This is the author's version published as:

A Comparison of the 27-item and 12-item Intolerance of Uncertainty Scales

Nigar G. Khawaja & Lai Ngo Heidi Yu

School of Psychology & Counselling

QUT.

Running Head: IUS

Words: 5561

Correspondence concerning this article should be addressed to Dr. Nigar G. Khawaja, Senior Lecturer, School of Psychology & Counselling, Queensland University of Technology, Victoria Park Rd., Kelvin Grove, p/c 4059, Australia. Fax: 61 7 3138 0486, Email: n.khawaja@qut.edu.au

Abstract

 The 27-item Intolerance of Uncertainty Scale (IUS: Freeston et al., 1994) has become one of the most frequently used measure of Intolerance of Uncertainty. More recently, an abridged, 12-item version of the IUS has been developed (Carleton, Norton, & Asmundson, 2007). The current research used clinical (n=50) and non-clinical (n=56) samples to examine and compare the psychometric properties of both versions of the IUS. The two scales showed good internal consistency at both the total and subscale level and had satisfactory test-retest reliability. Both versions were correlated with worry and trait anxiety and had satisfactory concurrent validity. Significant differences between the scores of the clinical and non-clinical sample supported discriminant validity. Predictive validity was also supported for the two scales. Total scores, in the case of the clinical sample, and a subscale, in the case of the non-clinical sample, significantly predicted pathological worry and trait anxiety. Overall, the clinicians and researchers can use either version of the IUS with confidence, due to their sound psychometric properties.

Word count: 166

Key words: Intolerance of uncertainty, anxiety and worry.

A Comparison of the 27-item and 12-item Intolerance of Uncertainty Scales.

Intolerance of uncertainty was first described by Freeston, Rhéaume, Letarte, Dugas, and Ladouceur (1994) as being a key construct related to worry. It refers to a set of cognitive, emotional, and behavioural processes, which are involved in excessive, uncontrollable worry about future events. Intolerance of uncertainty has been one of the commonly used constructs in research into mood and anxiety disorders (Buhr & Dugas, 2006). The 27-item Intolerance of Uncertainty Scale (IUS) has been investigated and validated with various populations and has become one of the most used measures of intolerance of uncertainty (Buhr & Dugas, 2002; Freeston et al., 1994, Norton, 2005; Sexton & Dugas, 2009). More recently, an abridged, 12 item version of the IUS has been developed (Carleton, Norton, & Asmundson, 2007). The purpose of the current research is to compare the psychometric properties and clinical utility of the 27 and 12 item versions of the IUS.

Development of the IUS

In order to measure the construct of the intolerance of uncertainty (IU), Freeston et al. (1994) initially developed the Intolerance of Uncertainty scale (IUS) in the French language. This self-report scale consisted of 27 items, which supported a five factor structure. The items measured individuals' emotional, cognitive and behavioural reactions to ambiguous and uncertain situations, such as stress and frustrations, as well as their attempts to control the future and their inability to act. Buhr and Dugas (2002) translated and back-translated the original IUS into English and evaluated the psychometric properties using statistical procedures similar to the French version. Results on this English version of the scale suggested a four-factor structure as the best representation of the construct. Both the French and the English versions of the IUS demonstrated excellent internal consistency ($\alpha = .94$ and $\alpha = .91$,

respectively) and good 5-week test-retest reliability ($r = .78$ and $r = .74$, respectively). Convergent and divergent validity were also evident. The French version (Freeston et al.,1994) differentiated Generalised Anxiety Disorder patients from those with other anxiety disorders and had a stronger association with the symptoms of worry than anxiety and depression. The English version (Buhr & Dugas, 2002) was associated with worry after taking into account anxiety and depression. Overall, their studies suggested that the 27-item IUS had good psychometric qualities for measuring intolerance of uncertainty. However, elevated correlations among the factors as well as the items suggested overlap at both factor and item level. Buhr and Dugas (2002) concluded that the concept of intolerance of uncertainty was captured better by the overall scale. Therefore, they recommended using the total scale score, instead of the subscales score as an index of intolerance of uncertainty.

Irrespective of the satisfactory psychometric properties of the scale, Norton (2005) argued that previous studies (Buhr and Dugas, 2002; Freeston et al, 1994) mainly examined the scale on Caucasian samples. Therefore, Norton conducted a psychometric analysis on 450 university students from four different cultural groups in the US (African American, Caucasian, Hispanic/Latino, and Southeast Asian). Statistical procedures used were in line with Buhr and Dugas (2002) study. Internal consistency was excellent with alpha coefficients over .93 within each racial group. All groups consistently demonstrated associations between IUS and worry. The results evidenced a strong cross-cultural consistency for the IUS; however, the factor structures differed across groups. Further, consistent with the overlap reported by Buhr and Dugas (2002), Norton found extensive cross-loading of items on multiple factors, thus making the interpretation of factors difficult. Norton recommended using the total IUS score as a best representation of the intolerance of uncertainty construct,

and suggested the possibility of item modification or reduction to improve the factor structure interpretability without a dramatic impact on the scale reliability.

