

# Evaluation of hierarchical model of trait and disorder- specific intolerance of uncertainty in anxiety disorder symptoms

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## Research Article

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# Abstract

**Background:** Research suggests that Intolerance of Uncertainty is a transdiagnostic risk and maintaining factor in anxiety disorders. The aim of this study was to evaluate the hierarchical model of trait Intolerance of Uncertainty and disorder-specific Intolerance of Uncertainty in symptoms of anxiety disorders in Iranian university students.

**Methods:** Participants ( $N = 561$ ) completed a battery of questionnaires which assess intolerance of uncertainty, disorder-specific intolerance of uncertainty, metacognition beliefs, fear of negative evaluation, obsessive cognitions, agoraphobic cognitions, obsessive compulsive symptoms, generalized anxiety disorder symptoms, social phobia symptoms, and panic disorder symptoms.

**Results:** Results showed hierarchical model of trait Intolerance of Uncertainty and disorder-specific Intolerance of Uncertainty fit with data. Trait intolerance of uncertainty and disorder-specific intolerance of uncertainty had significant direct and indirect association with various cognitive vulnerabilities and symptoms of anxiety disorders.

**Conclusion:** The findings showed trait intolerance of uncertainty and disorder-specific intolerance of uncertainty have significant contribution to various anxiety disorders. These findings have important implications in conceptualization, prevention and treatment of anxiety disorders.

## 1. Introduction

A number of cognitive behavioral models have been proposed to explain the etiology of anxiety disorders (1). New conceptualizations emphasize of shared risk factors in development of anxiety disorders (2). According to the triple vulnerability model of Barlow (2), there are three sets of factors, including general biological vulnerability, general psychological vulnerability, and specific psychological vulnerability interacting with each other to form and develop some specific emotional disorders. Research has also suggested that some of the vulnerability factors are related to various disorders and are therefore transdiagnostic (3).

In recent studies, increasing attention has been paid to intolerance of uncertainty (IU) as a general psychological risk factor to explain development and maintenance of anxiety disorders (4, 5). IU is considered as “negative thoughts about uncertainty and involves negative reactions to uncertain situations and events” (6). IU is driven from unknown and perception of uncontrollability of emotions and events (7). Research has recognized IU as a two dimensional concept: prospective anxiety and inhibitory anxiety (8). Initially, it was assumed that IU had a specific relationship with generalized anxiety disorder (GAD) and worry (9). However, recent research supported the transdiagnostic role of IU in social anxiety (10), post-traumatic stress disorder (PTSD) (11), obsessive-compulsive disorder (OCD) (12), and panic disorder (PD) (13). Furthermore, IU may lead to anxiety and safety behaviors through overestimating the possibility of threat (14). Additionally, high-level perception of IU and interpreting it as threat may lead to avoidant behaviors (15). Furthermore, some dysfunctional cognitions (e.g. worry, obsessional doubt, cognitive distortions) and behaviors (e.g. compulsions) may be an effort to decrease uncertainty and gain control (16). Therefore, IU is considered as an important transdiagnostic variable in anxiety disorders (17).

Although previous research emphasized on the importance of trait IU (7), recent evidence suggests that trait IU (i.e. general experience of uncertainty) and disorder-specific IU (DSIU) (i.e. specific focus on uncertainty in anxiety disorders) may be different (16). Existing evidence proposed that although individuals can tolerate uncertainty in some situations, however, they may cannot face with the uncertainty related to some specific personally distressing situations (14). In other words, uncertainty about the likelihood of making harm in obsessive-compulsive disorder may differ from uncertainty about social evaluative cues in social anxiety disorder (14). Therefore, distinguishing between role of trait IU and disorder-specific IU in anxiety disorders is important.

