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The Persian Tolerance of Uncontrollability Questionnaire and its Correlates: Reliability, Validity, and Measurement Invariance Across Gender

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Abstract
Many situations in life remain beyond an individual's control. Despite this, little research has focused on individual differences in tolerance of uncontrollability. The purpose of the present study was to translate and validate a Persian version of the Tolerance of Uncontrollability Questionnaire (TOUQ). The scale was translated from English to Persian and administered to 441 Iranian Farsi-speaking participants from the general population (females = 65%; mean age = 26.26 years [SD ± 7.36]). The Persian version of the TOUQ demonstrated excellent reliability and internal validity. The structure of the TOUQ appeared to be unidimensional and invariant across males and females. The scale demonstrated divergence from intolerance of uncertainty (IU), worry, and psychological distress, and convergence with distress tolerance (DT) and satisfaction with life. The TOUQ assesses a unique construct, different from other related relevant concepts (IU and DT), and predicts variation in worry scores. The TOUQ is a valid and reliable instrument that can robustly assess tolerance of uncontrollability.

Keywords Tolerance of uncontrollability · Uncontrollability · Psychometric · Reliability · Validity · Persian

Introduction

Uncontrollability is an aspect of life that cannot be avoided. There are different reactions to uncontrollability among individuals. Some can tolerate uncontrollability to a great extent, considering it an integral part of life, whereas others cannot tolerate the lack of control they are experiencing in all aspects of life, which can result in anxiety and mood disorders (Hofmann, 2005). Therefore, the degree to which individuals tolerate uncontrollability can have a substantial

impact on their mental health. The significance of tolerating uncontrollability can be better understood by the impact of control on the development of anxiety and depression.

According to Chorpita and Barlow (1998), early experiences that involve a lack of control could result in a cognitive style that increases the likelihood of interpreting subsequent events as being beyond an individual's control, which could make an individual more vulnerable to anxiety and depression. They state that when an individual feels unsure about their ability to control the outcomes of a situation, they experience "uncertain helplessness" which leads to an anxious state. If this feeling of helplessness increases, resulting in a complete lack of control, they experience a state of "mixed anxiety-depression". Finally, when an individual's sense of control is entirely gone and they are certain that the outcome will be negative, they experience a depressive state (Chorpita & Barlow, 1998; Alloy et al., 1990, p. 525-526).

The exploration of the concept of tolerance to uncontrollability can provide valuable insights into the underlying mechanisms of widespread mental health disorders, including anxiety and depression. This is particularly relevant given the fundamental nature of life, which is inherently unpredictable and often beyond an individual's control. Hay et al. (2021) recently developed a psychometric instrument that assesses tolerance of uncontrollability, the Tolerance of Uncontrollability Questionnaire (TOUQ). The construct of tolerance of uncontrollability is defined as the belief concerning (and comfort level with) the reality that many things in life are beyond our control.

One construct that appears to be related to this is intolerance of uncertainty which refers to an individual's tendency to perceive ambiguity and uncertainty as threatening, and attempts are made to resolve these situations through an array of cognitive, emotional, and behavioral responses (Birrell et al., 2011; Dugas et al., 2001). The difference between TOU and IU is that the experience,

situation, or outcome is known in the case of TOU but not in the case of intolerance of uncertainty. The uncertainty of a situation is not always present, making TOU distinct from intolerance of uncertainty, even if the situation is both outside of an individual's control and uncertain. Therefore, it was hypothesized that there would be a negative and significant association between TOU and IU (H_1) as well as a negative significant association between TOU and worry (H_2).

Another concept related to TOU is distress tolerance (DT), defined as an individual's ability to tolerate aversive, stressful, and uncomfortable conditions (Lass & Weiner, 2020; Leyro et al., 2010). DT plays a transdiagnostic role in a variety of disorders. For instance, low DT has been associated with a wide range of disorders such as anxiety disorders (Laposa et al., 2015), depressive disorders (Lass & Winer, 2020), and post-traumatic stress disorder (Akbari et al., 2021). DT is more specific than the intolerance of uncontrollability, and it pertains to aversive states, whereas TOU refers to the inability of an individual to control all aspects of their inner and outer worlds. Therefore, it was hypothesized there would be a significant and positive association between TOU and DT (H_3).

According to Rotter (1996), locus of control refers to the extent to which individuals believe that their actions can influence the rewards they receive in life and is a concept that is relevant to TOU. Individuals with internal locus control believe that their behavior, abilities, and efforts are responsible for the events and desired outcomes. Those with an external locus of control believe that future outcomes are ultimately determined by the actions of others, the environment, and chance. Among these two different personality traits, internal locus control is important for life satisfaction, physical and psychological well-being, self-esteem, and perseverance (Pu et al., 2017). Those who possess external locus control tend to see themselves as victims of their environment and the future, which can result in negative emotions and poorer psychological well-

being. Therefore, it was hypothesized there would be a positive significant association between TOU and internal locus of control (H_4) as well as a negative significant association between TOU and external locus of control (H_5). Consequently, it is also hypothesized that there would be a negative association between TOU and psychological distress (H_6).