In line with Norton's (2005) suggestions, Carleton et al. (2007) performed psychometric analyses on the English IUS to evaluate the possibility of a shorter version. Confirmatory factor analysis, using two undergraduate samples, identified a stable 12-item two factor structure (IUS-12) as the best representation of the IUS. The two factors were free from overlapping items. The first factor *Inhibitory Anxiety* consisted of five items and reflected beliefs about the negative nature of uncertainty and the manner in which it impairs a person's functioning. The second factor *Prospective Anxiety* comprised seven items reflecting beliefs about the negative impact of uncertainty related to future events. Consistent with previous findings (Buhr & Dugas, 2002; Freeston et al., 1994; Norton, 2005), the total score of IUS-12 maintained excellent internal consistency ($\alpha = .91$). The alpha coefficients for both factors were .85. The correlation between the total score of the 12-item scale and the total score of 27-item scale was very high ($r = .96$). The correlation between the two factors was also high ($r = .72$). Despite fewer items, convergent validity was not substantially different from the previous studies and construct validity showed little or no change. No gender specific changes were identified and IU emerged as a construct which affected men and women alike. The IUS-12 correlated with depression, anxiety and worry measures and predicted GAD and pathological worry.

In spite of the IUS-12's promising qualities, Sexton and Dugas (2009) argued that although the two factors did not overlap, they did not reflect the underlying theory and the content of intolerance of uncertainty adequately. Subsequent exploratory factor analyses with over two thousand students and some community members as participants suggested a two-factor model based on the original 27-item

IUS as the best representation of the construct (Sexton & Dugas, 2009). These two factors were further upheld by confirmatory factor analysis. Factor one consisted of 15 items. It was described as *Uncertainty has Negative Behavioural and Self-referent Implications*. It reflected beliefs that uncertainty impairs ones behaviour and capacity. Factor two consisted of 12 items and was described as *Uncertainty is Unfair and Spoils Everything*. It reflected beliefs about the distressing nature of uncertainty related to future events. The IUS overall scale and the two subscales showed excellent internal consistency with alphas over .90. These factors were correlated significantly with worry. Additionally, these factors also demonstrated distinct patterns of association with trait anxiety, depression, analogue GAD and somatic anxiety. The findings supported construct and divergent validity. Further investigations using the 2-factor structure have revealed that the IUS has similar psychometric properties across gender and across the four ethnic groups compared (Sexton & Dugas, 2009).

The Current Research

There is substantial evidence that IU is related with worry and anxiety (Sexton & Dugas, 2009). Even though it was initially considered a vulnerability factor for GAD patients, its involvement has been extended to other anxiety disorders Dugas, Marchand, & Ladouceur, 2005). It is therefore important to continue the investigation of the IU scales. While previous research has examined both versions of the IUS separately using both non-clinical and clinical populations, investigations have yet to explore the use of the two versions simultaneously using clinical and non-clinical samples. Therefore, the aim of the current research was to empirically compare for the first time the two recent versions of the IUS (Carleton et al, 2007; Sexton & Dugas, 2009), in order to identify the version with superior psychometric properties and better clinical utility. This research was exploratory in nature, with a focus on internal

consistency, test-retest, concurrent validity, discriminant validity and predictive validity in regards to worry and anxiety.

Method

Participants

The sample comprised of both clinical and non-clinical individuals. The clinical group consisted of 50 participants including 20 males and 30 females aged between 20 and 65 years (M = 42.62, SD = 11.89). Twenty-six percent of the participants were diagnosed with GAD only and the remaining had the principle diagnoses of GAD with one or more than one co-morbid diagnoses including Panic Disorder, Post Traumatic Stress Disorder, Social Phobia, and Obsessive Compulsive Disorder. The educational level of this group consisted of participants with a University Degree (46%), TAFE (22%), High School (18%), or Other (12%). Two percent did not report their educational level. In terms of relationship status, 48% of participants were married, 28% were single, 2% were divorced, 16% were widowed, 2% were co-habiting, and 2% did not report their relationship status. Most participants came from an English speaking background (92%), 6% spoke another language at home and 2% did not specify.

The non-clinical individuals were 56 university students undertaking a psychology degree, some of whom received course credit for their participation. Participants included 12 males and 44 females aged between 17 and 52 years (M = 27.02, SD = 11.26). Most (97%) of these participants were enrolled in a Bachelor degree and 7 % had were enrolled in Postgraduate education. In terms of marital status, 21.2 % of the participants were married, 55.4% were single, 5.4% were divorced, 5.4% were co-habiting and 12.5% reported other arrangements. The

majority of participants came from an English speaking background (76.8 %) and 23.2% spoke another language at home.

Measures

The following measures were included in the battery to allow a comparison of the 2-factor IUS-27 and IUS-12 as well as to examine the associations of these two scales with other frequently used measures of worry and anxiety.

Intolerance of Uncertainty Scale – 27-item (IUS-27). The revised IUS-27 with two factors was used (Sexton & Dugas, 2009). Items were scored on a 5-point Likert scale ranging from 1 (*not at all characteristic of me*) to 5 (*entirely characteristic of me*). The total scale has demonstrated excellent internal consistency with alpha coefficients of .95 (Sexton & Dugas, 2009) and good test-retest reliability of .74 over a five-week period (Dugas, Freeston & Ladouceur, 1997). It has also demonstrated satisfactory convergent and divergent validity (Buhr & Dugas, 2002; Freeston et al., 1994; Sexton & Dugas, 2009).