In an attempt to respond to this necessity, Shihata et al. (18) proposed a hierarchical model of trait IU and disorder-specific IU in anxiety disorder symptoms. The proposed model examined relationship between trait IU as a higher-order factor and

disorder-specific IU as intermediate factor, and disorder symptomology (symptoms of generalized anxiety disorder, social anxiety disorder, obsessive-compulsive disorder, and panic disorder). Shihata et al. (18) considered an established cognitive vulnerability as a mediator in each disorder symptoms: negative metacognition in generalized anxiety disorder (19); fear of negative evaluation in social anxiety disorder (20); inflated responsibility in obsessive-compulsive disorder (21); and agoraphobic cognition in panic disorder (22). They found that the proposed model fit with the data of the students. The results showed that disorder specific IU along with trait IU explained a significant variance of anxiety disorders symptoms.

However, as far as we know, there is no published study which evaluate structural validity of the Shihata et al. (18) model. Given that evaluating the existence of cultural differences in dealing with depression and anxiety is generally encouraged (23), we tried to evaluate this model in Iranian population. Studies showed that anxiety disorders are the most prevalent group of psychiatric disorders in Iran (15.6%) (24). In addition, in light of disagreements on the specific protocols for each disorder, and cost of protocols (25), development and evaluation of integrated explanatory models is a clinical and research necessity. Therefore, further investigating the transdiagnostic role of IU in anxiety disorders can help to develop and modify therapeutic protocols of these disorders in Iranian culture.

Thus, aim of this study was to evaluate structural validity of hierarchical model of trait IU and disorder-specific IU in symptoms of generalized anxiety disorder, social anxiety disorder, obsessive-compulsive disorder, and panic disorder in Iranian students. Our hypotheses were: 1) trait IU and disorder-specific IU would significantly predict negative metacognition and symptoms of generalized anxiety disorder, 2) trait IU and disorder-specific IU would significantly predict fear of negative evaluation and symptoms of social anxiety disorder, 3) trait IU and disorder-specific IU would significantly predict inflated responsibility and symptoms of obsessive-compulsive disorder, 4) trait IU and disorder-specific IU would significantly predict agoraphobic cognition and symptoms of panic disorder, 5) each of the disorder-specific IU and cognitive vulnerabilities mediate relationship of trait IU and disorder-specific symptoms.

## 2. Method

### 2.1. Participants

The participants were 614 university students from universities of Tehran, Iran (university of Tehran, Shahid Beheshti University, and Alzahra University). 32 students missed more than 10% of the items and their data was excluded from analyses. 21 students were excluded from analyses based on outliers from the box diagram. Thus, the data of 561 subjects (265 males, 296 females) were analyzed. The mean age of the males was 23.39 ( $SD = 7.38$ ) and females was 21.72 ( $SD = 5.72$ ). Other demographic information is presented in Table 1. Inclusion criteria were being over 18 years old.

#### Table 1

Demographic information of the participants

Variable	Frequency	Percent
Gender		
Woman	265	%52.8
Man	295	%47.2
Marital status		
Single	487	%86
Married	73	%13
Level of Education		
Masters	468	%83.4
Bachelor's degree	69	%12.3
PhD	24	%4.2

## 2.2. Measures

*Intolerance of Uncertainty Scale (IUS-12)* (26): This self-report instrument measures negative beliefs about uncertainty (27). IUS-12 has two subscales: prospective IU and inhibitory IU. Items are rated on a 5-point Likert scale from *not at all characteristic of me* (1) to *entirely characteristic of me* (5). The IUS-12 had excellent internal consistency (.91) and strong psychometric properties (28). The test-retest reliability and alpha coefficients of the scale were .76 and .88, respectively, for Iranian sample (29). In current study, Internal consistencies of IUS-12 was .84.

*Disorder-Specific Intolerance of Uncertainty Scale (DSIU)* (30): DSIU consists of eight three-item subscales measuring disorder-specific IU including generalized anxiety disorder (IU-GAD), social anxiety disorder (IU-SAD), obsessive-compulsive disorder (IU-OCD), health anxiety (IU-HA), posttraumatic stress disorder (IU-PTSD), panic disorder (IU-PD), specific phobia (IU-Phobia), and major depressive disorder (IU-MDD). Participants rated items on a five-point scale ranging from *not at all* (0) to *extremely* (4). The evidence demonstrated excellent psychometric properties (30). The disorder-specific IU-GAD, IU-SAD, IU-OCD, and IU-PD subscales were utilized in the current study. In the current work, the internal consistency of the subscales were as follow: IU-GAD (.82), IU-SAD (.87), IU-OCD (.84), and IU-PD (.92).

