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Just to be certain: Confirming the factor structure of the Intolerance of Uncertainty Scale in patients with obsessive-compulsive disorder

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ABSTRACT

Intolerance of Uncertainty (IU) is a cognitive construct in obsessive-compulsive disorder (OCD); yet no studies exist confirming the factor structure of the most widely used measure of IU, the Intolerance of Uncertainty Scale (IUS), in OCD patients. Moreover, no studies have examined how scores on this measure relate to OCD symptom dimensions. Accordingly, the present study examined a 12-item two-factor revised version of the IUS (IUS-12) in 205 OCD patients. Confirmatory factor analysis verified the scale's two-factor structure. The measure also demonstrated high internal consistency and the IUS-12 was correlated moderately with another self-report measure of IU. Finally, theoretically consistent and specific relationships emerged between the IUS-12 and OCD symptom dimensions. These findings are discussed in terms of implications for the assessment and treatment of OCD, and specifically how elevated scores on the IUS-12 subscales may be utilized to identify subtleties in the presentation of OCD-related problems with IU.

1. Introduction

Intolerance of uncertainty (IU) refers to "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 [OCCWG], 1997, p.678) and is considered an important domain of dysfunctional cognition associated with anxiety disorders such as obsessive-compulsive disorder (OCD; OCCWG, 1997) and generalized anxiety disorder (GAD; Dugas, Buhr, & Ladouceur, 2004). Individuals who are high in IU have a lower perceptual threshold of ambiguity, find uncertainty to be stressful and upsetting, believe that uncertainty reflects poorly on a person and should be avoided, and have difficulty functioning in uncertain or ambiguous situations (Buhr & Dugas, 2002; Krohne, 1993).

Most studies of IU use the Intolerance of Uncertainty Scale (IUS; Freeston, Rhéaume, Letarte, & Dugas, 1994), a 27-item self-report measure assessing cognitive, behavioral, and emotional responses to uncertainty in everyday life. The IUS is internally consistent (α's = .91–.94) and has good test-retest reliability (r = .74; Buhr & Dugas, 2002; Freeston et al., 1994), yet a number of concerns have also been raised. First, the IUS is atheoretical and was derived on the basis of clinical judgment rather than empirically (Birrell, Meares, Wilkinson, & Freeston, 2011). Second, it has several items that appear to pertain specifically to GAD (e.g., "My mind can't be relaxed if I don't know what will happen tomorrow"), and some researchers have speculated that as a result the IUS better accounts for symptoms of worry than symptoms of other anxiety disorders (Gentes & Ruscio, 2011). Third, the convergent and divergent validity of the IUS are not well established (Buhr & Dugas, 2002; Freeston et al., 1994). Fourth, factor analytic studies have yielded little consensus about the number of IUS factors. Authors have reported two- (Carleton, Norton, & Asmundson, 2007; Sexton & Dugas, 2009), four- (Berenbaum, Bredemeier, & Thompson, 2008; Buhr & Dugas, 2002; Norton, Sexton, Walker, & Norton, 2005),[1] and five- (Freeston

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[1] Since results in the original Norton et al. (2005) data were inconsistent across the four racial/ethnic groups studied (i.e., African American, Caucasian, Hispanic, South East Asian) and each group had a relatively small sample size (ns = 93–149), Birrell et al. (2011) described results from an unpublished reanalysis of the dataset in which these four groups were combined into one larger sample for factor-analysis, which resulted in the 4 factors reported here.

et al., 1994) factor solutions; with many factors having poor interpretability and items that cross-load. Finally, factor analytic studies of the IUS have been limited by their reliance on principal components analysis, which is actually conceptually and mathematically distinct from factor analysis (Russell, 2002), as well as on eigenvalues > 1 and Cattell (1966) to determine the number of factors to retain, which has potentially problematic consequences (Preacher & MacCallum, 2003).

As a result of these limitations, Carleton et al. (2007) investigated whether item-reduction would improve the IUS factor structure without substantially reducing its reliability. They identified (in an undergraduate sample) a psychometrically stable 12-item two-factor version (IUS-12) that, while more parsimonious, still demonstrated high internal consistency and construct validity. The IUS-12 also significantly predicted symptoms of generalized anxiety and worry after accounting for variance shared with general symptoms of anxiety and depression. Other researchers have also examined the IUS-12, consistently reporting good psychometric properties relative to the original IUS (Helsen, Van, Vlaeyen, & Goubert, 2013; Khawaja & Yu, 2010) as well as associations with symptoms of OCD, GAD, social anxiety, panic disorder, health anxiety, neuroticism, and trait anxiety (Boelen & Carleton, 2012; Boelen, Vrinssen, & van Tulder, 2010; Calleo, Hart, Björgvinsson, & Stanley, 2010; Carleton, Collimore, & Asmundson, 2010; Khawaja & Yu, 2010; Mahoney & McEvoy, 2012; McEvoy & Mahoney, 2011, 2012). Finally mounting evidence suggests the IUS-12 consists of two-factors representing approach and avoidance responses to uncertainty, respectively (Birrell et al., 2011). The first factor, Prospective IU, measures desire for predictability, preferences for knowing what the future holds, anxiety about future uncertain events, and active engagement in seeking information to increase certainty. The second, Inhibitory IU, measures avoidance and paralysis in the face of uncertainty.