Intolerance of Uncertainty Scale – 12-item (IUS-12). The IUS-12 with two factors was used (Carleton et al., 2007). Items were scored on a five point scale ranging from 1 (Not at all characteristic of me) to 5 (Entirely characteristic of me). Carleton et al. found excellent internal consistency for this scale ($\alpha = .91$), and a strong correlation between the 12-item IUS and the original 27-item IUS ($r = .96$).

Anxious Thoughts Inventory (AnTI). This 22-item self-report measures three types of worries: social, health and meta-worry (Wells, 1994). Two of the types are content-related worry: worry about social affairs, and worry about physical health. The other worry type measured is process worry: meta-worry, or the negative appraisal of worry itself. Items are rated on a 4-point Likert scale ranging from 1 (*almost never*) to 4 (*almost always*). Wells found high internal consistency for each of

the subscales (α = .84 for social worry, α = .81 for health worry and α = .75 for meta-worry). The test-retest reliabilities over a 6-week period for total score, social worry, health worry and meta-worry were .80, .76, .84 and .77, respectively.

Meta-Cognitions Questionnaire – Short form (MCQ-30). The MCQ-30 (Wells & Cartwright-Hatton, 2004) is a multidimensional 30-item measure of meta-cognitions. Items are rated on a 4-point Likert scale ranging from 1 (*do not agree*) to 4 (*agree very much*) and tap the factors *Cognitive Confidence*, *Positive Beliefs*, *Cognitive Self-consciousness*, *Uncontrollability and Danger*, and *Need to Control Thoughts*. Wells and Cartwright-Haddon found good internal consistency (α = .93), and test-retest reliability (r = .75) for the questionnaire.

Penn State Worry Questionnaire (PSWQ). The PSWQ (Meyer, Miller, Metzger, & Borkovec, 1990) was designed to provide a trait assessment of pathological worry. Sixteen self-report items are rated on a 5-point Likert scale ranging from 1 (*not at all typical of me*) to 5 (*very typical of me*). The PSWQ taps a single factor with high internal consistency (α = .86 to .94) and good test-retest reliability over 8-10 weeks, *r* = .92.

State Trait Anxiety Inventory Form Y-2 (STAI-T). The STAI-T (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is the trait version of the State Trait Anxiety Inventory. The STAI-T is a widely used instrument consisting of 20 self-report items reflecting dimensions of excessive worry, tension low self-esteem and demoralisation. Items are scored on a 4-point Likert scale ranging from 1 (*almost never*) to 4 (*almost always*). The STAI-T has good internal consistency with an alpha coefficient of .90, and test-retest reliability ranging from *r* = .73 to .86.

Procedure

Participants in the clinical group were recruited as part of a larger study that compared the effectiveness of therapies with GAD and other anxiety disorders (Strodl, Schweitzer, Khawaja, & Young, 2009). The clinical sample was recruited via media releases including radio broadcasts and newspaper advertisements. Those who responded to the advertisements were informed about the purpose of the study. Individuals who volunteered to participate were screened through a telephone interview and scheduled for a face-to-face interview. Participants were required to meet the DSM-IV-TR criteria for Generalised Anxiety Disorders (GAD). A ninety minute structured interview, consisting of Mini-International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998) as well as the section on GAD from the Anxiety Disorder Interview for DSM-IV's (ADIS) (Margraf, Schneider, Ehlers, DiNardo, & Barlow, 1991), was conducted by trainee psychologists enrolled in Masters or Doctoral programs in clinical psychology. Participants between the age of 18 to 65 years with the diagnosis of GAD only; or GAD co-morbid with other anxiety disorders were selected. Individuals with poor English language skills, poor memory, cognitive deficits, current substance dependence, or suffering from a psychotic illness were excluded.

Randomly ordered questionnaires were administered and participants were debriefed at the end of the session. All participants were offered treatment. A few participants, who did not meet the criteria for the study, were referred to the university clinic or other places in the city for counselling offered at nominal rates. One participant decided to withdraw from the study.

Non-clinical participants were recruited from the university. Consistent with the clinical group questionnaire administration was randomised, and participants were

debriefed at the end of the data collection session. These participants were also invited

to participate in the second session (assessing test-retest reliability) two weeks later.

Only the IUS-27 and IUS-12 scales were administered in the second session.

Design

The statistical analyses in this study focused on the reliability and validity of

the two versions. Bivariate correlations were used to assess the concurrent validity. To

examine the discriminant validity, t-tests were used to identify if there were gender

based differences. Similarly, clinical and non-clinical samples were compared on the

scales and the subscales. Standard multiple regressions were performed to evaluate

predictive validity. The responses on the two subscales of IUS-27 (*Uncertainty has*

Negative Implications and *Uncertainty is Unfair)* and IUS-12 (*Inhibitory Anxiety* and

Prospective Anxiety) served as the independent variables in the model, while

responses on the PSWQ, a frequently used measure of worry and STAI-T, a very

commonly used measure of anxiety, were the dependent variables.

Results

Preliminary Analyses.

All relevant statistical assumptions were met. In the clinical group, one

participant did not provide all the demographic details but completed all the

questionnaires; therefore, the questionnaire data for this case was retained. Similarly,

in the clinical group, a procedural error resulted in some participants omitting item 15

of the IUS-27. As a result, 30 missing data points were identified. Expectation

maximisation was performed (Tabachnick & Fidell, 2001) and cases with missing

data were replaced with the imputed values. Finally, 50 participants were retained in

the analyses. The Cronbach's alphas for the PSWQ, STAI-T, MCQ-30 and AnTI on

the basis of the two samples (non-clinical in parentheses) were .87 (.80), .85 (.94), .88

(.92) and .90 (.92) respectively, indicating that these measures had good internal

consistency.

