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A comparison of intolerance of uncertainty in analogue obsessive-compulsive disorder and generalized anxiety disorder☆

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Abstract

Intolerance of uncertainty has been defined as the unwillingness to tolerate the possibility that negative events may occur in the future, no matter how low the probability [Personality Individual Differences 17 (1994), 791–802]. Previous research suggests that intolerance of uncertainty may be more specific to worry and generalized anxiety disorder (GAD) than to other anxiety disorders [e.g., Dugas, M. J., Buhr, K., & Ladouceur, R. (2004). The role of intolerance of uncertainty in the etiology and maintenance of generalized anxiety disorder. In R. G. Heimberg, C. L. Turk, & D. S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice* (pp. 143–163). New York: Guilford Press]. However, Tolin et al. [J. Anxiety Disorders 17 (2003), 233–242] argued that intolerance of uncertainty may also play a central role in obsessive-compulsive disorder (OCD). Therefore, the current study compared intolerance of uncertainty in individuals with analogue GAD and/or OCD. Intolerance of uncertainty was strongly related to pathological worry, GAD symptoms, and OCD symptoms; however, neither worry nor GAD was found to be more strongly associated with intolerance of uncertainty than OCD. Further, individuals with analogue GAD or OCD reported more intolerance of uncertainty than controls, but they did not differ significantly from each other. These

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findings suggest that intolerance of uncertainty may be a central theme in a number of the anxiety disorders.

Keywords: Intolerance of uncertainty; Worry; GAD; OCD

1. Introduction

Researchers have long been interested in the overlapping and distinguishing features of the anxiety and mood disorders (e.g., Brown, Chorpita, & Barlow, 1998; Clark & Watson, 1991; Fresco, Frankel, Mennin, Turk, & Heimberg, 2002). Among the anxiety disorders, much of this interest has focused on generalized anxiety disorder (GAD) and obsessive-compulsive disorder (OCD), primarily due to the apparent similarities in the cognitive processes associated with these disorders. Though research has consistently found worries and obsessions to be distinguishable in terms of content [e.g., real-life circumstances vs. unrealistic and magical thinking] (Brown, Moras, Zinbarg, & Barlow, 1993; Langlois, Freeston, & Ladouceur, 2000; Turner, Beidel, & Stanley, 1992), recent conceptualizations of GAD and OCD suggest that these two disorders may be fundamentally more similar in terms of the functionality of worry and compulsions (Comer, Kendall, Franklin, Hudson, & Pimentel, 2004). Similarly, both disorders, and more specifically worry and compulsions, may be related to intolerance of uncertainty.

Dugas, Gosselin, and Ladouceur (2001) have described intolerance of uncertainty as the excessive tendency of an individual to view the potential occurrence of future negative events as unacceptable, irrespective of the probability of their occurrence. Other researchers have offered similar definitions, describing intolerance of uncertainty as ''beliefs about the necessity of being certain, about the capacity to cope with unpredictable change, and about adequate functioning in situations which are inherently ambiguous'' (Obsessive Compulsive Cognitions Working Group, 1997, p. 678). Individuals who are intolerant of uncertainty, therefore, may believe that they lack sufficient coping or problem solving skills to effectively manage threatening situations that have the potential to evoke discomfort and negative emotionality.

Krohne (1993) suggests that anxious individuals engage in uncertainty-motivated behavior as a mechanism for coping with ambiguous and potentially threatening stimuli and to achieve an increased sense of control over potentially aversive situations. Inherent in this model is the suggestion that intolerance for uncertain negative events may be a driving force behind a number of behaviors and cognitions (e.g., worry, obsessions, compulsions, hypervigilance) associated with various anxiety disorders. That is, these behaviors and cognitions may serve as mechanisms by which one can attempt to avoid or control

uncertain and potentially aversive situations. Recent research has begun to assess the link between intolerance of uncertainty and symptoms of both GAD and OCD, with preliminary evidence suggesting intolerance of uncertainty is highly related to both disorders (Dugas, Gagnon, Ladouceur, & Freeston, 1998; Steketee, Frost, & Cohen, 1998; Tolin, Abramowitz, Brigidi, & Foa, 2003).