Pessimism and optimism are other concepts related to TOU. In general, optimism refers to the expectation that an individual will encounter favorable outcomes, whereas pessimism refers to the expectation that an individual will encounter negative outcomes. It has been shown that optimism is associated with healthier and longer lives as well as having direct effects on physiological and psychological health (Boehm et al., 2018). Therefore, it was hypothesized there would be a negative significant association between TOU and pessimism (H_7), as well as a positive significant association between TOU and optimism (H_8). Additionally, religion and spirituality are other concepts that are theoretically related to TOU. A study by Chen et al. (2020) found that individuals who attended religious services experienced lower levels of psychological distress (depression, anxiety, hopelessness, and loneliness) and higher levels of psychosocial well-being (positive affect, life satisfaction, social integration, and purpose in life). Therefore, it was hypothesized there would be a positive significant association between TOU (as a well-being-related construct) and religiosity (H_9).

Another variable examined in the present study was mindfulness. Mindfulness can be viewed as an individual's tendency to be aware and observe what is occurring in the present moment, both inside and around them without labeling and judging their experiences (Toniolo-Barrios & Pitt., 2021). Based on this definition, it was hypothesized there would be a positive significant association between TOU and mindfulness (H_{10}).

Finally, the present study considered satisfaction with life as a relevant concept to TOU. As TOU is theoretically associated with lower psychological distress (Hay et al., 2021) and individuals with high levels of satisfaction with life also experience lower levels of psychological distress (Lathabhavan & Sudevan, 2022), it was hypothesized there would be a positive significant association between TOU and satisfaction with life (H_{11}).

The present study

The TOUQ is the first measure developed that defines and assesses uncontrollability, and further psychometric studies are required to evaluate it. Therefore, the present study examined the structure of the TOUQ using confirmatory factor analysis in order to determine whether it is consistent across gender (i.e., measurement invariance). The convergent and divergent validity of this measure was then examined with respect to its relevant concepts in addition to testing its reliability and temporality by a test-retest examination. Finally, since TOU is relevant to both the present moment and the future, the present study explored its incremental validity in predicting worry beyond its relevant concepts.

Method

The research design was a cross-sectional survey-based psychometric validation study, reported according to the COnsensus-based Standards for the selection of health status Measurement of Instruments (COSMIN; Gagnier et al., 2021).

Participants and procedure

A total of 441 participants were recruited from the general population through advertisements in digital applications (such as *WhatsApp, Telegram, Instagram, Twitter*, and *Facebook*). The only eligibility requirements were being (i) resident in Iran, (ii) proficient in Persian, and (iii) being at least 18 years of age. For confirmatory factor analysis, the sample size

was determined by the need for at least 20 participants per each item of TOUQ. All participants were at least 18 years old and signed a consent form describing the purpose of the study prior to completing the survey items.

The study was conducted in accordance with the revised 1989 Helsinki Declaration. The aforementioned apps on devices and computers were utilized to collect information remotely and to submit the survey, all items needed to be answered. This resulted in no missing data. The participation was voluntary and no compensation was provided.

TOUQ translation

The original English version was translated into Persian according to Beaton's et al.'s (2000) guidelines by the Iranian authors and reconciled with the original version. It was then back-translated and evaluated by an English-speaking researcher for psychological equivalence. In order to ensure psychological equivalence, 15 individuals participated in think-aloud cognitive interviews. This confirmed that the Persian version was psychologically equivalent to the English version based on the interpretations of the Iranian participants. Accordingly, it was not necessary to make any changes to the translated version of TOUQ.

Measures

Tolerance of Uncontrollability Questionnaire (TOUQ). The TOUQ (Hay et al., 2021) was used to assess tolerance of uncontrollability. The scale comprises 19 items (e.g., *"I am generally okay when I cannot control the outcome of things"*) that are rated from 1 (*strongly disagree*) to 7 (*strongly agree*). Scores range from 19 to 133 and the higher the score the higher tolerance of uncontrollability. The internal consistency in the present study was $\omega = .92$.

Life Orientation Test-Revised (LOT-R). LOT-R scale (Scheier et al.,1994; Persian version: Sohrabi & Jafari-Rosjan, 2016) was used to assess optimism and pessimism. The scale comprises

six items that are rated on a five-point scale from 0 (*strongly disagree*) to 4 (*strongly agree*). Three items (Items 1,4, and 10 e.g., *"In uncertain times I usually expect the best"*) assess optimism, and three items (Items 3,7, and 9, e.g., *"If something can go wrong for me, it will"*) assess pessimism. The internal consistencies in the present study for the optimism subscale and pessimism subscales were ω = .56 and ω = .53, respectively.