The development and validation of the IUS-12 has helped advance the measurement of IU; yet previous studies of this measure have mostly been conducted with undergraduate samples who are relatively young, predominantly female, and have low mean IUS scores (Birrell et al., 2011). Surprisingly, only two studies (Carleton et al., 2012; McEvoy & Mahoney, 2011) have conducted factor analyses of the IUS-12 in clinical samples. These studies both found that the best fitting model was the 12-item two-factor version identified by Carleton et al. (2007). One of these studies, however, included a mixed sample of patients with various anxiety and depressive disorders (McEvoy & Mahoney, 2011). The second conducted separate CFAs for each diagnostic group (i.e., various anxiety and depressive disorders), but acknowledged that the relatively small sample sizes were insufficient for robust CFA (*n*s ranging from 26–120), and that their findings were only preliminary (Carleton et al., 2012). Both studies (Carleton et al., 2012; McEvoy & Mahoney, 2011) called for further replication and extension of their findings in other (more homogeneous) clinical samples.

Accordingly, in the present study we examined the factor analytic structure, internal consistency, and validity of the IUS-12 in a large clinical sample of treatment-seeking patients with OCD. We chose to specifically examine patients with OCD because (a) there is consistent evidence for a relationship between IU and OCD symptoms (Calleo et al., 2010; Dugas, Gosselin, & Ladouceur, 2001; Holaway, Heimberg, & Coles, 2006; Steketee, Frost, & Cohen, 1998; Tolin, Abramowitz, Brigidi, & Foa, 2003; Tolin, Worhunsky, & Maltby, 2006), and (b) we aimed to also examine relationships between IU and the different OCD symptom dimensions (e.g., contamination, symmetry), which have not been investigated to date. Surprisingly, no previous studies have examined this measure in an exclusively OCD clinical sample.

From a cognitive-behavioral perspective, IU is thought to play a role in the escalation of normally occurring intrusive thoughts into clinical obsessions. For example, an individual with an unwanted intrusive thought about stabbing her child might think, "I need to know *for certain* that I am not a bad mother and won't harm my child." This gives rise to distress, which is then neutralized using maladaptive checking or re-assurance-seeking rituals with the goal of attaining certainty that the negative event will not transpire. Such rituals further maintain the obsessional thinking and need for certainty (e.g., Rachman, 2002; Radomsky, Gilchrist, & Dussault, 2006).

A highly heterogeneous condition, OCD consists of four empirically derived theme-based symptom dimensions: contamination, responsibility for harm, unacceptable thoughts, and order/symmetry (e.g., Abramowitz et al., 2010; McKay et al., 2004). In studies examining associations between IU and particular OCD themes, IU appears to be most strongly related to responsibility/doubting obsessions and checking compulsions (Abramowitz, Nelson, Purdon, Antony, & Summerfeldt, 2007a; Calleo et al., 2010; Holaway et al., 2006; Overton & Menzies, 2002; Tolin et al., 2003), yet it is also associated to some degree with the other symptom dimensions (Abramowitz & Deacon, 2006; Calleo et al., 2010; Holaway et al., 2006; Tolin, Brady, & Hannan, 2008; Wheaton, Abramowitz, Berman, Riemann, & Hale, 2010). The few studies (Boelen & Carleton, 2012; Carleton et al., 2012; McEvoy & Mahoney, 2011) that have examined the IUS-12 subscales in relation to OCD symptoms have reported conflicting findings as to whether Inhibitory IU (Boelen & Carleton, 2012, Study 1), Prospective IU (Boelen & Carleton, 2012, Study 2; McEvoy & Mahoney, 2011), or neither (Carleton et al., 2012) are uniquely related to OC symptoms. Moreover, these studies only considered global OCD symptom severity rather than the OCD symptom dimensions; thus it remains unknown whether these dimensions differentially relate to the different dimensions of uncertainty as measured by the IUS-12.