Among individuals with GAD, it has been hypothesized that worry is an attempt to control the uncertainty associated with feared situations (Dugas, Buhr, & Ladouceur, 2004). That is, an individual who is intolerant of uncertainty may engage in worry to prepare for an uncertain negative event, consequently decreasing the anxiety (and potential surprise) associated with the feared situation. This conceptualization is consistent with the avoidance model of worry proposed by Borkovec (1994, also see Borkovec, Alcaine, & Behar, 2004), which suggests that worry may function as a means to avoid experiencing unwanted and/or aversive somatic arousal, images, thoughts, and emotions. Empirically, intolerance of uncertainty has been associated with measures of pathological worry and GAD (Dugas et al., 2001; Holaway, Mennin, Turk, & Heimberg, 2002), with some research suggesting that individuals with GAD may have a lower threshold for the experience of uncertainty than do non-clinical controls or individuals with other anxiety disorders (Ladouceur et al., 1999). Similarly, intolerance of uncertainty has been found to significantly distinguish both clinical (GAD) and non-clinical worriers from non-anxious controls (Buhr & Dugas, 2002; Holaway et al., 2002). Further, cognitive-behavioral therapies specifically focusing on features of intolerance of uncertainty have shown success in ameliorating worry and related symptoms in individuals with GAD (Dugas et al., 2003; Ladouceur et al., 2000).

Though intolerance of uncertainty has received much attention in the literature on GAD, until recently, it has been less studied in OCD. Theoretical descriptions of the construct as it relates to OCD, however, date back to the 1970s (e.g., Carr, 1974). It has been suggested that individuals with OCD possess an excessive need for certainty (Makhlouf-Norris & Norris, 1972) and may experience significant anxiety until certainty is obtained (Beech & Liddell, 1974; Kozak, Foa, & McCarthy, 1987). Specifically, it has been hypothesized that intolerance of uncertainty in OCD may be most related to compulsions and ritualistic behaviors (Beech & Lidell, 1974; Steketee et al., 1998; Tolin et al., 2003). That is, individuals may view rituals and compulsions as their only available strategy for reducing the distress associated with the possibility of a feared outcome. Steketee et al. (1998) found that individuals with OCD reported more intolerance of uncertainty than those with other anxiety disorders and normal controls. In addition, intolerance of uncertainty was the only construct (compared to responsibility, control, threat estimation, tolerance for anxiety, and coping) to successfully predict OCD symptoms above and beyond mood and worry. Tolin et al. (2003) found that patients with OCD did not report more intolerance of

uncertainty than non-anxious controls; however a subset of OCD patients identified as compulsive checkers reported significantly more intolerance of uncertainty than OCD participants without a checking compulsion or non-anxious controls.

Few studies have directly examined the specificity of intolerance of uncertainty to particular psychological disorders (e.g., Dugas et al., 2001; Dugas, Marchand, & Ladouceur, 2005; Ladouceur et al., 1999). Though not the principal focus, existing studies that have compared intolerance of uncertainty in GAD to other disorders have done so primarily with OCD, with a few including comparisons with panic disorder. For example, using a non-clinical sample, Dugas et al. (2001) found that although intolerance of uncertainty was strongly correlated with both pathological worry and OCD symptoms, the relationship between intolerance of uncertainty and worry was significantly stronger than the relationship between intolerance of uncertainty and symptoms of either OCD or panic disorder. Further, although OCD symptoms were a significant predictor of intolerance of uncertainty, worry accounted for significant additional variance. In a recent examination by Dugas et al. (2005), patients with non-comorbid GAD were found to report significantly higher levels of intolerance of uncertainty than patients with a non-comorbid diagnosis of panic disorder with agoraphobia (PDA). Further analyses across both diagnostic groups found intolerance of uncertainty to be significantly correlated with worry but not significantly related to symptoms of PDA (i.e., fear of bodily sensations, agoraphobic cognitions). Similarly, Ladouceur et al. (1999) found intolerance of uncertainty to be greater among patients with GAD than in a mixed anxiety disorder group (73.7% of these patients had OCD). However, Steketee et al. (1998) reported contrasting results, finding that individuals with OCD reported greater intolerance of uncertainty than those in a mixed anxiety disorder group which included individuals with panic disorder [with and without agoraphobia] (49%), GAD (22.4%), social anxiety disorder (14.3%), and agoraphobia alone (14.3%). Differences in the findings of these two studies may be partially due to differences of measurement, as well as the lack of direct comparisons between individuals with GAD and OCD. Most recently, Sexton, Norton, Walker, and Norton (2003) tested a hierarchical model of vulnerabilities to anxiety in a college student sample; intolerance of uncertainty predicted worry and generalized anxiety symptoms but did not predict obsessive-compulsive, panic, or hypochondriacal symptoms. These results have since been replicated in a clinical sample (Norton, Sexton, Walker, & Norton, in press).