Mindful Attention Awareness Scale (MAAS). The MAAS (Brown & Ryan, 2003; Persian version: Ghorbani et al., 2009) was used to assess the frequency of mindful states in day-to-day life. The scale comprises 15 items (e.g., *"I find myself doing things without paying attention"*) that are rated on a six-point scale from 1 (*almost always*) to 6 (*almost never*). The scores range from 15 to 90 and higher scores indicate greater levels of mindfulness. The internal consistency in the present study was ω = .79.

Duke University Religion Index (DUREL). The DUREL (Koenig et al. 1997; Persian version: Baljani et al., 2011) was used to assess religiosity. The scale comprises five items and three dimensions: organizational religiosity (one item scored on a six-point scale, i.e., *"How often do you attend church or other religious meetings?"*), non-organizational religiosity (one item scored on a six-point scale, i.e., *"How often do you spend time in private religious activities, such as prayer, meditation or bible study?"*), and intrinsic religiosity (three items scored on a five-point scale, e.g., *"My religious beliefs are what really lie behind my whole approach to life"*). The scores range from 5 to 27 and higher scores indicate higher religiosity. The internal consistency in the present study was ω = .80.

Distress Tolerance Scale (DTS). The DTS (Simons & Gaher, 2005; Persian version: Akbari et al., 2021) was used to assess an individual's ability to tolerate negative emotions. The scale comprises 15 items and four dimensions: an appraisal of capacity and distress experienced,

absorption of negative emotions, regulation of emotions, and tolerance of distressing emotions. Items (e.g., *"I can't handle feeling distressed or upset*") are rated on a five-point scale from 1 (*strongly agree*) to 5 (*strongly disagree*). The scores range from 15 to 75 and higher scores indicate higher distress tolerance. The internal consistency for the total scale in the present study was ω = .80. Also, the internal consistencies for the subscales were ω = .62, .76, .81, .68 for tolerance, absorption, appraisal, and regulation, respectively.

Rotter's Locus of Control Scale (LOCS). The LOCS (Rotter, 1966; Persian version: Biabangard, 1992) was used to assess the tendency to see events as being controlled internally or externally. The scale comprises 23 items (e.g., external control: *"Many of the unhappy things in people's lives are partly due to bad luck"*; internal control: *"People's misfortunes result from the mistakes they make"*) that are rated either 1 or 0 on a two-point scale. The scores range from 0 to 23 and scores higher than 9 indicate an external locus of control and scores lower than 9 indicate an internal locus of control. The internal consistency in the present study was ω = .89.

The Penn State Worry Questionnaire (PSWQ). The PSWQ (Meyer et al., 1990; Persian version: Dehshiri et al., 2009) was used to assess pathological excessive worry. The scale comprises 16 items (e.g., *"I am always worrying about something"*) that are rated on a five-point scale from 1 (*not at all typical of me*) to 5 (*very typical of me*) and five items (Items 1, 3, 8, 10 and 11) are scored reversed. The scores range from 16 to 80 and higher scores indicate higher worry. The internal consistency in the present study was ω = .80.

Intolerance of Uncertainty Scale (IUS-12). The IUS-12 (Buhr & Dugas, 2002; Persian version: Vadivel et al., 2022) was used to assess reactions to uncertainty and ambiguous situations. The 12 items (e.g., *"Uncertain events upset me greatly"*) with two dimensions (prospective anxiety and inhibitory anxiety) are rated on a five-point scale from 1 (*not at all characteristic of*

me) to 5 (*entirely characteristic of me*). The scores range from 12 to 60 with higher scores indicating higher intolerance of uncertainty. In the present study, the internal consistencies for the prospective anxiety and inhibitory anxiety subscales were ω = .81 and ω = .70, respectively.

Depression Anxiety Stress Scales (DASS-21). The DASS-21 (Lovibond & Lovibond, 1995); Persian version: Sahebi et al., 2005) was used to assess levels of depression, anxiety, and stress. The 21 items (e.g., *"I felt that I had nothing to look forward to"*) on the three subscales are rated on a scale from 0 (*did not apply to me at all*) to 3 (*applied to me much*). The scores range from 0 to 21 on each subscale with higher scores indicating a higher level of the particular mood state. In the present study, the internal consistency for the total scale was ω = .94, and the values were ω = .88, ω = .85, and ω = .87 for the depression, anxiety, and stress subscales, respectively.

Satisfaction with Life Scale (SWLS). The SWLS (Diener et al., 2003; Persian version: Maroufizadeh et al., 2016) was used to assess global satisfaction with life. The five items (e.g., *"If I could live my life over, I would change almost nothing"*) are rated on a seven-point scale ranging from 1 (*totally disagree*) to 7 (*totally agree*). The scores range from 5 to 35 with higher scores indicating higher life satisfaction. In the present study, the internal consistency for the total scale was ω = .89.