*Metacognition Questionnaire (MCQ-30)* (31): The MCQ-30 was used to measure metacognitive beliefs of participants about their worry and thoughts. This scale consists of five subscales; positive beliefs about worry, negative metacognitions about the uncontrollability and danger of worry, cognitive confidence, need to control thoughts, and cognitive self-consciousness (31). Responses were rated on a four-point Likert scale from *do not agree* (1) to *agree very much* (4). The alpha coefficients for Iranian sample for total scale was .91 and for the subscales were ranged from .71 to .87 (32). In the current study, we used negative metacognitions about the uncontrollability and danger of worry subscales. Internal consistency of the subscale was .87.

*Brief Fear of Negative Evaluation Scale, Straightforward Items (BFNE-S)* (33): BFNE-S adopted from BFNE (Leary, 1983) and comprises 8 straightforwardly- worded items with a 5-point Likert-type scale (0 = *not at all characteristic of me*; 5 = *extremely characteristic of me*). This scale measures the irrational thoughts related to being judged in a hostile way (34). The evidence established good psychometric properties in Iranian population (35).

*Obsessive-Beliefs Questionnaire-44 (OBQ-44)* (36): The self-report OBQ-44 was developed from OBQ-87 by obsessive compulsive cognitions working group(36). It assesses dysfunctional beliefs about development and maintenance of obsessive-compulsive disorder (37). The OBQ-44 consists of three subscales: Responsibility/Threat Estimation (OBQ-RT), Perfectionism/Certainty, Importance/Control of Thoughts. Participants showed their level of agreement on a 7-point Likert-

type scale from *disagree very much (-3) to neutral (0) to agree very much (+3)*. This scale has good internal consistency and criterion validity in clinical and non-clinical samples (38). In Iranian population, it showed good test-retest and internal consistency reliability and discriminant validity (39). In the current study we used OBQ-RT subscale Internal consistency of the subscale was .88.

*Agoraphobic Cognitions Questionnaire (ACQ)* (40): This 14-item scale assesses thoughts concerning negative consequences of experiencing anxiety and was designed to assess aspects of fear (panic attacks) in agoraphobics. The ACQ comprises two 7-item subscales: physical concerns and social/behavioral concerns. Responses were rated on a 5-point Likert scale from *thought never occurs (1) to thought always occurs (5)*. Researches have shown good discriminant and construct validity and reliability of the scale (40). Psychometric research showed good sensitivity and validity in Iranian population (41). In the current study, internal consistency of the scale was .86.

*Generalized Anxiety Disorder-7 (GAD-7)* (42): The 7-item GAD-7 was designed to identify probable cases of generalized anxiety disorder. Individuals were asked "how often, during the last 2 weeks, they were bothered by such symptoms." Responses were rated on a 4-point Likert scale from *not at all (0) to nearly every day (4)*. Psychometric research in Iranian population showed good reliability and validity (43). In the current study, internal consistency of the scale was .87.

*Social Interaction Phobia Scale (SIPS)* (44): SIPS comprise 14 items assessing social phobia symptoms. Each item is measured on a 5-point Likert scale ranging from *0 (not at all characteristic or true of me) to 4 (extremely characteristic or true of me)* and participants showed how often they were bothered by each symptom, during the past week. This scale comprises of 3 subscales: social interaction anxiety, fear of overt evaluation, and fear of attracting attention. The SIPS had high internal consistency (.92), test-retest reliability, and convergent validity (44). Psychometric research in Iranian students indicated good reliability and validity (45). In the current study, internal consistency of the scale was .93.