In summary, existing research suggests intolerance of uncertainty may be related to both OCD and GAD, with mixed findings regarding its specificity to either disorder. Further research directly comparing individuals with OCD and GAD on their report of intolerance of uncertainty is needed to better understand the specificity and generality of the construct.

1.1. Goals of the current study

The current study had three primary goals. First, we examined self-reported intolerance of uncertainty among individuals with analogue GAD, analogue OCD, non-anxious individuals, and individuals reporting elevated symptoms of both GAD and OCD, to determine if these groups differed significantly on this construct. Second, we examined whether intolerance of uncertainty was more strongly related to GAD or OCD symptoms, specifically testing the relationships among intolerance of uncertainty, worry, GAD, obsessions, and compulsions across the entire sample. Finally, we examined whether the relationship between intolerance of uncertainty and OCD symptoms would remain significant when worry and generalized anxiety were controlled, as well as whether the relationship between intolerance of uncertainty and worry and generalized anxiety would remain significant when controlling for OCD symptoms.

2. Method

2.1. Participants and procedure

A sample of 560 undergraduate students at a large metropolitan university completed questionnaires pertaining to worry, GAD, OCD, and intolerance of uncertainty, as well as additional measures not related to the present study. Students received partial course credit for their participation. Five hundred and five students with complete data were included in the current study (69.2% women and 30.8% men, M age = 18.70 years, S.D. = 2.32). Of the 500 participants reporting ethnicity, 316 were European/Caucasian, 82 were African-American, 45 were Asian or Asian-American, 18 were Hispanic/Latino, 22 were of mixed heritage, and 17 reported "other."

Participants were divided into the following groups based on their scores on measures of GAD and OCD: GAD, OCD, GAD + OCD, and non-anxious control. Thirty-three participants met the criterion for GAD (a positive score on the Generalized Anxiety Disorder Questionnaire for DSM-IV (GAD-Q-IV) criterion-based scoring system), 38 participants met the criterion for OCD (scores equal to or greater than 40 on the Obsessive-Compulsive Inventory (OCI), Distress scale), and 38 participants met the criteria for both disorders. One-hundred and fifty-six participants with scores less than 3.5 on the GAD-Q-IV dimensional score and less than 12 on the OCI Distress scale were assigned to the non-anxious control group. Participants (n = 240) who did not meet criteria for one of these groups were omitted from the analyses of variance to be reported; however, they were included in the correlational and regression analyses reported below.

2.2. Measures

The *Generalized Anxiety Disorder Questionnaire for DSM-IV* (Newman et al., 2002) is a self-report measure designed to assess DSM-IV (American Psychiatric Association [APA], 1994) criteria for GAD. The GAD-Q-IV consists of five yes–no questions assessing the occurrence of excessive and uncontrollable worry (e.g., ''Do you find it difficult to control the worry once it starts?''), a listing of the most frequent topics of worry, a checklist of the six somatic symptoms related to GAD (e.g., muscle tension, irritability), and two questions assessing the amount of interference and distress resulting from the worry and physical symptoms, scored on a 0 (''None'') to 8 (''Very Severe'') scale. The GAD-Q-IV can be scored via a criterion-based or dimensional scoring system. The dimensional scoring system provides an overall index of the severity of GAD (range 0–13), with total scores of 5.7 and above suggestive of a diagnosis of GAD (Newman et al., 2002). Alternatively, the criterion-based scoring system compares individual items to specific DSM-IV criteria for GAD, determining whether a diagnosis is present (Newman, Zuellig, Kachin, Constantino, & Cashman, 2001). As recent studies have found the criterion-based scoring system to be more conservative than the dimensional scoring system (e.g., Turk, Heimberg, Luterek, Mennin, & Fresco, in press), the former was used in the current study.

The *Penn State Worry Questionnaire* (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) was designed to assess the generality, excessiveness, and uncontrollability dimensions of pathological worry. Its 16 items (e.g., ''I am always worrying about something'') are scored on a 1 (''not at all typical of me'') to 5 (''very typical of me'') Likert-type scale. The PSWQ has good internal consistency in both undergraduate and clinical samples (Brown, Antony, & Barlow, 1992; Meyer et al., 1990), with a coefficient alpha of .72 in the current study. Additionally, the PSWQ has demonstrated good retest reliability over periods up to 10 weeks and is moderately to strongly correlated with measures of anxiety and depression (Meyer et al., 1990). Some investigations of the psychometric properties of the PSWQ have reported a unifactorial structure (Brown et al., 1992; Van Rijsoort, Emmelkamp, & Vervaeke, 1999), whereas others have reported a two-factor solution (Fresco, Heimberg, Mennin, & Turk, 2002; Stöber, 1998). The current study used the total score of the PSWQ as the primary index of pathological worry.