Data analysis

The data were analyzed using IBM SPSS Statistics version 28 and Amos version 24. The present study did not use exploratory factor analysis because if a scale has already been validated, subsequent analysis should be performed using confirmatory factor analysis (CFA). Moreover, CFA is better for theory-driven hypotheses and EFA is better suited for data-driven hypotheses (Matsunaga, 2010). Consequently, the factor structure of the Persian version of the TOUQ was examined using CFA. It is recommended that the number of observations for confirmatory factor

analysis be three to twenty times greater than the number of items. In this case, the assumption is met (19 items * 20 observations) = 380 participants. According to Hu and Bentler's suggestions (1999), several fit indices were evaluated, such as comparative fit index (CFI; good fit ≥0.90), root mean square error of approximation (RMSEA; good fit ≤0.08), and standardized root mean square residual (SRMR; good fit ≤0.08). An acceptable fit was considered to be a value close to these cutoffs. Following this, tests of measurement invariance were conducted across gender to determine whether the TOUQ scores from the Persian version were comparable between females and males. A reliability assessment was performed using the total sample using Cronbach's alpha, composite reliability, and average variance based on CFA. Also, using Pearson's method of moment correlation analysis, the test-retest reliability, divergent and convergent validity were evaluated. In addition, hierarchical regression analysis was used to determine incremental validity.

Results

Demographic features

The total sample comprised 441 participants (approximately 65% females). The age of participants ranged from 18 to 54 years with a mean age of 26.26 years (±7.36) for the total sample. The mean age across genders was significantly different: $t(439) = -2.53$, $p = 0.01$, with the higher mean age for males (27.46 years ±7.34) as compared to females (25.61 years ±7.30). The majority of the participants (73.2%) were educated at university level. However, there were no significant gender differences in the proportion of educational attainment ($p = 0.175$). Almost half of the sample (45%) reported their income at more than $200 per month. However, there were no significant gender differences based on the income level ($p = 0.125$). Of the total sample, 59% were employed. However, there were significant gender differences in occupational status ($p <$

0.01) with higher unemployment among females. See Table 1 for further details of socio-demographic features.

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Confirmatory factor analysis (CFA)

To carry out the confirmatory factor analysis, multivariate outliers were tested using Mahalonobis distances, and 34 individuals were excluded. The adequacy of the number of participants is also supported by the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy which was .93, suggesting that the sample size is adequate to proceed with the analysis. Also, the assumption of the sphericity was met by Bartlett's test of sphericity χ^2 (171) = 3745.34, p = 0.01, suggesting that the required correlation between items is observed. As seen in Table 2, the item loadings are above the recommended value of .30, ranging from .39 to .79. The corrected item-total correlation ranged from .40 to .74 suggesting good discrimination and corresponding to the latent variable of tolerance of uncontrollability as measured by TOUQ.

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To verify the single-factor dimension of TOUQ, CFA was performed and the fit indices were as follows: χ^2/df = 5.21, GFI = .80, CFI = .82, NFI = .79, IFI = .82, TLI = .80, RMSEA = 0.10, and SRMR = 0.07. These results indicate that the model fit was poor for all indices except for SRMR. To resolve the problem, the item-parceling method was implemented. This is a common method for single-factor measures and can improve the model fit (Bandalos, 2002; Orcan, 2013). Items were aggregated according to their covariances as suggested by modification indices. This resulted in four parcels: Parcel 1 (Items 1, 2, 3, 4, 6, and 19), Parcel 2 (Items 5, 10, and 11), Parcel 3 (Items 8, 9, 17, and 18), and Parcel 4 (Items 7, 12, 13, 14, 15, and 16). Following this

procedure, the fit indices were acceptable: χ^2/df = 3.17, GFI = .99, CFI = .99, NFI = .99, IFI = .99, TLI = .98, RMSEA = 0.07, and SRMR = 0.01.

Measurement invariance

Multiple-group confirmatory factor analysis was used to test whether the TOUQ had an invariant factor structure across gender. Evidence was found for configural invariance. The parcel load on the same factor across genders was supported by good fit indices (χ^2 = 4.48, df = 2, χ^2/df = 2.24, RMSEA = 0.05, SRMR = 0.01, CFI = 0.99). Evidence was also found for metric invariance. Here the factor loadings were constrained to be equal across genders and were supported by good fit indices (χ^2 = 8.19, df = 5, χ^2/df = 1.64, RMSEA = 0.04, SRMR = 0.02, CFI = 0.99). A chi-square difference test between the unconstrained and constrained factor loadings was non-significant (χ^2 = 3.71, df = 3, p = 0.29) indicating that each parcel contributed to the latent construct to a comparable extent in both genders. Finally, evidence was found for scalar invariance where the item intercepts were constrained to be equal across genders (χ^2 = 4.48, df = 2, χ^2/df = 2.24, RMSEA = 0.05, SRMR = 0.01, CFI = 0.99). The chi-square difference test between unconstrained and constrained item intercepts was non-significant (χ^2 = 1.05, df = 7, p = 0.18).

Reliability and test-retest reliability

Reliability was assessed using traditional internal consistency indices (i.e., Cronbach's alpha and McDonald's omega). The internal consistency alpha and omega values were both .92, indicating excellent internal consistency. Also, the composite reliability was .90 and the average variance extracted was .69 suggesting that CFA-based reliability indices were acceptable.