On the basis of previous research, we hypothesized that in a clinical sample of patients with OCD: (a) confirmatory factor analysis (CFA) would support a 2-factor structure of the IUS-12, as previously defined (Carleton et al., 2007, 2012; McEvoy & Mahoney, 2011), (b) the IUS-12 will demonstrate high internal consistency, and (c) would correlate strongly with another self-report measure of IU. In addition, we tested the hypothesis that the IUS-12 and its subscales would be associated with the OCD symptom dimension involving obsessions about responsibility for harm and checking rituals. Due to inconsistent findings, however, we did not have a priori hypotheses about the other symptom dimensions.

2. Materials and methods

2.1. Participants

Participants were 205 treatment-seeking patients (96 men and 108 women) at the Obsessive-Compulsive Disorders Center at Rogers Memorial Hospital in Oconomowoc, Wisconsin with a primary diagnosis of OCD. The majority of the sample was enrolled in the residential program for OCD (77%; $n = 158$); the remainder was enrolled in the Center's OCD intensive outpatient program (23%; $n = 47$). The majority of patients also had co-occurring diagnoses (80%; $n = 164$); the most common were other anxiety disorders (19%) followed by unipolar depression (37%). The group's mean age was 29.9 years ($SD = 11.10$; range = 18–63) and the sample was 91% Caucasian, 2% African American, 2.5% Asian, 3.4% Latino/Hispanic, and 1% Indian. The mean number of years of education participants reported was 14.87 ($SD = 2.36$; range = 12–20).[2]

[2] Due to missing data, years of education was only available for a subset of the sample ($n = 120$).

2.2. Measures

2.2.1. Intolerance of Uncertainty Scale, Short Form (IUS-12; Carleton et al., 2007)

The IUS-12 is a 12-item short form of the original 27-item Intolerance of Uncertainty Scale (Freeston et al., 1994) that measures reactions to uncertainty, ambiguous situations, and the future. Sample items include: "Uncertain events upset me greatly" and "I always want to know what the future has in store for me." Participants rate each item on a scale from 1 (*Not at all characteristic of me*) to 5 (*Entirely characteristic of me*). The IUS-12 has two factors, Prospective IU (7 items) and Inhibitory IU (5 items), as well as good psychometric properties in both clinical and non-clinical samples (Carleton et al., 2007, 2012; Khawaja & Yu, 2010; McEvoy & Mahoney, 2011).

2.2.2. Yale-Brown Obsessive, Compulsive Scale – self-report version (Y-BOCS-SR; Goodman, Price, Rasmussen, & Mazure, 1989a; Goodman, Price, Rasmussen, & Mazure, 1989b).

The Y-BOCS is a commonly used measure of OCD symptom severity that assesses obsessions and compulsions on the following five parameters: (a) time spent, (b) interference, (c) distress, (d) resistance, and (e) control. Scores on the Y-BOCS range from 0 to 40, and higher scores indicate greater symptom severity. Used as a self-report measure (as in the present study), the Y-BOCS-SR has good reliability and validity (Steketee, Frost, & Bogart, 1996).

2.2.3. Dimensional Obsessive-Compulsive Scale (DOCS, Abramowitz et al., 2010)

The DOCS is a 20-item self-report measure that assesses the severity of four empirically validated OCD symptom dimensions: (a) contamination, (b) responsibility for harm and mistakes, (c) symmetry/ordering, and (d) unacceptable thoughts. Within each symptom dimension, five items (rated 0 to 4) assess the following parameters of severity over the past month: (a) time occupied by obsessions and rituals, (b) avoidance behavior, (c) associated distress, (d) functional interference, and (e) difficulty disregarding the obsessions and refraining from the compulsions. The DOCS subscales have excellent reliability in clinical samples ($\alpha = .94–.96$), and the measure converges well with other measures of OC symptoms (Abramowitz et al., 2010). Reliability of the DOCS subscales in the present sample were excellent ($\alpha = .93–.96$).

2.2.4. Obsessive Beliefs Questionnaire-44 (OBQ-44, OCCWG, 2001, OCCWG, 2003, OCCWG, 2005)

The OBQ-44 is a 44-item self-report instrument that measures three subscales of dysfunctional obsessive beliefs hypothesized to underlie OCD symptoms: (a) threat overestimation and responsibility (OBQ-RT), (b) importance and control of thoughts (OBQ-ICT), and (c) perfectionism and need for certainty (OBQ-PC). The instrument has good validity, internal consistency, and test-retest reliability (OCCWG, 2001). Reliability of the OBQ-44 subscales in the present sample was excellent ($\alpha = .92–.95$).

2.2.5. Beck Depression Inventory-II (BDI-II, Beck, Steer, & Brown, 1996)

The BDI-II is a 21-item self-report scale that assesses the severity of affective, cognitive, motivational, vegetative, and psychomotor components of depression. Scores of 20 or greater suggest the presence of clinical depression. The BDI-II has excellent reliability and validity and is widely used in clinical research (Beck, Steer, & Brown, 1996).