The *Obsessive-Compulsive Inventory* (Foa, Kozak, Salkovskis, Coles, & Amir, 1998) is a 42-item measure designed to assess frequency and distress of obsessions and compulsions across a broad range of symptom presentations. The OCI provides total scores for both frequency and distress of symptoms, as well as frequency and distress scores for seven subscales: washing, checking, doubting, ordering, obsessing, hoarding, and mental neutralizing. The OCI has been found to have good convergent validity with other measures of OCD (e.g., Yale-Brown Obsessive-Compulsive Scale: Goodman et al., 1989; Maudsley Obsessive-Compulsive Inventory: Hodgson & Rachman, 1977) in both clinical and college

student samples (Foa et al., 1998; Simonds, Thorpe, & Elliott, 2000). In a non-clinical sample, retest reliability over a 4-week period was found to be satisfactory, and the OCI total scale and subscales demonstrated high internal consistency (Simonds et al., 2000). A cutoff score of 40 on the OCI Distress scale allowed correct classification of 80% of patients with OCD (Foa et al., 1998) and was used in the current study as the criterion for membership in the analogue OCD group. The OCI was found to have excellent internal consistency for both the Distress ($\alpha = .96$) and Frequency ($\alpha = .96$) scales in the present sample.

The *Intolerance of Uncertainty Scale* (IUS; Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994) was designed to measure an individual's intolerance of uncertainty, particularly the ideas that uncertainty is unacceptable, reflects badly on a person, leads to frustration and stress, and leads to the inability to take action. The scale is comprised of 27 items (e.g., ''Uncertainty makes me uneasy, anxious, or stressed'' or ''A small unforeseen event can spoil everything, even with the best of planning'') and is scored on a 1 (''not at all characteristic of me'') to 5 (''entirely characteristic of me'') Likert-type scale. Psychometric properties of the English version of the scale were recently evaluated by Buhr and Dugas (2002). The IUS demonstrated excellent internal consistency ($\alpha = .94$), good retest reliability over a 5-week period ($r = .78$), and highly significant correlations with measures of worry and depression (Buhr & Dugas, 2002). Based on the recommendations of Buhr and Dugas (2002), the IUS total score was used and demonstrated excellent internal consistency in the current study ($\alpha = .93$).

3. Results

3.1. Preliminary analyses

Participants in the four diagnostic groups did not differ with respect to age [$F(3, 260) = .312$, $P = .817$]; however, the groups differed on gender

Table 1
Ethnic composition of each diagnostic group

	Diagnostic group				
	Non-anxious controls	GAD	OCD	GAD/OCD	Total
African-American	24 (15.5%)	4 (12.5%)	4 (10.5%)	9 (23.7%)	41 (15.8%)
Asian/Asian-American	7 (4.6%)	0 (.0%)	9 (23.7%)	3 (7.9%)	19 (7.2%)
European/Caucasian	107 (70.4%)	26 (81.3%)	20 (52.6%)	16 (42.1)	169 (65%)
Hispanic/Latino	6 (3.9%)	1 (3.1%)	1 (2.6%)	0 (.0%)	8 (3.1%)
Mixed Heritage	2 (1.3%)	1 (3.1%)	4 (10.5%)	6 (15.8%)	13 (5.0%)
Other	6 (3.9%)	0 (.0%)	0 (.0%)	4 (10.5%)	10 (3.8%)
Total	152 (100%)	32 (100%)	38 (100%)	38 (100%)	260 (100%)[a]

Note. GAD: generalized anxiety disorder; OCD: obsessive-compulsive disorder.
[a] Four individuals did not report ethnicity.

ratio [$\chi^2(3, N = 264) = 11.69, P < .01$], as there were significantly more males in the OCD group (52.6%) than in either the GAD (18.2%) or GAD + OCD (23.7%) groups. An independent samples *t*-test, however, indicated that IUS scores did not differ as a function of gender [$t(262) = -.471, P = .638$]. Due to inadequate sample sizes, an examination of the equality of ethnic distribution across diagnostic groups could not be conducted (see Table 1).[1]