Of the total participants, 26 individuals participated in the test-retest of the TOUQ. At T1, the mean score on TOUQ was 70.46±17.83 and the mean score at T2 (21 days later) was 67.61±16.25. The mean scores were not significantly different: t(25) = 1.42, p = 0.166. Moreover,

the correlation between T1 (α = .89) and T2 (α = .87) was significant and high (r = .82). Therefore, the TOUQ had acceptable test-retest validity and is a representative and stable measure of tolerance of uncontrollability over time.

Convergent and divergent validity

Table 3 shows the convergent and divergent validity of TOUQ with the variables of interest. TOUQ was not significantly correlated with locus of control (internal and external), optimism, pessimism, religiosity, and mindfulness (all p-values > 0.05). Therefore, six hypotheses were not supported (i.e., H_4, H_5, H_7, H_8, H_9, and H_{10}).

TOUQ was significantly and positively associated with satisfaction with life: r = .13 and DT r = .28, and its subscales (tolerance, absorption, and appraisal; r-values = .25 to .27) except for the regulation subscale (p > 0.05). The TOUQ was negatively and significantly associated with worry (r = -.36), intolerance of uncertainty (inhibitory anxiety, r = -.28; prospective anxiety, r = -.22), and psychological distress r = -.17 (depressive, anxiety, and stress symptoms; r-values = -.11 to -.19). Therefore, five hypotheses were supported (i.e., H_1, H_2, H_3, H_6, and H_{11}).

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Incremental validity

Further analysis tested whether TOUQ predicted worry, explaining additional variances beyond the other predictors. In the first step, assumptions of hierarchical regression analysis were examined. The p-values for the Anderson-Darling statistic, Goldfeld-Quandt statistic, and Durbin-Watson test were not significant which means the assumptions of normality, lack of heteroskedasticity, and lack of autocorrelation were met, respectively. The residuals were normally distributed and the collinearity was below the recommended value (VIF < 7).

Step-wise regression analysis was used to examine only relevant and statistically significant variables into the model in order to determine the incremental validity of TOUQ in predicting worry. In order to simplify the process, non-significant predictors were discarded since they add unnecessary complexity. Therefore, all 15 variables in Table 3 were included except worry, as predictors of worry. Based on the results of the step-wise model, only two subscales of DASS-21 (stress, anxiety), both subscales of IU (inhibitory anxiety and prospective anxiety), two subscales of DT (appraisal and regulation), and TOUQ were retained. Therefore, a four-step hierarchical regression model was designed and Table 4 shows the results for predicting worry scores from stress and anxiety [Step 1], inhibitory anxiety and prospective anxiety Step 2], appraisal and regulation [Step 3], and TOUQ [Step 4].

Worry scores were significantly predicted at Step 1 by stress and anxiety: F (2, 404) = 128.05, $p < .001$, explaining 38.8% of the variation in worry scores. Also, a significant regression was obtained by including the inhibitory anxiety and prospective anxiety scores (Step 2): F (4, 402) = 85.33, $p < .001$, explaining a further 7.1% of the variance in worry scores: ΔF (2, 402) = 26.47, $p < .001$. The inclusion of appraisal and regulation (Step 3) was also significant: F (6, 400) = 62.99, $p < .001$, explaining a further 2.7% of variance explained in worry scores: ΔF (2, 400) = 10.35, $p < .001$. Finally, the addition of the TOUQ in (Step 4) was also significant: F (7, 399) = 61.47, $p < .001$, explaining an extra 3.3% of the variance in worry scores: ΔF (1, 399) = 27.43, $p < .001$.

The final model (Step 4) demonstrated that two subscales of DASS-21 (stress, anxiety), both subscales of IU (inhibitory anxiety and prospective anxiety), two subscales of DT (appraisal and regulation), and TOUQ (all p-values < .05) significantly predicted variability in worry scores, accounting for a total of 51% (adjusted R^2) of the variation in worry scores. In this model, TOUQ

predicted a unique variance (SR^2 = 3.3%) in worry score by explaining additional variances beyond DT (SR^2 values = 0.08% to 1%), IU (SR^2 values = 0.06% to 0.08%), and psychological distress (SR^2 values = 0.08% to 0.09%).

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Discussion

Although the notion of uncontrollability is familiar, the TOUQ is the first psychometric measure that has been developed to define and assess uncontrollability. Therefore, further psychometric studies are required to evaluate this measure and lay the foundation for further research into the relevance of this construct to human well-being.

Structure and reliability of TOUQ

The present study tested the structure of the TOUQ and the results were similar to those of the original version of the TOUQ (Hay et al., 2021). All items contributed to the tolerance of uncontrollability as a unidimensional construct. Additionally, the present study extended the original study by conducting CFA. However, the fit indices for the scale with 19 items were below acceptable levels. There, the item-parceling method was implemented, which is a common approach for one-dimensional measures. The TOUQ demonstrated an excellent fit with four parcels aggregated based on their covariances. Due to the fact that this is the present study is the first to validate the TOUQ in another language, it was not possible to compare the results of the CFA with those of the original study or any other research. The parceled model also demonstrated full measurement invariance across genders, suggesting that the mean scores obtained from TOUQ can be used to compare males' and females' tolerance of uncontrollability.