2.3. Procedure

Prior to admission to one of the treatment programs, all prospective patients completed a telephone assessment with a trained intake staff member which included the clinician-rated version of the Y-BOCS to determine the presence of OCD. The clinical director of the Center (BCR) reviewed the results of this assessment with the intake interviewer and determined whether the patient was appropriate for admission, and if so, which level of care (intensive outpatient or residential) best fit the severity and needs of the patient. Upon admission, each patient completed an in person diagnostic evaluation with a psychiatrist to confirm the diagnosis of OCD and any co-occurring diagnoses, as well as the Y-BOCS-SR. Individuals included in the present study were those age 18 and over, for whom there was 100% agreement (between the psychiatrist and clinical director) that OCD was a primary diagnosis, and who scored at least 16 on the Y-BOCS-SR. Each participant also completed the IUS-12 at admission. A subset of participants ($n = 97$) completed additional measures of interest for the present study (i.e., DOCS, OBQ-44, BDI-II).

2.4. Statistical analyses

We used the following statistical approach to test our hypotheses. First, to confirm the factor structure of the IUS-12 in the present sample, we conducted a confirmatory factor analyses (CFA) examining one and two factor solutions. Second, to examine the scale's reliability, we calculated internal consistency of the total scale and subscales, as well as inter-item, item-subscale, and item-total correlations. Third, independent samples *t*-tests were used to compare men and women and individuals with and without a comorbid diagnosis on the IUS-12. Fourth, we computed Pearson correlation coefficients to examine how scores on the IUS-12 were related to demographic variables (age), OCD symptom dimensions (DOCS subscales), OCD-related cognitions (OBQ-44 subscales), and depression (BDI-II). Fifth, we computed hierarchical regression analyses to examine how well the IUS-12 subscales predicted OCD symptom dimension severity (DOCS subscales) over and above depressive symptoms (BDI-II).

3. Results

3.1. Descriptive statistics

Means, standard deviations, skewness, and kurtosis for the full sample on the IUS-12 items, subscales, and total score appear in Table 1. As can be seen, none of the items displayed problematic levels of skewness (max skewness = −.29) or kurtosis (max kurtosis = −1.37; Tabachnick & Fidell, 2013).

3.2. Factor analysis

Confirmatory factor analyses (CFA) were conducted using LISREL 8.80 (Jöreskog & Sörbom, 1996). A priori hypotheses about item loadings and factor structure of the IUS-12 were based on results from previous studies supporting a two factor solution in both non-clinical (Carleton et al., 2007) and mixed clinical samples (Carleton et al., 2012; McEvoy & Mahoney, 2011). We examined one and two factor solutions using maximum likelihood estimation with the correlation matrix. Model fit was determined using χ^2, Root Mean Square Error of Approximation (RMSEA; values should be < .08; MacCallum, Browne & Sugawara, 1996), Tucker-Lewis Index (TLI; values should be > .90 and preferably > .95; Hu & Bentler, 1999; Tucker & Lewis, 1973), Expected Cross Validation Index (ECVI; lower values indicate better fit; Browne & Cudeck, 1993), Comparative Fit Index (CFI; values should be > .95; Hu &

Table 1
Descriptive statistics and factor loadings for the IUS-12 ($N = 205$).

Item number	*M*	*SD*	Skewness	Kurtosis	CITC	Factor loading
1. Unforeseen events upset me greatly	3.12	1.36	−.07	−1.19	.74	.79
2. It frustrates me not having all the information I need	3.27	1.37	−.18	−1.20	.63	.65
3. One should always look ahead so as to avoid surprises	3.21	1.31	−.20	−1.02	.67	.76
4. A small, unforeseen event can spoil everything, even with the best of planning	3.28	1.34	−.26	−1.09	.67	.74
5. I always want to know what the future has in store for me	3.30	1.39	−.27	−1.19	.71	.76
6. I can't stand being taken by surprise	3.20	1.40	−.21	−1.25	.74	.83
7. I should be able to organize everything in advance	3.15	1.47	−.11	−1.37	.66	.71
8. Uncertainty keeps me from living a full life	3.30	1.45	−.24	−1.30	.73	.79
9. When it's time to act, uncertainty paralyzes me	3.38	1.32	−.25	−1.14	.74	.82
10. When I am uncertain I can't function very well	3.41	1.36	−.29	−1.18	.78	.89
11. The smallest doubt can stop me from acting	3.15	1.42	−.13	−1.29	.68	.80
12. I must get away from all uncertain situations	3.28	1.35	−.20	−1.12	.62	.68
IUS-12 Total	39.06	12.43	−.20	−.77		
Prospective IU	22.55	7.58	−.18	−.79		
Inhibitory IU	16.52	5.79	−.21	−1.01		

Note. IUS-12 = Intolerance of Uncertainty Scale-12 item version; CITC = Corrected Item-Total Correlation.