3.2. Group differences in worry, GAD, and OCD

As expected, the four diagnostic groups differed significantly on measures of worry, GAD, and OCD. Both groups with GAD scored significantly higher on the PSWQ than the group with OCD, which scored higher than the non-anxious controls. Similar results were noted for the GAD-Q-IV dimensional score, except that the group with OCD did not differ from the non-anxious controls. On the OCI Distress scale, both groups with OCD scored higher than the group with GAD, which scored significantly higher than the non-anxious controls. These results suggest that our classification criteria produced groups with meaningful differences on these measures. Details of these analyses are presented in Table 2.

3.3. Group differences in intolerance of uncertainty

To examine differences in IUS scores across the four diagnostic groups, an analysis of variance was conducted. The main effect of group was significant [$F(3, 260) = 50.99, P < .001, \eta^2 = .37$]. Post hoc Tukey's HSD tests indicated that individuals meeting study criteria for both GAD and OCD reported significantly higher scores on the IUS than those in the OCD group and the non-anxious control group (P's $< .001$); they also scored higher on the IUS than the those in the GAD group, but only at the trend level [$P = .07$] (see Table 2). Individuals in both the GAD and OCD groups endorsed significantly more intolerance of uncertainty than those in the control group. However, the GAD and OCD groups were not significantly different from each other.

[1] Because sample sizes were not sufficient for analyses assessing equality of ethnic distribution across diagnostic group or for comparisons of IUS scores by ethnic group, separate ANOVAs were conducted comparing IUS scores of the diagnostic groups in both an inclusive sample and in a sample comprised of only European/Caucasian participants (the European/Caucasian group was the only ethnic group with adequate sample sizes across all four diagnostic groups). These analyses yielded equivalent results, suggesting that ethnicity did not account for significant differences between diagnostic groups. However, further research on the relationship between intolerance of uncertainty and ethnicity is warranted.

Table 2
Group means and standard deviations on measures of intolerance of uncertainty, worry, GAD, and OCD

	Diagnostic group							
	Total sample (n = 505)	Non-anxious controls (n = 156)	GAD (n = 33)	OCD (n = 38)	GAD + OCD (n = 38)	F	df	ES
PSWQ	48.15 (13.51)	39.00[a] (10.18)	64.15[c] (9.85)	45.45[b] (8.38)	65.53[c] (9.92)	112.40*	3, 260	.56
GAD-Q-IV dimensional score	3.87 (3.16)	1.59[a] (.91)	9.72[b] (1.40)	1.80[a] (1.01)	9.84[b] (1.24)	1056.18*	3, 260	.92
OCI Distress score	23.56 (23.44)	4.48[a] (3.76)	21.51[b] (11.45)	62.84[c] (16.51)	63.69[c] (20.85)	471.60*	3, 260	.84
IUS	54.37 (16.51)	45.15[a] (12.80)	66.30[b‡] (20.39)	59.81[b] (16.59)	75.21[c‡] (17.91)	50.99*	3, 260	.37

Note. PSWQ: Penn State Worry Questionnaire; GAD-Q-IV: Generalized Anxiety Disorder Questionnaire for DSM-IV; OCI: Obsessive-Compulsive Inventory, IUS: Intolerance of Uncertainty Scale. Means with different superscripts (a, b, and c) are significantly different from each other. ES: effect size (partial η^2), where .01 is small, .06 is medium, and .14 is large.

* $P < .05$, unless otherwise specified.

‡ $P < .10$.

3.4. Correlations among measures of intolerance of uncertainty, worry, GAD, and OCD

Correlational analyses were conducted using the entire sample. The IUS was significantly and moderately correlated with the PSWQ, GAD-Q-IV dimensional score, and Frequency and Distress scales of the OCI. Additionally, the IUS was significantly related to all of the OCI subscales (e.g., obsessing, checking, neutralizing) [see Table 3]. All correlations remained significant after applying a Bonferroni correction for multiple tests (i.e., .05/11 = .005).