The reliability of the TOUQ was tested using traditional indices (Cronbach's alpha and McDonald's omega) as well as CFA-based indices (composite reliability and average variance

extracted). All the results were satisfactory. Additionally, a test-retest analysis was conducted with 26 participants at an interval of three weeks in order to examine the temporal reliability of TOUQ scores and the findings supported the reliability of the measure over time.

Divergent and convergent validity of TOUQ

In terms of divergent validity, five hypotheses were proposed comprising the negative significant association between TOU and worry (H_2), IU (H_1), external locus of control (H_5), pessimism (H_7), and psychological distress (H_6). Of these, only three were supported (TOU and worry, IU, and psychological distress). For convergent validity, six hypotheses were proposed comprising the positive significant association between TOU and optimism (H_8), religiosity (H_9), mindfulness (H_{10}), DT (H_3), satisfaction with life (H_{11}), and internal locus of control (H_4). However, only two were supported (TOU and DT and satisfaction with life).

The non-significant association between TOU and internal locus of control was not consistent with the original study (Hay et al., 2021), which reported a positive association between internal locus of control and TOU. However, the non-significant association between TOU and external locus of control was in line with the original study's finding. The non-significant association observed in the present study may be attributed to the categorical measure of locus of control which may lead to losses of variance (i.e., locus of control was used as a dummy variable with a score of 0 relating to internal locus of control, and 1 relating to external locus of control). If other measures are used the hypotheses may have been supported.

Similar to the results for locus of control, the associations between TOU and optimism and pessimism were not significant. The non-significant association for pessimism is in line with the original study. However, Hay et al. found a positive and significant association between optimism

and TOU which is not replicated in the present study. This non-significant pattern of associations might be due to cultural differences which require further investigation.

It was hypothesized that there would be a positive significant association between TOU and religiosity However, similar to the original study, the association was not significant, suggesting that maybe the TOU is a universal phenomenon that is not influenced by the level of individuals' religiosity. Therefore, further research is needed to provide insight into these findings.

Inconsistent with the original study, the present study did not find a significant association between TOU and mindfulness. One potential explanation might be that TOU is a cognitive-level construct and is concerned more about how individuals think (their attitude on) the uncontrollability is tolerable. Therefore, it may not be captured by a metacognitive level construct such as mindfulness.

However, despite the original study that did not find evidence of any association between TOU and DT, the present study found a positive significant association between these two variables. This suggests that tolerance of uncontrollability and emotional distress tolerance are congruent (i.e., individuals with higher emotional distress tolerance have higher tolerance of uncontrollability). Similarly, the study found a positive association between TOU and satisfaction with life. This may be due to the fact that some individuals with high satisfaction with life may see uncontrollability as tolerable because they have the required support to overcome the events or they believe they could overcome this. Also, it could be that individuals with a high tolerance for uncontrollability may not face common worry, anxiety, and distress that other individuals (i.e., people with lower TOU) are facing, resulting in more feeling of being satisfied with life. This explanation is perhaps supported by the negative significant association between TOU and worry, and IU and psychological distress. Here, the higher level of TOU may protect individuals against

psychopathology. However, at this stage, all interpretations should be treated with caution due to the lack of literature on this topic.

Incremental validity of TOUQ in predicting worry

The TOUQ demonstrated excellent incremental validity by predicting a unique variance (SR^2 = 3.3%) in worry beyond what was explained by DT, IU, and psychological distress which predicted only 1% of the variation in worry scores. The findings of the study are particularly intriguing, as they suggest that TOU is a unique construct as compared with its most relevant concepts, DT and IU. IU is characterized by a low tolerance for uncertainty and a sense of being attached to the outcome, whereas TOU concerns seeking to forsake or leave behind the outcomes, more nuanced with the real world. Since IU has been one of the main targets for reducing worry in generalized anxiety disorder (Koerner & Dugas, 2006), and in the present study TOU outperformed the IU in predicting worry, this suggests that enhancing TOU might be a good adjunct to UT in delivering more effective treatment to reduce worry.

Limitations and future directions

The present study is one of the first to validate an old concept, but with a newly defined construct, which lays the foundation ground for future research. However, all findings should be interpreted in light of the limitations. Given that the study was cross-sectional, it limits the interpretation of causality and temporality of the findings, which should be examined in future longitudinal studies to further the understanding of the role of TOU in psychopathology. Additionally, the sample was drawn from the general population, which may limit the generalizability of the results to clinical samples. Therefore, future studies may assess the measurement invariance among different clinical populations. Also, approximately two-thirds of the sample were female, and future studies may benefit from a more gender-balanced sample. The test-retest reliability was conducted with. A very

small subsample of the original participants and future studies should use a larger sample size when replicating the study. Self-report measures were used and these are vulnerable to recall and social desirability biases.