*Obsessive Compulsive Inventory – revised (OCI-R)* (46): The OCI-R measures symptoms of obsessive-compulsive disorder (OCD). It contains 18 items and has six subscales: washing, checking, obsessions, mental neutralizing, ordering, and hoarding, rated on a 5-point Likert-type scale ranging from *not at all (0) to extremely (4)*. Respondents described how much they felt distressed or bothered by each symptom, during the past month. Psychometrics evidence showed excellent properties (46). Internal consistency in Iranian students was satisfactory (47). In the current study, internal consistency of the scale was .90.

*The Panic Disorder Screener (PADIS)* (48): PADIS is a 4-item scale identifying panic disorder in the community and assessing severity of symptoms. The PADIS had good reliability and validity, sensitivity (.77), specificity (.84), and internal consistency (48). In the current study, internal consistency of the scale was .88.

## 2.3. Procedure

Subjects were selected from the city of Tehran's student population using convenience sampling. After coordinating with the universities' educational departments and the instructors, the second researcher (FM) referred to the classes and explained purpose and procedure of the study. participants who agreed to sign a written informed consent were asked to complete the questionnaires. Ethical review board of University of Social Welfare and Rehabilitation Sciences approved the study procedure (Code of Ethics: 1397.144). All methods were carried out in accordance of the institutional guidelines and conforming to the ethical standards of the declaration of Helsinki. There were no rewards/incentives for completing the survey.

## 2.4. Data analysis

We used SPSS 25.0 to calculate descriptive statistics and correlation matrix between measured variables. Correlation matrix were examined by calculating Pearson correlation coefficient. The correlation matrix between the observed variables showed no multiple linearity between them (49).

The measurement models were evaluated by confirmatory factor analysis (CFA) and hypothesized model was assessed by SEM with maximum likelihood estimation conducted in Mplus 7.4. For evaluation of measurement and structural model, fit indices, factor loadings, and modification indices were considered. Model fit indices included the  $\chi^2/df$  ratio, Tucker-Lewis index (TLI), comparative fit index (CFI), root mean square error of approximation (RMSEA), and standard root mean square residual (SRMR). For evaluating the strength of structural pathways, standardized estimates were utilized. Bootstrapping with at least 1000 repeated samples was used for estimating the strength of the total and specific indirect effects.

### 3. Results

#### 3.1. Correlation between variables

The bivariate correlations showed moderate to large significant associations between trait IU, all disorder-specific IU subscales, cognitive vulnerabilities, and disorder symptoms. Descriptive statistics indices and correlations of research variables are reported in *Table 2*.

**Table 2**

Descriptive statistics, Cronbach's alpha, and bivariate correlations between all study variables.

	mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1.IUS-12	35.56	8.10	1												
2.IU-GAD	5.38	2.96	.65*	1											
3.IU-SAD	5.24	3.37	.47*	.50*	1										
4.IU-OCD	5.41	3.25	.55*	.52*	.52*	1									
5.IU-PD	2.68	3.29	.43*	.51*	.37*	.47*	1								
6.MCQ-neg	11.40	4.07	.51*	.56*	.44*	.39*	.49*	1							
7.BFNE-S	21.30	8.47	.45*	.48*	.74*	.48*	.32*	.47*	1						
8.OBQ-RT	32.17	8.38	.48*	.48*	.33*	.47*	.44*	.44*	.39*	1					
9.ACQ	23.77	8.41	.27*	.37*	.33*	.27*	.40*	.55*	.36*	.38*	1				
10.GAD-7	8.10	5.07	.41*	.49*	.37*	.35*	.39*	.65*	.43*	.41*	.59*	1			
11.SIPS	16.64	12.66	.41*	.40*	.68*	.40*	.35*	.46*	.64*	.33*	.45*	.49*	1		
12.OCI-R	17.18	11.15	.42*	.44*	.40*	.43*	.44*	.50*	.44*	.45*	.51*	.50*	.53*	1	
13.PADIS	1.06	2.43	.18*	.29*	.14*	.22*	.46*	.36*	.20*	.24*	.39*	.39*	.22*	.30*	1