To examine whether specific scales were more strongly related to intolerance of uncertainty than others, a series of comparisons of correlated correlation coefficients was conducted, based on procedures outlined by Meng, Rosenthal, and Rubin (1992). IUS scores were not significantly more highly related to the GAD-Q-IV dimensional score than to the total scores on either the Frequency [$z(504) = 1.12$, $P = .263$] or Distress [$z(504) = 1.11$, $P = .267$] subscales of the OCI, or the OCI obsessing [$z(504) = .95$, $P = .342$] and doubting [$z(504) = 1.27$, $P = .204$] subscales. However, correlations between the IUS and the GAD-Q-IV dimensional score were significantly larger than those of the IUS and the remaining OCI subscales, with z-scores ranging from 1.97 to 4.44 (P's $< .05$). In addition, scores on the IUS were not more strongly related to the PSWQ than to scores on the Frequency [$z(504) = 1.62$, $P = .105$] and Distress [$z(504) = 1.63$, $P = .103$] subscales of the OCI or the OCI obsessing [$z(504) = 1.46$, $P = .144$] and doubting [$z(504) = 1.78$, $P = .075$] subscales, although these differences did approach significance. However, scores on the IUS were significantly more strongly correlated with the PSWQ than with the remaining OCI subscales, with z-scores ranging from 2.48 to 4.82 (P's $< .05$).

As previous literature (Reed, 1985; Tolin et al., 2003) has suggested that compulsive checking and doubting may be more related to intolerance of uncertainty than other compulsive behaviors, correlated coefficients of the OCI subscale scores and the IUS were compared. Scores on the doubting subscale were found to be more strongly correlated with the IUS than the washing [$z(504) = 4.00$, $P < .05$], ordering [$z(504) = 2.56$, $P < .05$], and hoarding [$z(504) = 3.70$, $P < .05$] subscales. The comparison of the IUS-doubting correlation to the IUS-neutralizing correlation approached significance [$z(504) = 1.89$, $P = .059$], but the comparison to the IUS-obsessing correlation fell short [$z(504) = -.52$, $P = .603$]. Similarly, scores on the checking subscale were found to be more strongly related to the IUS than scores on the washing [$z(504) = 3.74$, $P < .05$] and hoarding [$z(504) = 2.90$, $P < .05$] subscales, but not the neutralizing [$z(504) = .95$, $P = .342$] subscale. The test of the IUS-checking correlation versus the IUS-ordering correlation [$z(504) = 1.88$, $P = .060$] and the IUS-obsessions correlation [$z(504) = -1.55$, $P = .061$] approached significance. The checking and doubting subscales did not significantly differ from each other [$z(504) = -1.22$, $P = .222$] in the magnitude of their association with the IUS.

Table 3
Zero-order correlations between intolerance of uncertainty, worry, GAD, and OCI subscales ($N = 505$)

	IUS	PSWQ	GAD-Q-IV	OCI Distress	OCI Frequency	Washing	Checking	Doubting	Ordering	Obsessions	Hoarding
PSWQ	.50										
GAD-Q-IV	.48	.73									
OCI Distress	.43	.33	.37								
OCI Frequency	.43	.34	.38	.89							
Washing	.26	.17	.21	.68	.80						
Checking	.39	.30	.31	.83	.92	.68					
Doubting	.42	.31	.34	.76	.82	.54	.77				
Ordering	.33	.29	.30	.68	.80	.64	.69	.59			
Obsessing	.44	.35	.41	.77	.80	.48	.68	.68	.48		
Hoarding	.27	.29	.34	.53	.67	.42	.54	.52	.53	.53	
Neutralizing	.36	.27	.33	.81	.86	.59	.78	.70	.58	.72	.52

Note. IUS: Intolerance of Uncertainty Scale; PSWQ: Penn State Worry Questionnaire; GAD-Q-IV: Generalized Anxiety Disorder Questionnaire for DSM-IV; OCI: Obsessive Compulsive Inventory. All correlations significant at $P < .001$.

Table 4
Summary of hierarchical regression analyses for variables predicting intolerance of uncertainty ($N = 505$)

	Variable	*B*	*SE B*	β
Step 1	PSWQ	.61	.05	.50
Step 2	PSWQ	.49	.05	.40
	OCI Distress Total[a]	.21	.03	.30
Step 1	OCI Distress Total	.30	.03	.43
Step 2	OCI Distress Total	.21	.03	.30
	PSWQ[b]	.49	.05	.40
Step 1	GAD-Q-IV Dimensional Score	2.53	.20	.48
Step 2	GAD-Q-IV Dimensional Score	1.98	.21	.38
	OCI Distress Total[c]	.20	.03	.29
Step 1	OCI Distress Total	.30	.03	.43
Step 2	OCI Distress Total	.20	.03	.29
	GAD-Q-IV Dimensional Score[d]	1.98	.21	.38

[a] $R^2 = .25$; $\Delta R^2 = .08$, $P < .001$.
[b] $R^2 = .18$; $\Delta R^2 = .15$, $P < .001$.
[c] $R^2 = .24$; $\Delta R^2 = .07$, $P < .001$
[d] $R^2 = .18$; $\Delta R^2 = .12$, $P < .001$.