Bentler, 1999), Bentler-Bonett Normed Fit Index (NFI; values should be > .90 and preferably > .95; Bentler & Bonett, 1980), and Standardized Root Mean Square Residual (SRMR; values should be < .08; Hu & Bentler, 1999).

Goodness of fit statistics are reported in Table 2 for both models. Based on each index, the two-factor solution provided a better fit to the data than the one factor solution; chi-square empirical test of the difference between the one and two factor models, $\chi^2(1) = 142.37$, $p < .0001$. This finding supports Carleton and colleagues' (2007) designation of the two factors as Prospective IU (Factor 1) and Inhibitory IU (Factor 2). According to most indices in the current study, the two factor solution provided a good fit to the data; the one exception was that the RMSEA indicated that the two-factor solution provided a poor fit. Since this statistic is more sensitive to sample size, however, it is thought that the other fit indices serve as more accurate measures of model fit in the current sample. Taken together, therefore, the two factor solution overall provided an adequate fit to the data. Factor loadings for the two factor solution are reported in Table 1. All items loaded highly on their respective factor, with squared multiple correlation coefficients ranging from .46–.79. As expected, the two factors were strongly correlated ($r = .78$).

3.3. Internal consistency

We conducted the remaining analyses using these same two-factor subscales and total score because the factor loadings confirmed the factor structure found in previous studies (Carleton et al., 2007, 2012; McEvoy & Mahoney, 2011). First, we calculated internal consistency of the total scale and subscales using Cronbach's coefficient alpha (Cronbach, 1951). Although Cronbach's alpha has limitations as an index of internal consistency (e.g., it is a function of the number of items in a scale; Cortina, 1993; Cronbach, 1951) it is widely used, and therefore can be compared across measures; also experts disagree over whether any other particular index is preferable (Brown, 2006). The internal consistency of the IUS-12 total score ($\alpha = .93$), Prospective IU subscale ($\alpha = .90$), and Inhibitory IU subscale ($\alpha = .90$) were excellent and well above the recommended minimum standard of .80 (Nunnally, 1978). IUS-12 inter-item correlations ranged from .21–.73 ($M = .53$), which is only slightly higher than the ideal range of .15–.50 (Briggs & Cheek, 1986). Corrected Item-Total Correlations (CITC) are presented in Table 1. As can be seen, all of the item-total correlations were between .62 (item 12) and .78 (item 10). Item-subscale correlations for the Prospective IU subscale ranged from .59 (item 2) to .78 (item 6). Item-subscale correlations for the Inhibitory IU subscale ranged from .64 (item 12) to .83 (item 10).

3.4. Demographic comparisons and associations

There were no sex differences on the Prospective IU, $t(202) = .21$, $p = .84$ (Cohen's $d = .03$), or Inhibitory IU subscales, $t(202) = .41$, $p = .69$ (Cohen's $d = .06$). In addition, neither subscale was significantly associated with age: Prospective IU, $r(205) = -.03$, $p = .65$; Inhibitory IU, $r(205) = -.01$, $p = .56$). Moreover, patients with comorbid conditions did not have more severe scores on the Prospective IU, $t(203) = -.06$, $p = .96$ (Cohen's $d = -.01$), or the Inhibitory IU subscales, $t(203) = -.22$, $p = .83$ (Cohen's $d = -.03$), relative to patients without comorbid conditions.

3.5. Correlations with other study measures

The remaining analyses were conducted using a subset of the participants ($n = 97$) who completed the DOCS, OBQ-44, and BDI-II. Descriptive statistics for these study measures appear in Table 3. The sample's mean Y-BOCS-SR score ($M = 27.44$, $SD = 5.58$) indicated a severe degree of OCD symptoms. The total DOCS score ($M = 32.20$, $SD = 15.66$) was well above the empirically derived clinical cutoff of 21 (Abramowitz et al., 2010), and the mean DOCS and OBQ-44 subscale scores were comparable to similar samples of treatment-seeking patients with OCD (Abramowitz et al., 2010; Wheaton et al., 2010). Finally, the group's mean BDI-II score was indicative of clinically significant depressive symptoms.

The results of our correlational analyses appear in Table 4. A Bonferroni corrected alpha of .003 was used to correct for multiple tests (.05/16). As can be seen, both subscales were significantly

Table 2
IUS-12 confirmatory factor analyses fit indices.