Reliability

The internal consistency, for the total as well as the sub scales of the IUS-27

and IUS-12, was calculated using the clinical and the non-clinical samples. The

Cronbach's alpha coefficients for the two scales and their subscales are presented in

Table 1. Both versions of the IUS and their subscales demonstrated good internal

consistency on the basis of the two samples.

Please insert Table 1 here

Test-retest reliability was examined using the scores of the non-clinical sample

over a two week interval. For the IUS-27 test-retest reliability was $r = .83$ and for the

IUS-12 was $r = .77$, indicating satisfactory reliability.

Concurrent Validity

To evaluate the concurrent validity of the IUS-27, IUS-12 and their subscales,

Pearson correlations were performed among the IUS and other measures of worry and

anxiety using the clinical and the non-clinical samples. Table 2 presents the

correlations based on the clinical and the non-clinical samples.

Please insert Tables 2 here

As indicated by Table 2, in the clinical population the total scores for the IUS-

27, IUS-12 and their subscales were significantly correlated with the PSWQ, STAI-T,

MCQ-30 and AnTI. As seen by the table, the correlations ranged from low ($r = .27$ for

Uncertainty is Unfair and AnTI) to moderate ($r = .53$ for IUS-12 and MCQ-30). The

results indicate that two scales and their subscales were related with other scales

measuring anxiety and worry. The IUS-27 and IUS-12 and their subscales had

moderate to high correlations. As the items of the shorter version were drawn from

the original items, the total scores for the 27 and 12 items versions were correlated. The correlations between the two subscales in each version were moderate. Further, the *Uncertainty has Negative Implications* subscale of the IUS-27 and the *Inhibitory Anxiety* subscales of the IUS-12 were strongly associated and reflected a similar theme. Similarly the *Uncertainty is Unfair* subscale of the IUS-27 and the *Prospective Anxiety* subscale of the IUS-12 were strongly associated and reflected a similar theme. The PSWQ, STAI-T, MCQ-30 and AnTI were also significantly associated, except for the relationship between MCQ-30 and STAI-T, which was nominal. The modest relationships indicated that these study measures are distinct constructs but share some common features in measuring worry.

As shown in Table 2, the total scores for the IUS-27, IUS-12 and their subscales in the non-clinical population were significantly correlated with the PSWQ, STAI-T, MCQ-30 and AnTI. The correlations ranged from moderate ($r = .41$ for PSWQ and Prospective Anxiety) to high ($r = .73$ for Inhibitory Anxiety and MCQ-30). The two scales and their subscales were associated with other scales measuring anxiety and worry. The correlations between the two IUS scales and their subscales were high. The IUS-12 was highly correlated with the original version IUS-27. The correlations between the subscales of each version were also high. Further, the *Uncertainty has Negative Implications* subscale of the IUS-27 and the *Inhibitory Anxiety* subscales of the IUS-12 were strongly associated and indicated a similar theme, while the *Uncertainty is Unfair* subscale of the IUS-27 and the *Prospective Anxiety* subscale of the IUS-12 were strongly associated and revealed a similar theme. PSWQ, STAI-T, MCQ-30 and AnTi were also significantly associated. Overall, compared to the clinical sample, the correlations among the IUS-27, IUS-12, their

subscales and the anxiety and worry scales were generally higher for the non-clinical sample (Table 2).

Discriminant Validity

Independent sample t-tests were conducted to investigate the scales ability to discriminate between men and women and the clinical and non-clinical samples. In order to control for a family wise error rate a more stringent cut off value of $p = .01$ was used. Results indicated no significant differences as a result of the gender. Table 3 shows the means, standard deviations and the *t* values for the clinical and the non-clinical groups. The clinical and the non-clinical groups were compared on the two versions of the scales as well as their subscales. There was a significant difference for the total scores of IUS-27 and IUS-12. This indicates that the scales were overall able to discriminate between the samples. Analyses using the subscales revealed that the two groups significantly differed on the scores for the two factors of IUS-27: *Uncertainty has Negative Implication* and *Uncertainty is unfair.* In the case of the shorter version, the two grouped significantly differed on one of the factor, *Inhibitory anxiety* but not the other.

Please insert Table 3 here

Predictive Validity

Separate analyses were conducted on the clinical as well as the non-clinical samples. Age, which was not correlated with the other variables, was not controlled for in the regression analyses. The PSWQ and STAI-T were chosen to evaluate predictive validity as they are frequently used measures for excessive worry and anxiety commonly found in GAD patients. Table 4 present the results of the regression analyses.