Although the present study conducted a comprehensive evaluation of the psychometric properties of the TUO, it should be acknowledged that traditional psychometric criteria may not fully capture the complexity of clinical reality (Cosci, 2021; Carrozzino et al., 2021; Mansueto et al., 2021). To overcome limitations of classical psychometrics, future studies may use the Clinimetric Patient-Reported Outcome Measures (CLIPROM; Carrozzino et al., 2021) criteria as guidance toward the validation process of the TOU. To effectively explore the clinical utility of the TOU, it is recommended that psychometric and clinimetric approaches should be integrated to gain a deeper understanding of the effectiveness and practicality of the TOU in a clinical setting (Carrozzino et al., 2022; Mansueto et al., 2021).

Conclusion

The Persian version of TOUQ is a valid measure of TOU and has excellent reliability and internal validity as assessed by 21-day interval test-retest reliability. The structure of TOUQ appeared to be unidimensional and invariant across males and females. It demonstrated divergence from IU, worry, and psychological distress and convergence with DT and life satisfaction. Also, the notion of TOU as a unique construct as compared to its most relevant concept (IU and DT) in predicting variation in worry scores was supported. To better understand the uniqueness and validity of TOU and to provide insight into the reasons why TOU may not be associated with the expected concepts such as locus of control, optimism, pessimism, religiosity, and mindfulness, further research is necessary. Overall, the TOUQ appeared to be a valuable and promising

psychometric instrument for further research in examining a wide range of psychological disorders.

Conflict of interest

None.

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Table 1. Demographic features for the total sample and across genders ($N = 441$)

Variable	Female N (%)	Male N (%)	Total N (%)	χ^2 test
Educational attainment				$\chi^2(5) = 7.68$, $p = 0.175$
Uncompleted diploma	11 (84.6%)	2 (15.4%)	13 (2.9%)	
Diploma	65 (61.9%)	40 (38.1%)	105 (23.8%)	
Associate degree	31 (60.8%)	20 (39.2%)	51 (11.5%)	
Bachelor degree	119 (68.8%)	54 (31.2%)	173 (39.2%)	
Master degree	44 (57.1%)	33 (42.9%)	77 (17.4%)	
Ph.D. degree	17 (77.3%)	5 (22.7%)	22 (4.9%)	
Occupational status				$\chi^2(2) = 30.56$, $p < 0.01$
Unemployed	138 (77.5%)	40 (22.5%)	178 (40.3%)	
Part-time	71 (68.3%)	33 (31.7%)	104 (23.5%)	
Full-time	78 (49.1%)	81 (50.9%)	159 (36%)	
Income level per month				χ^2 (2) = 4.15, $p = 0.125$
Less than 100$	62 (63.9%)	35 (36.1%)	97 (21.9%)	
100$ to 200$	103 (71.5%)	41 (28.5%)	144 (32.6%)	
More than 200$	122 (61.0%)	78 (39.0%)	200 (45.3%)	

Table 2: Item loading and descriptive statistics.

No.	CFA-Loading	I-T	Skewness	Kurtosis	M	SD
ITEM 1	.57	.56	0.95	0.08	2.68	1.57
ITEM 2	.57	.57	1.31	0.84	2.32	1.54
ITEM 3	.66	.66	1.04	0.08	2.57	1.62
ITEM 4	.62	.64	0.102	-1.27	3.73	1.87
ITEM 5	.62	.62	-0.79	-0.46	4.83	1.76
ITEM 6	.39	.40	-0.04	-1.18	4.00	1.84
ITEM 7	.57	.56	0.05	-1.16	3.76	1.70
ITEM 8	.60	.61	-0.60	-0.75	4.57	1.76
ITEM 9	.63	.61	-0.26	-1.08	4.17	1.69
ITEM 10	.52	.51	-0.09	-1.26	4.05	1.88
ITEM 11	.77	.71	0.80	-0.32	2.81	1.65
ITEM 12	.69	.63	-0.01	-1.26	3.87	1.86
ITEM 13	.79	.74	0.50	-0.92	3.12	1.70
ITEM 14	.66	.62	0.16	-1.40	3.60	2.00
ITEM 15	.67	.63	0.05	-1.18	3.60	1.75
ITEM 16	.63	.61	0.36	-1.03	3.40	1.88
ITEM 17	.70	.68	-0.37	-1.18	4.22	1.84
ITEM 18	.61	0.62	-0.62	-0.75	4.61	1.81
ITEM 19	.60	0.57	.382	-1.09	3.36	1.80

Note. I-T = corrected item total correlation.

Table 3: Means, standard deviations, and correlations between variables.