	χ^2	df	RMSEA	RMSEA CI	SRMR	CFI	TLI	NFI	ECVI	ECVI CI
1-Factor	307.31	54	.18	.16; .20	.08	.93	.92	.92	1.57	1.34; 1.82
2-Factor	164.94	53	.11	.09; .13	.06	.97	.96	.96	1.15	.97; 1.37

Note. IUS-12 = Intolerance of Uncertainty Scale-12 item version; RMSEA = Root Mean Square Error of Approximation; RMSEA CI = 90% Confidence Interval for RMSEA; SRMR = Standardized Root Mean Square Residual; CFI = Comparative Fit Index; TLI = Tucker-Lewis index; NFI = Normed fit index; ECVI = Expected Cross-Validation Index; ECVI CI = 90% Confidence Interval for ECVI.

Table 3
Means and standard deviations on other study measures ($n = 97$).

Measure	*M* (*SD*)
DOCS	
Contamination	7.81 (6.97)
Responsibility for harm	7.06 (6.08)
Unacceptable thoughts	11.12 (6.32)
Symmetry	6.20 (5.70)
OBQ-44	
Responsibility/threat	62.64 (25.45)
Importance/control of thoughts	69.95 (25.35)
Perfectionism/certainty	41.40 (19.64)
BDI-II	27.72 (13.19)

Note. DOCS = Dimensional Obsessive, Compulsive Scale; OBQ-44 = Obsessive Beliefs Questionnaire-44; BDI-II = Beck Depression Inventory-II.

Table 4
Correlations between the IUS-12 subscales and other study measures ($n = 97$).

	Prospective IU	Inhibitory IU
DOCS		
Contamination	.14	.09
Responsibility for harm	.37[a]	.35[a]
Unacceptable thoughts	.26	.39[a]
Symmetry	.41[a]	.26
OBQ-44		
Responsibility/threat	.44[a]	.41[a]
Importance/control of thoughts	.23	.27
Perfectionism/certainty	.47[a]	.48[a]
BDI-II	.23	.36[a]

Note. IUS-12 = Intolerance of Uncertainty Scale-12 item version; DOCS = Dimensional Obsessive, Compulsive Scale; OBQ-44 = Obsessive Beliefs Questionnaire-44; BDI-II = Beck Depression Inventory-II.
[a] $p < .003$.

and moderately positively correlated with the DOCS Responsibility for Harm, OBQ-RT, and OBQ-PC. In addition, the Prospective IU subscale was moderately associated with DOCS Symmetry, and the Inhibitory IU subscale was moderately associated with both the DOCS-Unacceptable Thoughts and the BDI-II.

3.6. Multivariate regression analyses

To examine the IUS factors as predictors of the various OCD symptom dimensions, we conducted a series of four hierarchical multiple regression analyses with each of the DOCS subscales as the dependent variables. In each model, the BDI-II was entered in Step 1 and the two IUS-12 subscales were entered simultaneously in Step 2. Regression diagnostics identified no violations of normality or homoscedasticity, and no outliers were identified as problematic (i.e., standardized residual ≥3 SDs above the mean). Analyses revealed that the tolerance statistics (≥.43) and variation inflation factors (VIF; ≤2.32) were adequate to satisfy the condition of independent predictors (Tabachnick & Fidell, 2013), indicating that multicollinearity was within acceptable ranges. Thus, the assumptions for our regression analyses were met. A Bonferroni corrected alpha of .01 was used to correct for multiple tests (.05/4). Summary statistics for these regression analyses are presented in Table 5.

3.6.1. Predicting DOCS contamination

The BDI-II (Step 1) accounted for 3% of the variance in DOCS Contamination scores, which was not significant ($p = .11$). When the IUS-12 subscales were added in Step 2, the amount of variance did not increase significantly, $\Delta R^2 = .02$, $p = .48$. The final model accounted for only 4% of the variance, $F(3, 93) = 1.34$, $p = .27$.

3.6.2. Predicting DOCS responsibility for harm

The BDI-II (Step 1) accounted for 2% of the variance in DOCS Responsibility for Harm scores, which was not significant ($p = .15$). When the IUS-12 subscales were added in Step 2, the amount of variance accounted for increased significantly, $\Delta R^2 = .13$, $p = .001$. As can be seen, however, neither the Prospective IU nor the Inhibitory IU subscales emerged as significant individual predictors; instead the subscales only accounted for significant unique variance as a group. The final model accounted for 13.2% of the variance, $F(3, 93) = 5.63$, $p = .001$.

3.6.3. Predicting DOCS unacceptable thoughts

The BDI-II (Step 1) accounted for 12.3% of the variance in DOCS Unacceptable Thoughts scores, which was significant ($p < .001$). When the IUS-12 subscales were added in Step 2, the amount of variance accounted for did not increase significantly, $\Delta R^2 = .08$, $p = .01$. The final model accounted for 20.2% of the variance, $F(3, 93) = 7.83$, $p < .001$.