3.5. Further tests of specificity: regression analyses

To examine whether the relationship between intolerance of uncertainty and OCD symptoms would remain significant after the effects of worry and generalized anxiety had been controlled (and vice versa), a series of hierarchical regressions was conducted. In the first analysis, the PSWQ was entered in the first step of the regression equation predicting intolerance of uncertainty and was significant, $t(503) = 12.62$, $P < .001$. When entered in the second step, the OCI Distress total score accounted for significant additional variance (7.9%) in the IUS, beyond that accounted for by worry, $F(1, 502) = 59.04$, $P < .001$; worry, however, remained a significant contributor, $t(503) = 10.39$, $P < .001$. Therefore, the PSWQ and OCI Distress total score were independently associated with the IUS, both accounting for unique variance in the construct. Both the PSWQ and OCI Distress total score remained significant (both P's $< .001$) when reversing the order of entry of predictors in an additional regression analysis predicting intolerance of uncertainty (see Table 4).

Parallel regression analyses to those detailed above were conducted using the GAD-Q-IV dimensional score in place of the PSWQ. These regression analyses with the GAD-Q-IV revealed an identical pattern of results to those found using the PSWQ. Details of these analyses are presented in Table 4.[2]

[2] Regression analyses were also conducted using the OCI Frequency scale in place of the OCI Distress scale. These analyses yielded equivalent results to those obtained when using the OCI Distress scale.

4. Discussion

Intolerance of uncertainty has received increasing research attention in relation to GAD and OCD in the last few years. Most studies have found intolerance of uncertainty to be most related to GAD (e.g., Dugas et al., 2001; Ladouceur et al., 1999; Sexton et al., 2003), specifically to its hallmark symptom of pathological and uncontrollable worry, although a number of studies found support for a significant relationship between intolerance of uncertainty and symptoms of OCD (e.g., Steketee et al., 1998; Tolin et al., 2003). To better understand the specificity of this construct, the current study compared levels of intolerance of uncertainty among participants with analogue OCD and GAD. Participants in both the GAD and OCD groups reported significantly higher levels of intolerance of uncertainty than those in a non-anxious control group; however, they did not differ significantly from one another. This finding suggests that intolerance of uncertainty may not be specific to one disorder, but is, in fact, relevant to both GAD and OCD. Further comparisons found that individuals who met self-reported criteria for both disorders endorsed a significantly greater degree of intolerance of uncertainty than those in the non-anxious control group and the OCD group, and they surpassed the GAD group at the trend level ($P = .07$). This finding may suggest higher levels of intolerance of uncertainty are related to greater levels of psychological disturbance. Alternatively, this finding may suggest that intolerance of uncertainty is uniquely related to both GAD and OCD, with the combination of these disorders resulting in greater levels of intolerance of uncertainty, an interpretation that is also consistent with the results of our regression analyses.

Additional analyses found intolerance of uncertainty to be significantly associated with measures of GAD and OCD, as well as worry and various compulsive behaviors. Comparisons of correlation coefficients did not reveal any significant differences between GAD/worry and OCD (OCI Distress) and the strength of their association with intolerance of uncertainty, further supporting the relevance of this construct to both disorders. This finding of similar magnitudes of correlation stands in contrast to previous research with non-clinical samples (Dugas et al., 2001), in which worry was significantly more strongly correlated with intolerance of uncertainty than symptoms of OCD or panic disorder. Comparison of correlation coefficients between our study and the Dugas et al. study may explain this apparent discrepancy. Specifically, we found a more modest correlation between intolerance of uncertainty (IUS) and worry (PSWQ: $r = .50$) than was reported by Dugas et al. ($r = .70$). Examination of a third study that utilized the same two measures revealed a correlation of intermediate magnitude ($r = .60$; Buhr & Dugas, 2002). In contrast to the variability in estimates regarding the magnitude of relationship between intolerance of uncertainty and worry, estimates of the correlations between intolerance of uncertainty and OC symptoms appear to be more stable (IUS and Padua Inventory, $r = .48$, in Dugas et al., 2001; IUS and OCI Frequency and Distress,

r's = .43, in the current study). Therefore, it appears that whether significant differences are detected between the magnitude of correlations of the IUS with worry as compared to OC symptoms may be influenced by the magnitude of the relationship observed between the IUS and PSWQ. Shifting to the prediction of intolerance of uncertainty, both the current study and Dugas et al. (2001) found OC symptoms to be a significant predictor. Further, in the current study, OC symptoms were found to predict significant unique variance above and beyond worry (this was not tested by Dugas et al.).