Note: SD, standard deviation; IUS-12, Intolerance of Uncertainty Scale, Short Form; IU, intolerance of uncertainty; GAD, generalized anxiety disorder; SAD, social anxiety disorder; OCD, obsessive compulsive disorder; PD, panic disorder; MCQ-neg, negative metacognitions subscale from the Meta-cognitions Questionnaire-30; BFNE-S, Brief Fear of Negative Evaluation Scale, Straightforward Items; OBQ-Res, responsibility subscale from the Obsessive-Beliefs Questionnaire-44; ACQ, Agoraphobic Cognitions Questionnaire; GAD-7, Generalized Anxiety Disorder-7; SIPS, Social Interaction Phobia Scale; OCI-R, Obsessive Compulsive Inventory-Revised; PADIS, The panic Disorder Screener

\* $p < 0.01$ .

## 3.1. Measurement models

In order to test the dimensionality of each subscale, independent CFA was performed to examine the measurement model of each variable employed in structural model. Modification indices and error covariance were performed for models with poor fit. The factor loadings of measurement models were significant and ranged from .63 to .98. All variables showed a unidimensional construct.

## 3.2. Structural model

The goodness of fit indices confirmed that the Shihata et al.'s model (2017) on uncertainty provided an acceptable fit with the data ( $\chi^2 / df = 2.75$ , CFI = .92, TLI = .91, SRMR = .06, RMSEA = .05). The structural model with standardized parameter is displayed in Fig. 1.

### 3.2.1. Generalized Anxiety Disorder symptoms

The direct effect of trait IU on generalized anxiety disorder symptoms was not significant ( $\beta = .08$ , SE = .18,  $p < .001$ , 95% CI = .22 – .39). The total indirect effect was significant ( $\beta = .59$ , SE = .17,  $p < .001$ , 95% CI = .31 – .87). Disorder-specific IU-GAD did not make a significant contribution ( $\beta = .05$ , SE = .12,  $p < .001$ , 95% CI = -.14 – .25). The only significant indirect path was observed between trait intolerance of uncertainty and GAD symptoms through negative metacognition ( $\beta = .51$ , SE = .13,  $p < .001$ , 95% CI = .29 – .74).

### 3.2.3. Social Anxiety Disorder symptoms

The direct effect ( $\beta = .15$ , SE = .05,  $p < .001$ , 95% CI = .05 – .24) and total indirect effect ( $\beta = .46$ , SE = .04,  $p < .001$ , 95% CI = .39 – .53) were both significant. In the indirect effect, disorder-specific intolerance of uncertainty ( $\beta = .34$ , SE = .05,  $p < .001$ , 95% CI = .25 – .43) had significant contribution on the social anxiety disorder symptoms, but fear of negative evaluation did not predict social anxiety disorder symptoms ( $\beta = .03$ , SE = .01,  $p < .001$ , 95% CI = .01 – .06).

### 3.2.4. Obsessive-Compulsive Disorder symptoms

The direct effect ( $\beta = .51$ , SE = .09,  $p < .001$ , 95% CI = .36 – .67) and total indirect effect ( $\beta = .15$ , SE = .07,  $p < .05$ , 95% CI = .03 – .28) were both significant. Within the indirect effect, inflated responsibility ( $\beta = .08$ , SE = .04,  $p < .001$ , 95% CI = .01 – .15), and disorder-specific IU-OCD did not predict obsessive-compulsive disorder symptoms ( $\beta = .05$ , SE = .05,  $p < .001$ , 95% CI = -.03 – .15).

### 3.2.5. Panic Disorder symptoms

The direct effect was not significant ( $\beta = -.13$ , SE = .07,  $p < .001$ , 95% CI = -.25 – .01), but total indirect effect had significant contribution ( $\beta = .47$ , SE = .07,  $p < .05$ , 95% CI = .36 – .59). Within the indirect effect, IU-PD ( $\beta = .29$ , SE = .04,  $p < .001$ , 95% CI = .22 – .37) and agoraphobic cognition ( $\beta = .16$ , SE = .05,  $p < .001$ , 95% CI = .07 – .25) made a significant contribution.