Please insert Table 4 here

Predictive Validity Analyses with Clinical Sample. First, the role of IUS as a predictor of pathological worry (PSWQ) was examined. Two separate analyses were conducted to evaluate the role of the IUS-27 and IUS 12 in predicting pathological worry on the clinical sample. The results of the first analysis revealed that the linear combination of the subscales of IUS-27 accounted for a significant amount of variance of pathological worry, $R^2 = .15$, adjusted $R^2 = .12$, $F (2,47) = 4.20$, $p < .05$. Further examination of the beta weights on each subscale, (Table 4), indicated that neither of the subscales made a significant contribution to the prediction of pathological worry. The results of the second analysis showed that the linear combination of the subscales of IUS-12 significantly predicted pathological worry, $R^2 = .16$, adjusted $R^2 = .12$, $F (2,47) = 4.31$, $p < .05$; however, the beta weights suggest that neither of the subscales significantly predict pathological worry (Table 4). Overall, both the IUS-27 and IUS-12 yielded comparable outcomes and the overall models have similar effect in predicting pathological worry. However, individually, none of the subscales played a role in predicting pathological worry. All the subscales in both versions accounted for small unique variances from 1 to 7 percent, but the second subscales of both versions had slightly higher unique variances than the first subscales.

Second, the role of IUS as a predictor of trait anxiety (STAI-T) was examined. Two separate analyses were run to evaluate the role of the IUS-27 and IUS-12 in predicting trait anxiety on the clinical sample. The results of the first analysis revealed that the linear combination of the subscales of IUS-27 accounted for a significant amount of variance of trait anxiety, $R^2 = .16$, adjusted $R^2 = .13$, $F (2,47) = 4.55$, $p < .05$. However, further examination of the beta weights on each subscale, presented in Table 4, found that none of the subscales significantly predicted trait anxiety. The

results of the second analysis showed that the linear combination of the two subscales of IUS-12 predicted trait anxiety significantly, $R^2 = .15$, adjusted $R^2 = .11$, $F(2,47) = 4.06$, $p < .05$. Again, the beta weights indicated that none of the subscales significantly predicted trait anxiety (Table 4). Overall, both the IUS-27 and IUS-12 yielded comparable outcomes and the overall models had similar effect in predicting trait anxiety. However, neither subscale in either version played a role in predicting the trait anxiety. All the subscales in both versions accounted for small unique variances from 2 to 5 percent, but the second subscales of both versions had slightly higher unique variances than the first subscales.

Predictive Validity Analyses with Non-Clinical Sample. First, the role of IUS as a predictor of worry (PSWQ) was examined. Two separate analyses were conducted to evaluate the role of the IUS27 and IUS-12 in predicting worry on the non-clinical sample. The results of the first analysis revealed that the linear combination of the two subscales of IUS-27 accounted for a significant amount of variance of pathological worry, $R^2 = .47$, adjusted $R^2 = .45$, $F(2,53) = 23.91$, $p < .001$. Further examination of the beta weights on each subscale presented in Table 4 indicated that the *Uncertainty has Negative Implications* subscale significantly predicted worry. The results of the second analysis showed that the linear combination of the two subscales of IUS-12 significantly predicted pathological worry, $R^2 = .47$, adjusted $R^2 = .45$, $F(2, 53) = 23.08$, $p < .001$. The *Inhibitory Anxiety* subscale significantly predicted worry (Table 4). Overall, only one of the subscales in both the IUS-27 and IUS-12 played a role in predicting worry; however, both versions yielded comparable outcomes and the overall models have similar effect in predicting worry. The *Uncertainty has Negative Implications* subscale of IUS-27 accounted for 20% unique variance and the *Inhibitory Anxiety subscale* of IUS-12 accounted for

29% unique variance, whereas the *Uncertainty is Unfair* subscale of IUS-27 accounted for 2% unique variance and the *Prospective Anxiety* subscale of IUS-12 accounted 4% unique variance.

Second, the role of IUS in the prediction of trait anxiety (STAI-T) was investigated. Two separate analyses were run to evaluate the role of the IUS-27 and IUs-12 in predicting trait anxiety on the non-clinical sample. The results of the first analysis revealed that the linear combination of the two subscales of IUS-27 accounted for significant amount of variance of trait anxiety, $R^2 = .46$, adjusted $R^2 = .44$, $F(2,53) = 22.82$, $p < .01$. Further examination of the beta weights on each subscale showed that, in the case of the longer scale, the *Uncertainty has Negative Implications* subscale significantly predicted trait anxiety (Table 4). The results of the second analysis showed that the linear combination of the two subscales of IUS-12 significantly predicted trait anxiety, $R^2 = .55$, adjusted $R^2 = .53$, $F(2, 53) = 32.30$, $p < .001$. The beta weights presented in Table 4 indicated that the *Inhibitory Anxiety* subscale of this shorter version was the stronger predictor. Overall, only one of the subscales in both the IUS-27 and IUS-12 contributed to the trait anxiety, therefore both versions yielded comparable outcomes and the overall models had similar effect in predicting trait anxiety. The *Uncertainty has Negative Implications* subscale of IUS-27 accounted for 14% unique variance and the *Inhibitory Anxiety subscale* of IUS-12 accounted for 32% unique variance, whereas the *Uncertainty is Unfair* subscale of IUS-27 accounted for 0% unique variance and the *Prospective Anxiety* subscale of IUS-12 accounted 3% unique variance.

Discussion

The primary goal of this study was to compare the two different versions of the IUS (the IUS-27 and IUS-12) in order to identify the version with superior psychometric properties based on clinical and non-clinical samples.

