = .707$); trait anxiety also predicted inhibitory IU ($R^2 = .569$, $F[2, 40] = 9.59$, $p < .001$; $\beta = .40$; $p = .012$) when entered simultaneously with depression, which did not ($\beta = .25$; $p = .112$).

Discussion

Evidence suggesting that intolerance of uncertainty plays a role in the anxiety disorders and depression has increased exponentially; however, existing research has erred on the side of sensitivity rather than specificity. The results of the present analyses provide strong evidence that anxiety accounts for more variance in IU than in depression and that, when accounting for trait anxiety, depression and IU are not significantly associated. These findings suggest that the associations between depression and IU reported in the extant literature may be accounted for by comorbidity between anxiety and depression (or co-occurrence of symptoms or characteristics of each). In undergraduate and clinical samples, anxiety and depression each demonstrated relationships with IU when examined alone; however, when examined collectively, anxiety significantly predicted IU and depression did not in nearly all analyses.

This study supports the assertions of Carleton (2012) and Gentes and Ruscio (2011) that the perceived relationship between depression and IU may be explained by anxiety and supports findings of other studies to that effect (Boelen & Reijntjes, 2009; Boelen et al., 2010; Khawaja & McMahon, 2011). Though considerable research seemingly contradicts the present findings (Carleton et al., 2012; de Jong-Meyer et al., 2009; Dugas et al., 2004; Mahoney & McEvoy, 2012; McEvoy & Mahoney, 2011, 2012; Miranda et al., 2008; Yook et al., 2010), discrepancies may be explained by methodological differences. Specifically, some studies did not examine depression and IU in relation to anxiety (e.g., Mahoney & McEvoy, 2011; McEvoy & Mahoney, 2012), and others controlled for some anxiety but may not have captured anxiety *in toto* (e.g., Carleton et al., 2012; Dugas et al., 2004; McEvoy & Mahoney, 2011). Further, the present study conceptualized anxiety and depression as dimensional constructs rather than diagnostic entities. As anxiety may be implicated in many diagnoses (e.g., major depressive disorder with anxious distress, adjustment disorder with anxiety; APA, 2013) without meeting criteria for an anxiety disorder, it is quite possible that IU may contribute to any disorder with an anxiety component, including depressive disorders. This is in line with the idea put forth by Carleton (2016a, 2016b) that fear of the unknown may be a, and potentially *the*, foundational fear underlying anxiety pathology. Thus, the wind need not be taken completely out of the transdiagnostic sails; rather, clarification that IU may be associated with anxious mood states more than depressive mood states may help explain which diagnoses IU is associated with and why.

In the undergraduate sample, depression and inhibitory IU remained associated after controlling for trait anxiety, although trait anxiety did account for a considerable portion of the variance shared by depression. Specifically, when entered in separate models, depression accounted for 49% of the variance in inhibitory IU and trait anxiety accounted for 61% of the variance in inhibitory IU. When examined simultaneously, however, depression

accounted for only 16% of the variance, whereas anxiety still accounted for 50%. This pattern was not found in the clinical sample, though it should be noted that the clinical sample was relatively small and individuals with primary diagnoses of depression were excluded. Though the preponderance of evidence in the present study indicates that depression and IU are unrelated when accounting for anxiety, this finding suggests that inhibitory IU (i.e., difficulty acting in the face of uncertainty) may play a role in depression distinct from anxiety. Jensen and Heimberg (2015) and Thibodeau et al. (2015) have provided strong evidence that IU may vary across individuals by domain; thus, it may also be that types of IU (i.e., prospective, inhibitory) vary across individuals and domains, as well. Further, Krohne, Pieper, Knoll, and Breimer (2002) argue that many maladaptive behaviors in anxiety disorders are intended to reduce aversive uncertainty (e.g., checking in OCD). Some theorists argue that individuals experiencing IU may prefer to live with pessimistic certainty (Dupuy & Ladouceur, 2008; Yook et al., 2010) rather than engage in the costly behaviors necessary to reduce uncertainty. Considering these conjectures with respect to our findings, one interpretation is that depression arises in some part as a result of one's inability or unwillingness to expend the energy necessary to act in the face of uncertainty or to negotiate living with it. If this is the case, IU may be worth examining further in light of the helplessness-hopelessness model proposed by Alloy et al. (1990), and it may be an important factor in the trajectory from anxiety to depression.

At least three implications are apparent. First, the transdiagnostic nature of IU may be accounted for by the involvement of anxiety in numerous disorders, within and beyond those categorized as anxiety disorders. Examinations of IU, then, may benefit from examining anxiety dimensionally (i.e., trait anxiety), rather than only as a set of diagnostic criteria. Second, as discussed above, IU may contribute to the development of depression secondary to anxiety, suggesting possible refinements to etiological and developmental models. Mixed or comorbid anxiety and depression may involve a struggle to cope with and resolve intolerable uncertainty. Lastly, treatments targeting IU specifically (e.g., van der Heiden, Muris, & van der Molen, 2012) or those aimed toward mixed or comorbid anxiety and depression may be strengthened by recognizing the role of IU in anxiety.

Among the strengths of the current study are the replication of findings in undergraduate and clinical samples, the use of assessments designed to assess anxiety and depression as separate constructs, and our rigorous criteria for inclusion in the clinical sample. These aspects give us confidence that our findings accurately capture the relationships among anxiety, depression, and IU in these populations. Despite these strengths, our study is limited by the inclusion of only one clinical sample, from which individuals with primary diagnoses of depression were excluded. Thus, levels of depression in both samples may not have been representative of the larger population. Future studies should examine these relationships in more diverse, broad, and inclusive clinical and community samples in which anxiety/depression comorbidity is more representative of the population. Further, although our analyses provide a strong cross-sectional picture, longitudinal studies are merited in order to understand the developmental role of IU in anxiety and depression.

In sum, the present study indicates that IU may be more closely associated with trait anxiety than depression, in contrast with a large body of existing research. It may be that IU is better

understood in a framework that considers anxiety and depression as dimensional constructs rather than diagnostic entities. Moreover, future examinations of the transdiagnostic nature of IU and the relationship between anxiety and depression may benefit from considering the role of certainty versus uncertainty, as well as fear of the unknown (Carleton 2016a, 2016b).

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Table 1

Correlations, means, and standard deviations of all variables

Undergraduate Sample (N= 554)						
Variable	M	SD	1	2	3	4
1. STAI-A	14.30	4.11				
2. BDI-II	11.30	9.66	0.65**			
3. IUS-12	31.68	8.64	0.61**	0.45**		
4. IIU	11.25	4.61	0.61**	0.49**	0.85**	
5. PIU	20.42	8.64	0.47**	0.30**	0.89**	0.52**
Clinical Sample (N= 43)						
Variable	M	SD	1	2	3	4
1. STAI-A	19.67	4.21				
2. BDI-II	21.45	10.96	0.52**			
3. IUS-12	35.49	10.18	0.66**	0.45**		
4. IIU	13.84	5.03	0.53**	0.46**	0.90**	
5. PIU	21.65	6.07	0.67**	0.39*	0.93**	0.68**

Note. STAI-A = State-Trait Anxiety Inventory, Trait form, 7-item version; BDI-II = Beck Depression Inventory - II; IUS-12 = Intolerance of Uncertainty Scale - 12 item version; IIU = Inhibitory intolerance of uncertainty subscale from the IUS-12; PIU = Prospective intolerance of uncertainty subscale from the IUS-12.

*
 $p < .05$

**
 $p < .01$