3.6.4. Predicting DOCS symmetry

The BDI-II (Step 1) accounted for 1% of the variance in DOCS Symmetry scores, which was not significant ($p = .41$). When the IUS-12 subscales were added in Step 2, the amount of variance accounted for increased significantly, $\Delta R^2 = .17$, $p < .001$. As can be seen, only the Prospective IU subscale accounted for significant unique variance in DOCS Symmetry scores. The final model accounted for 17.5% of the variance, $F(3, 93) = 6.58$, $p < .001$.

Table 5
Regression analyses predicting the DOCS subscales.

Dependent variable	Predictors	ΔR^2	β	*t*	*sr*
DOCS Contamination	Step 1: BDI-II	.03	.16	1.59	.16
	Step 2: IUS-12 subscales	.02			
	Prospective IU		.18	1.18	.12
	Inhibitory IU		−.10	−0.64	−.07
DOCS Responsibility for Harm	Step 1: BDI-II	.02	.15	1.46	.15
	Step 2: IUS-12 subscales	.13[a]			
	Prospective IU		.25	1.77	.17
	Inhibitory IU		.16	1.11	.11
DOCS Unacceptable Thoughts	Step 1: BDI-II	.12[a]	.35	3.65[a]	.35
	Step 2: IUS-12 subscales	.08			
	Prospective IU		−.03	−0.21	−.02
	Inhibitory IU		.32	2.28	.21
DOCS Symmetry	Step 1: BDI-II	.01	.09	0.84	.09
	Step 2: IUS-12 subscales	.17[a]			
	Prospective IU		.48	3.52[a]	.33
	Inhibitory IU		−.10	−0.70	−.07

Note. DOCS = Dimensional Obsessive, Compulsive Scale; BDI-II = Beck Depression Inventory-II; IUS-12 = Intolerance of Uncertainty Scale-12 item version; *sr* = semi-partial correlation.
[a] $p < .01$.

4. Discussion

Carleton et al. (2007) empirically derived a 12-item version of the IUS to afford the efficient assessment of IU. Yet whereas IU is a conceptually important cognitive domain in OCD, the present study was the first to psychometrically evaluate the IUS-12 in a clinical sample of OCD patients. Consistent with Carleton et al. (2007, 2012) and McEvoy and Mahoney (2011), we confirmed a stable 2-factor solution for the IUS-12 indicating that the factor structure evidenced in previous work is also applicable to patients with OCD. In addition, we found strong evidence for internal consistency and preliminary support for convergent validity as the IUS-12 and its subscales were moderately strongly associated with another measure of certainty-related cognitions. Thus, the IUS-12 appears well suited as a brief, valid, and reliable measure of IU in people with OCD.

A second aim of this study was to examine associations between the IUS-12 subscales and OCD symptom dimensions. Indeed, as hypothesized, we found strong evidence that both IUS-12 subscales are associated with OCD symptoms involving obsessional doubts about being responsible for harm or mistakes and checking compulsions. This relationship, which remained even after accounting for depressive symptoms in our regression analyses, is consistent with clinical observations and previous findings (Abramowitz et al., 2007a,b; Calleo et al., 2010; Holaway et al., 2006; Overton & Menzies, 2002; Tolin et al., 2003). With regard to prospective IU, clinical observations indicate that individuals with concerns about responsibility for harm often worry about future uncertain events (e.g., car accidents, fires, burglaries), and actively check and seek reassurance that possible negative outcomes have not or will not transpire. With regard to inhibitory IU, the excessive checking and reassurance seeking can result in functional impairment; specifically individuals with this presentation of OCD tend to get "stuck" in the face of their uncertainty. For example, they may be late to appointments due to repeatedly checking that doors are locked and appliances are off.

Inhibitory IU, but not prospective IU, was associated with OCD symptoms involving unacceptable thoughts of sex, violence, and religion. Indeed, IU has been associated with obsessing and mental neutralizing in previous studies (Abramowitz & Deacon, 2006; Holaway et al., 2006; Tolin et al., 2008). In particular, inhibitory IU may be associated with this OCD symptom dimension due to the highly distracting nature of repugnant intrusive thoughts. Our regression analyses, however, suggest that this relationship is better accounted for by depressive symptoms, a finding that is consistent with previous research indicating that the tendency to misinterpret unacceptable intrusive thoughts as significant uniquely predicts symptoms of depression (Abramowitz, Storch, Keeley, & Cordell, 2007b).