Internal Consistency

The results indicated that the IUS-27 had a higher internal consistency than the IUS-12. However, the difference was very small. Subscales for both versions displayed good internal consistency, except for the *Inhibitory Anxiety* subscales of the IUS-12, which reported lower alpha coefficient than the similar subscale, *Uncertainty has Negative Implications,* in the IUS-27. It is important to note that the *Uncertainty has Negative Implications* subscale consists of 15 items whereas the *Inhibitory Anxiety* subscale has only 5 items derived from the longer subscale. It seems that scales and subscales with a larger number of items demonstrated higher internal consistency (Nunnally & Bernstein, 1994). In general, both the IUS-27 and IUS-12 emerged as internally consistent and these findings concur with previous research on both the IUS-27 (e.g. Buhr & Dugas 2002; Freeston et al., 1994; Norton, 2005; Sexton & Dugas, 2009) and the IUS-12 (Carleton et al., 2007).

Test-retest Reliability

Test-retest was conducted on the non-clinical sample only and results indicated that both the IUS-27 and IUS-12 are stable over time. These test-retest reliability results are consistent with Dugas et al. (1997) and Freeston et al.'s (1994) findings. Overall, the current results suggest that the IUS-27 has slightly higher test-retest reliability. Nevertheless, both versions were adequately stable and reliable overtime.

Concurrent Validity

The IUS-27 and IUS-12 were compared with other anxiety and worry scales. Both versions were moderately correlated with the other scales and showed similar concurrent validity. A moderate level of correlation suggests that the IUS scales represent a unique construct that shares some aspects with other measures of anxiety and worry. Further, the subscales of the IUS-27 were moderately correlated with those measuring similar themes in the IUS-12. The correlations between the subscales in each measurement were moderate to high, indicating a large amount of covariance, consistent with previous research (Carleton et al., 2007; Sexton & Dugas, 2007, 2009).

Discriminant Validity

Consistent with the previous studies (Carleton et al., 2007, IU impacted men and women in a similar manner. However, the clinical sample scored higher than the non-clinical sample. The total scores of the scales differentiated the two groups. Similarly, the clinical sample scored significantly higher than the non-clinical participants on the two subscales of the longer version as well as the *Inhibitory Anxiety* subscale of the shorter version. The mean scores of the two groups did not differ for the subscale *Prospective Anxiety*, which takes into account the anxiety and uncertainty related to future events. It is possible that this dimension impacts individuals, with and without clinical anxiety and pathological worries, in a similar manner. It is important to note that the discriminant validity of the ISU-12 was not assessed by the authors (Carleton et al., 2007), therefore more investigation is warranted.

Predictive Validity

Both the IUS-27 and the IUS-12 were associated with various aspects of anxiety and worry as measured by PSWQ and STAI-T. Overall, both scales showed

similar relationships and were equally good at predicting worry and anxiety. The results were consistent with previous research using the original IUS with clinical and non-clinical samples (Dugas et al., 2005). Similarly, the findings were consistent with recent investigations using shortened versions of IUS with university student and community samples (Sexton & Dugas, 2009).

However, when examining the predictive validity of the subscales, different patterns of predictors emerged for the clinical and the non-clinical samples. In the clinical sample, none of the subscales in either of the two versions emerged as a stronger predictor of pathological worry or trait anxiety. The findings indicated that in the case of individuals experiencing anxiety disorders, beliefs of uncertainty related to their own self as well as future were equally associated with their worry and trait anxiety. In addition, due to the large amount of shared variance between the subscales it is recommended that when using the IUS with clinical population, the total score is more likely to provide an appropriate measure. This is consistent with the suggestions of Buhr and Dugas (2002) and Norton (2005).

On the other hand, analyses conducted on the non-clinical sample indicated that only one of the subscales on IUS-27 (*Uncertainty has Negative Implications*) and IUS-12 (*Inhibitory anxiety*) measuring a similar theme was significantly associated with worry and trait anxiety. The results indicated that in the case of individuals who were not experiencing anxiety disorders, only beliefs of uncertainty related to their functioning were associated with worry and trait anxiety. It seemed that the non-clinical sample, compared to the clinical sample, was less bothered by uncertainty about the future and its distressing nature. However, until more research is conducted the separate use of subscales should be treated cautiously with the non-clinical population.

A close examination of the regression coefficients revealed that in the case of non-clinical sample the IU scales explained nearly half of the variance for the pathological worry and trait anxiety. However, a different picture appeared for the clinical sample. IU explained a small amount of the variance. It is possible that other factors, along with IU, explain the clinical conditions of anxiety and worry.

Limitations and Future Directions

Although this research is the first to investigate both versions of the IUS simultaneously in clinical and non-clinical samples, it is not without limitations. The non-clinical sample was not assessed to rule out any the presence of any anxiety disorder. Future studies are recommended to use a diagnostic interview to exclude those with psychopathology. The information about the test-retest of the scales is only available for the non-clinical population. Therefore, there is a need to evaluate the stability of these scales by using a clinical sample. The samples were small and the inter-rater reliability data were not available regarding the diagnoses for the clinical sample. Even though the clinical sample included met the diagnostic criteria for GAD, the participants were self referred and recruited from the community. Therefore, their motivation and expectations may have impacted on the results. Further, participants recruited from clinical settings could have more severe symptomology. As such, the findings from the current research may not be fully generalisable to clinical populations. Future studies could consider focusing on participants from clinical settings, and separating individuals with GAD from those with co-morbid mood and anxiety disorders. Further, keeping in view the previously noted inconsistencies in factor structure among different cultural groups (Norton, 2005), more research on factor structure, using large and diverse populations would be beneficial. The discriminant validity requires further investigation. The relative importance of the

subscales as predictors could also be examined using larger samples. Further evaluation of the role of these predictors in the aetiology and maintenance of worry and anxiety may allow clinicians to develop more effective treatment programs for those experiencing conditions.