Further analyses found that both worry and GAD have significantly stronger associations with intolerance of uncertainty than a number of compulsive behaviors (e.g., washing, hoarding). Doubting and checking compulsions were most related to intolerance of uncertainty, with significantly greater correlations with the IUS than most other compulsive behavior subscales. This finding appears to be consistent with literature suggesting intolerance of uncertainty to be most intimately related to OCD doubting and checking. For example, Reed (1985) suggested that doubts about one's experiences or actions were directly related to uncertainty regarding one's capacity to avoid danger. Similarly, Tolin et al. (2001) found individuals with OCD to evidence lower memory confidence for objects perceived to be dangerous, compared to individuals without an anxiety disorder; these individuals were also more likely to be identified as compulsive checkers. Further, Tolin et al. (2003) found OC individuals with checking compulsions to report higher levels of intolerance of uncertainty than those without checking compulsions. Taken together, these findings suggest that intolerance of uncertainty may be an integral link between doubting and checking, such that doubting may give rise to intolerance of uncertainty, while checking may function as an attempt to decrease uncertainty and associated distress. From a slightly different perspective, doubting that one has properly turned off the stove or locked the front door likely generates significant anxiety that may be further heightened by one's level of intolerance for uncertainty. Checking, therefore, may serve as an effective mechanism for decreasing the anxiety created by the combination of one's doubt and inability to tolerate uncertainty. Further examination of the specific nature of intolerance of uncertainty among individuals with OCD, particularly as it relates to checking and doubting, is certainly warranted.

Limitations to the findings of the current study are three-fold. First, utilization of analogue subjects limits applicability of findings to individuals with clinical GAD and/or OCD. Though participants in the current study were divided into groups based on relatively stringent criteria, it cannot be assumed that reported levels of intolerance of uncertainty are, in fact, similar to those experienced by clinically diagnosed individuals. A second limitation of the study is use of self-report measures, rather than clinician-rated measures, to assess GAD and OCD. For example, semi-structured interviews would likely provide a more accurate assessment of the nature, presence, and frequency of pathological worry and specific obsessive-compulsive behaviors. Similarly, use of a self-report questionnaire to assess intolerance of uncertainty further limits the current

findings. Though the majority of studies examining this construct have used the IUS, experimental studies that manipulate intolerance of uncertainty are needed. One preliminary study involving the experimental manipulation of intolerance of uncertainty has been conducted (e.g., Ladouceur et al., 2000); however, further research is necessary to better understand the specific nature and function of intolerance of uncertainty among individuals with GAD and OCD.

In summary, there is mounting evidence that intolerance of uncertainty plays a role in both GAD and OCD. Future research would benefit from studies aimed at better understanding the specific nature of intolerance of uncertainty as it relates to the development and maintenance of psychological disorders such as GAD and OCD. For example, if worry and compulsive behaviors serve comparable functions in that they both decrease uncertainty and associated anxiety (Comer et al., 2004), identifying potential factors (e.g., emotion regulation deficits, an inflated sense of responsibility) associated with the differential development of one disorder over the other becomes an important topic for future research. In addition, research examining the presence of intolerance of uncertainty in disorders other than GAD and OCD (e.g., depression, social anxiety disorder, post-traumatic stress disorder, eating disorders) may suggest that the construct plays an integral role in the development and maintenance of a number of disorders. Exploration of the construct beyond GAD and OCD is certainly warranted. In addition, future studies may benefit from examining whether there are multiple domains of intolerance of uncertainty that are differentially correlated with various forms of psychopathology. For example, uncertainty about others' opinions may be particularly important in social anxiety disorder, uncertainty about one's future direction may be particularly important in GAD, and uncertainty about one's immediate surroundings may be particularly important in OCD. Understanding the nature of intolerance of uncertainty as it relates to development and maintenance of various psychological disorders will likely inform current conceptualizations of psychopathology, potentially augmenting current approaches to the assessment and treatment of these disorders.

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