Prospective IU was associated with OCD symptoms involving symmetry, ordering, and not-just-right experiences even after accounting for depressive symptoms, which is also consistent with previous findings (Abramowitz & Deacon, 2006; Calleo et al., 2010; Holaway et al., 2006; Tolin et al., 2008; Wheaton et al., 2010). One explanation for this is that many OCD patients fear that the feelings of incompleteness that accompany this OCD dimension will persist indefinitely into the future (e.g., Abramowitz, 2006). In addition, a subset of patients with this symptom dimension evidence magical thinking and uncertainty about future-oriented disasters that might occur if order and symmetry are not attained (e.g., my mother will die if the books are not arranged alphabetically).

Finally, the IUS-12 subscales were unrelated to the contamination OCD symptom dimension. This is consistent with most previous studies finding that contamination-related OCD symptoms are not strongly associated with the need for certainty, but rather with other domains of cognition such as overestimation of threat and disgust (e.g., Jones & Menzies, 1998; McKay & Moretz, 2009; Tolin et al., 2008; Wheaton et al., 2010; but see Abramowitz & Deacon, 2006 and Calleo et al., 2010 for exceptions) that often emerge as unique predictors of contamination above and beyond other cognitive constructs, like IU.

Taken together, the findings from this present study have implications for the assessment and treatment of OCD. Given the patterns of relationships between the IUS-12 subscales and OCD symptom dimensions, administration of the two IUS-12 subscales might help identify and predict subtleties in how an OCD patient manages IU. For example, greater endorsement of items on the Prospective IU subscale might indicate the use of active strategies for trying to manage IU, such as excessive checking and reassurance-seeking. For individuals with high scores on this subscale, it would be important to assess the extent to which family members might be involved in compulsive rituals (e.g., providing reassurance). Accordingly, higher scores on this subscale might also predict the need to involve significant others in treatment, particularly with response prevention procedures. On the other hand, greater endorsement of inhibitory IU might be predictive of the tendency to deal with uncertainty more subtly and passively, perhaps with mental rituals and avoidance. These strategies might result in functional impairment as a result of distraction (from mental compulsions), difficulty making decisions, and avoidance of activities that may trigger uncertainty.

Undoubtedly future research is needed to examine these clinical predictions, especially since the relationships between the IUS-12 subscales and OCD symptom dimensions have not been previously studied, and thus we had no a priori hypotheses for these relationships. Future research will also be required in order to learn whether incorporating individualized information about IU dimensional vulnerabilities into IU-specific treatments such as in vivo exposure to IU (Grayson, 2010) or cognitive restructuring about the need to be certain (Wilhelm & Steketee, 2006) will be beneficial. Nevertheless, when the potential clinical implications are considered along with the fact that the IUS-12 is a brief measure that is easy to score and psychometrically strong, it is easy to consider the measure as ideal for use as a clinical and research tool.

The present study has a number of limitations that should be considered. First, because we studied a sample of OCD patients pursuing intensive outpatient or residential treatment, our findings may not apply to routine clinical settings, or to non-treatment seeking individuals with OCD. Second, although a structured diagnostic interview was not a routine part of the admissions process, it can be assumed for the following reasons that our sample did in fact meet criteria for OCD: (a) all participants were evaluated and admitted for treatment at an OCD specialty clinic by two experienced clinicians, (b) patients were only included in the study if the two assessors agreed on the diagnosis and their Y-BOCS-SR score was above the clinical cutoff of 16, (c) mean scores on OCD symptom measures were well within the clinical ranges, and (d) mean scores on the IUS-12 scores were higher than studies with undergraduates (e.g., $M = 25.85$; Carleton et al., 2007) and community samples (e.g., $M = 29.53$; Carleton et al., 2012).

Third, the cross-sectional design of this study does not allow for causal inferences regarding the relationship between IU and OCD symptoms. While it seems intuitive that IU leads to checking behavior for example, there is also research suggesting that checking leads to reduced memory confidence (e.g., Rachman, 2002; Radomsky et al., 2006). Fourth, the sample was primarily Caucasian, which may limit the generalizability of the results to other racial/ethnic groups. The literature to date suggests that there are not differences in IU based on race and ethnicity (Norton, 2005), although more research in this area is certainly needed. Finally, the current study relied solely on self-report measures, which can artificially inflate relationships among variables. We are currently

conducting laboratory studies using experimental designs in which uncertainty is manipulated that will hopefully help address this limitation.

In summary, despite these limitations, the current study confirmed the two-factor structure of the revised Intolerance of Uncertainty Scale (IUS-12) in a clinical sample of treatment-seeking OCD patients. We also found specific associations between the IUS-12 subscales and the most up to date empirically derived OCD symptom dimensions. The pattern of relationships between these constructs indicates that administration of the IUS-12 subscales may be used to help predict how an individual with OCD experiences and manages IU. Based on the current findings, therefore, the IUS-12 appears to be a brief, simple, and psychometrically strong measure, with opportunities for clinically utility in both treatment and research settings.

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