Conclusion

This research aimed to investigate the psychometric properties of two versions of the IUS in clinical and non-clinical populations. The results indicate that both the IUS-27 and IUS-12 are statistically sound and have satisfactory psychometric properties. While the IUS-27 has slightly better reliability, the IUS-12 is a more economical instrument to use. The shorter instrument may be particularly beneficial when participants or patients are required to complete a battery of questionnaires. Both versions of the IUS are equally effective in the measurement of Intolerance of Uncertainty. Given the similar properties of the IUS-27 and the IUS-12, clinicians and researchers may choose either version without any serious limitations.

References

Buhr, K., & Dugas, M. J. (2002). The intolerance of uncertainty scale: Psychometric

properties of the English version. *Behaviour Research and Therapy, 40*, 931-

945.

Buhr, K., & Dugas, M. J. (2006). Investigating the construct validity of intolerance of

uncertainty and its unique relationship with worry. *Journal of Anxiety*

Disorders, 20, 222–236.

Carleton, R. N., Norton, P. J., & Asmundson, G. J. G. (2007). Fearing the unknown:

A short version of the Intolerance of Uncertainty Scale. *Journal of Anxiety*

Disorders, 21, 105-117.

Dugas, M. J., Freeston, M. H., & Ladouceur, R. (1997). Intolerance of uncertainty and

problem orientation in worry. *Cognitive Therapy and Research, 21*, 593-606.

Dugas, M. J., Marchand, A., & Ladouceur, R. (2005). Further validation of a

cognitive-behavioral model of generalized anxiety disorder: Diagnostic and

symptom specificity. *Journal of Anxiety Disorders, 19*, 329-343.

Freeston, M. H., Rhéaume, J., Letarte, H., Dugas, M. J., & Ladouceur, R. (1994).

Why do people worry? *Personality and Individual Differences, 17*, 791-802.

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990) Development

and validation of the Penn State Worry Questionnaire. *Behaviour Research*

and Therapy, 28, 487-495.

Margraf, J., Schneider, S., Ehlers, A., DiNardo, P. A., & Barlow, D. H. (1991).

Diagnostic interview of mental disorders: Interview guidelines. Berlin,

Germany: Springer Verlag.

Norton, P. J. (2005). A psychometric analysis of the Intolerance of Uncertainty Scale

among four racial groups. *Journal of Anxiety Disorders, 19*, 699-707.

Nunnally, J. C., & Bernstein, R. J. (1994). *Psychometric theory.* (3rd ed.). New York: McGraw-Hill, Inc.

Sexton, K. A., & Dugas, M. J. (2007). *Cross-cultural validity of the Intolerance of Uncertainty Scale.* Poster presented at the 41st annual convention of the Association for Behavioral and Cognitive Therapies, Philadelphia, PA, USA.

Sexton, K. A., & Dugas, M. J. (2009). Defining distinct negative beliefs about uncertainty: Validating the Factor Structure of the Intolerance of Uncertainty Scale. *Psychological Assessment, 21*, 176-186.

Sheehan, D.V., Lecrubier, Y., Sheehan, K.H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R. & Dunbar G.C. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. Journal of Clinical Psychiatry, 59, 22-33.

Speilberger, C., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory.* Palo Alto, CA: Consulting Psychologists.

Strodl, E., Schweitzer, R., Khawaja, N., & Young, R. (2009). A comparison of cognitive behaviour therapy and supportive expressive therapy as group interventions for GAD. Unpublished Manuscript. Queensland University of Technology.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics.* (4th ed.). Boston: Allyn & Bacon.

Wells, A. (1994). A multi-dimensional measure of worry: Development and preliminary validation of the Anxious Thoughts Inventory. *Anxiety, Stress and Coping: An International Journal, 6*, 289-299.

Wells, A., & Cartwright-Hatton, S. (2004). A short form of the metacognitions

questionnaire: Properties of the MCQ-30. *Behaviour Research and Therapy,*

42, 385-396.

Table 1

Cronbach's Alphas for the IUS-27 and IUS-12 in Clinical and Non Clinical Samples

	Clinical (n=50)	*Non-Clinical (n=56)*
IUS-27	.93	.95
IUS-27 F1	.90	.92
IUS-27 F2	.88	.92
IUS-12	.87	.92
IUS-12 F1	.72	.89
IUS-12 F2	.86	.86

Note. IUS-27: 27-item Intolerance of Uncertainty Scale; IUS-27 F1: Uncertainty has Negative Implications; IUS-27 F2: Uncertainty is Unfair; IUS-12: 12-item Intolerance of Uncertainty Scale; IUS-12 F1: Inhibitory Anxiety and IUS-12 F2: Prospective Anxiety.