No.	x̄	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	69.2	21.9	-																		
2	11.2	2.2	.04	-																	
3	7.9	2.2	.08	.01	-																
4	5.2	2.3	-.02	-.06	-.39**	-															
5	39.5	10.1	.03	-.05	.22**	-.25**	-														
6	14.3	5.0	.01	.08	.19**	-.13**	.12*	-													
7	41.8	11.3	.28**	.02	.16**	-.23**	.43**	.07	-												
8	7.3	2.8	.25**	-.01	.10*	-.17**	.31**	.07	.83**	-											
9	8	3.1	.25**	.05	.25**	-.29**	.46**	.14**	.84**	.71**	-										
10	18.4	5.6	.27**	.04	.21**	-.24**	.43**	.06	.91**	.65**	.73**	-									
11	8	2.7	.06	-.05	-.14**	.04	.03	-.08	.44**	.26**	.11*	.21**	-								
12	50.6	12.3	-.36**	-.04	-.24**	.22**	-.41**	-.01	-.50**	-.41**	-.48**	-.55**	.01	-							
13	15.3	4	-.28**	-.01	-.06	.13**	-.36**	-.06	-.44**	-.40**	-.36**	-.43**	-.13**	.51**	-						
14	20.2	5.9	-.22**	-.05	-.15**	.26**	-.53**	-.11*	-.59**	-.48**	-.58**	-.60**	-.07	.60**	.74**	-					
15	19.4	7.8	.13**	.03	.30**	-.31**	.38**	.18**	.34**	.27**	.40**	.36**	-.07	-.31**	-.22**	-.44**	-				
16	23.1	13.5	-.17**	-.07	-.36**	.35**	-.59**	-.20**	-.61**	-.49**	-.64**	-.63**	.01	.59**	.46**	.68**	-.60**	-			
17	7.5	5.3	-.11*	-.09	-.39**	.42**	-.52**	-.23**	-.50**	-.38**	-.56**	-.54**	.06	.47**	.36**	.60**	-.67**	.90**	-		
18	6.2	4.6	-.15**	-.06	-.24**	.22**	-.53**	-.13**	-.50**	-.41**	-.51**	-.51**	-.02	.54**	.40**	.56**	-.42**	.88**	.67**	-	
19	9.3	5.0	-.19**	-.035	-.32**	.290**	-.56**	-.16**	-.64**	-.54**	-.67**	-.65**	-.02	.61**	.49**	.69**	-.53**	.92**	.76**	.75**	-

Note. 1 = TOUQ; 2= Locus of control (0 = internal, 1 = external); 3 = Optimism; 4 = Pessimism; 5 = Mindfulness; 6 = Religiosity; 7 = Distress tolerance (DT); 8 = Tolerance-subscale of DT; 9 = Absorption-subscale of DT; 10 = Appraisal-subscale of DT; 11 = Regulation-subscale of DT; 12 = Worry; 13 = Inhibitory anxiety-subscale of IU; 14 = Prospective anxiety-subscale of IU; 15 = Satisfaction with life; 16 = Psychological distress (DASS-21); 17 = Depressive symptoms-subscale of DASS-21; 18 = Anxiety symptoms-subscale of DASS-21; 19 = Stress symptoms-subscale of DASS-21.

Table 4: Incremental validity of TOUQ in predicting variation in worry scores, hierarchical regression analysis.

Predictor	B [Ll, Ul]	β	*T*	SR^2	*R*	R^2	Adjusted R^2	ΔR^2
Step 1					.62	.38	.38	.38
Stress	1.15 [0.87, 1.44]	.47*	7.90	0.094				
Anxiety	0.50 [0.18, 0.81]	.18*	3.13	0.014				
Step 2					.67	.46	.45	.071
Stress	0.65 [0.33, 0.96]	.26*	4.08	0.022				
Anxiety	0.42 [0.13, 0.72]	.16*	2.82	0.010				
Inhibitory anxiety	0.49 [0.16, 0.82]	.16*	2.93	0.011				
Prospective anxiety	0.44 [0.17, 0.71]	.21*	3.20	0.013				
Step 3					.69	.48	.47	.027
Stress	0.40 [0.08, 0.73]	.16*	2.48	0.007				
Anxiety	0.40 [0.11, 0.69]	.15*	2.75	0.009				
Inhibitory anxiety	0.55 [0.23, 0.88]	.18*	3.36	0.014				
Prospective anxiety	0.30 [0.03, 0.58]	.14*	2.18	0.006				
Appraisal	-0.47 [-0.69, -0.25]	-.21*	-4.25	0.023				
Regulation	0.43 [0.11, 0.76]	.09*	2.63	0.008				
Step 4					.72	.52	.51	.033
Stress	0.41 [0.10, 0.73]	.17*	2.61	0.008				
Anxiety	0.41 [0.13, 0.69]	.15*	2.86	0.009				
Inhibitory anxiety	0.39 [0.07, 0.71]	.13*	2.40	0.006				
Prospective anxiety	0.35 [0.08, 0.61]	.16*	2.59	0.008				
Appraisal	-0.37 [-0.59, -0.15]	-.17*	-3.39	0.013				
Regulation	0.42 [0.10, 0.73]	.09*	2.61	0.008				
TOUQ	-0.11 [-0.15, -0.06]	-.19*	-5.23	0.033				

*$p<0.01$