Table 2

Concurrent validity for the IUS-27 and IUS-12

Pearson correlations using Non-clinical (above the diagonal) and Clinical (below the diagonal) samples

	1	2	3	4	5	6	7	8	9	10
1.IUS-27		.96	.97	.96	.93	.89	.62	.64	.72	.67
2.IUS-12	.94		.91	.96	.94	.95	.54	.60	.71	.63
3.IUS-27 F1	.92	.78		.87	.94	.80	.67	.66	.72	.68
4.IUS-27 F2	.87	.94	.61		.86	.96	.52	.55	.68	.59
5.IUS-12 F1	.87	.83	.90	.64		.81	.65	.71	.73	.69
6.IUS-12 F2	.82	.93	.56	.97	.58		.41	.45	.64	.52
7.PSWQ	.36	.38	.29	.38	.33	.36		.76	.67	.71
8.STAI-T	.39	.38	.34	.37	.30	.36	.62		.71	.75
9.MCQ-30	.49	.53	.40	.49	.45	.49	.35	.19		.61
10.AnTI	.49	.40	.58	.27	.48	.27	.28	.36	.52	

Note. Non-clinical sample *n*: 50; Clinical sample *n*: 56; IUS-27: 27-item Intolerance of Uncertainty Scale; IUS-12: 12-item Intolerance of Uncertainty Scale; IUS-27 Factor 1: Uncertainty has Negative Implication; IUS-27 Factor 2: Uncertainty is Unfair; IUS-12 Factor 1: Inhibitory Anxiety; IUS-12 Factor 2: Prospective Anxiety; PSWQ: Penn State Worry Questionnaire; STAI-T: State Trait Anxiety Inventory for Adult Form Y-2; MCQ-30: 30-item Meta-Cognitions Questionnaire; AnTI: Anxious Thoughts Inventory; All correlations are significant at *p* < .05 (2-tailed) except the relationship between MCQ-30 and STAI-T in the clinical sample.

Table 3

Means, Standard Deviation and the Group differences for the IUS-27 and IUS-12

	Clinical	Non-Clinical	*t*	*p*
	M (SD)	*M (SD)*		
IUS-27 Total	80.24 (18.26)	66.58(21)	3.55	.001
IUS-27 F1	2.86(.75)	2.28(.75)	3.97	.001
IUS-27 F2	3.10 (.75)	2.69(.86)	2.56	.01
IUS-12Total	36.76 (8.72)	30.62 (9.98)	3.35	.001
IUS-12 F1	2.96 (.76)	2.18 (.85)	4.93	.001
IUS-27 F2	3.13(.84)	2.81(.91)	1.86	.06

Note. IUS-27: 27-item Intolerance of Uncertainty Scale; IUS-27 Factor 1: Uncertainty has Negative Implication; IUS-27 Factor 2: Uncertainty is Unfair; IUS-12: 12-item Intolerance of Uncertainty Scale; IUS-12 Factor 1: Inhibitory Anxiety; IUS-12 Factor 2: Prospective Anxiety; Clinical sample n: 50; Non-Clinical sample n: 56; *t* values are significant at *p* < .01 (2-tailed) and *df*: 104.

Table 4

Standard Multiple Regression Analyses for the Subscales of IUS-27 and IUS-12

Measures	B	SE B	β	T	sr_i^2 (unique)
Predicting Pathological Worry (PSWQ) **(Clinical Sample)**					
IUS-27 subscales					
– Uncertainty has Negative Implications[1]	.09	.16	.09	0.54	.01
– Uncertainty is Unfair[2]	.38	.20	.33	1.90	.07
IUS-12 subscales					
– Inhibitory Anxiety[1]	.55	.46	.20	1.19	.03
– Prospective Anxiety[2]	.44	.30	.25	1.48	.04
Predicting Trait Anxiety (STAI-T) **(Clinical Sample)**					
IUS-27 subscales					
– Uncertainty has Negative Implications[1]	.10	.10	.18	1.05	.02
– Uncertainty is Unfair[2]	.19	.12	.27	1.58	.04
IUS-12 subscales					
– Inhibitory Anxiety[1]	.26	.28	.15	0.93	.02
– Prospective Anxiety[2]	.29	.18	.27	1.64	.05
Predicting Pathological Worry (PSWQ) **(Non-Clinical Sample)**					
IUS-27 subscales					
– Uncertainty has Negative Implications[1]	1.14	.25	.94	4.54**	.20
– Uncertainty is Unfair[2]	-.41	.28	-.30	-1.45	.02
IUS-12 subscales					
– Inhibitory Anxiety[1]	3.05	.57	.93	5.39**	.29
– Prospective Anxiety[2]	-5.24	2.63	-.34	-1.99*	.04

Predicting Trait Anxiety (STAI-T)
(Non-Clinical Sample)

IUS-27 subscales					
– Uncertainty has Negative Implications[1]	.76	.21	.76	3.67**	.14
– Uncertainty is Unfair[2]	-.11	.23	-.10	-.47	.00

IUS-12 subscales					
– Inhibitory Anxiety[1]	2.59	.42	.97	6.13**	.32
– Prospective Anxiety[2]	-3.88	1.97	-.31	-1.97*	.03

Note. IUS-27: 27-item Intolerance of Uncertainty Scale; IUS-12: 12-item Intolerance of Uncertainty Scale; STAI-T: State Trait Anxiety Inventory for Adult Form Y-2.
[1] measure similar theme & [2] measure similar theme.
**$p < .01$; *$p < .05$.