The model illustrated more variance in disorder-specific IU-GAD compared to disorder-specific IU-SAD, IU-OCD, and IU-PD (Table 3). In addition, the model predicted a higher level of variance in fear of negative evaluation, negative metacognitions, and inflated responsibility than agoraphobic cognitions. Finally, the model significantly predicted of variance in all symptom measures (30–61%).

#### Table 3

Proportion of variance ( $R^2$ ) in each construct explained by the final structural model.

Disorder	Disorder-specific IU	Cognitive Vulnerability	Symptoms
Generalized anxiety disorder	76%	65% (negative metacognition)	61%
Social anxiety disorder	45%	69% (Fear of negative evaluation)	61%
Obsessive-Compulsive disorder	52%	50% (Inflated responsibility)	46%
Panic Disorder	42%	41% (Agoraphobic cognition)	30%

## 4. Discussion

The present study evaluated validity of a hierarchical model of trait intolerance of uncertainty and disorder-specific intolerance of uncertainty (18) in Iranian university students, after controlling cognitive vulnerabilities. Results showed that the proposed model showed acceptable fit with data of Iranian students. This finding is in line with the Shihata et al. study (18).

Trait intolerance of uncertainty showed strong association with IU-GAD and negative metacognition. This finding was consistent with previous research representing the association between intolerance of uncertainty and other vulnerabilities (4). Contrary to our hypothesis, the direct effect between trait intolerance of uncertainty and generalized anxiety disorder symptoms was not significant, when IU-GAD and negative metacognition were considered in the path. This is not consistent with research indicating direct relationship between trait intolerance of uncertainty and generalized anxiety disorder symptoms (16). However, it should be considered that previous research studied only trait intolerance of uncertainty, not disorder-specific intolerance of uncertainty. Another potential explanation could be that the measure of disorder-specific IU-GAD assesses uncertainty widely (e.g. uncertainty about everything) and thus, this is similar to the trait intolerance of uncertainty (18). It seems that negative metacognition play role as a mediator between trait intolerance of uncertainty and generalized anxiety disorder symptoms. In other words, when negative metacognition was eliminated from the model, trait intolerance of uncertainty showed significant association with generalized anxiety disorder symptoms. According to these findings, it might be suggested that trait intolerance of uncertainty leads to symptoms of generalized anxiety disorder via metacognitive beliefs.

Our results suggest that there is a positive and significant association between trait intolerance of uncertainty and disorder-specific IU-SAD, fear of negative evaluation, and social anxiety disorder symptoms. This is consistent with previous studies suggesting intolerance of uncertainty is an important factor in development and maintenance of social anxiety disorder symptoms (5, 18). The findings of the model on social anxiety disorder showed that the direct path of trait intolerance of uncertainty to social anxiety disorder symptoms was significant, but when the disorder specific intolerance of uncertainty was included in the path as mediator variable, the statistical power of the path increased. This finding is in line with the research of Shihata et al. (18). Similarly, Boelen & Reijntjes (50) showed that trait intolerance of uncertainty predict social anxiety disorder symptoms after negative evaluation was controlled. The findings of this study may indicate that social anxiety symptoms are associated with IU-SAD rather than trait intolerance of uncertainty. Therefore, individuals with social anxiety disorder symptoms may benefit from treatments which focused on intolerance of uncertainty in social situations.

The results showed that there is a significant relationship between trait intolerance of uncertainty and IU-OCD, inflated responsibility, and obsessive-compulsive disorder symptoms. The trait intolerance of uncertainty was significantly correlated with symptoms of obsessive-compulsive disorder, which was consistent with previous studies showing that intolerance of uncertainty was an important factor in obsessive-compulsive disorder symptoms (18). This finding probably indicates that people with symptoms of obsessive-compulsive disorder are unable to adapt to unpredictable changes and need to assure that unpleasant changes will not occur. In line with this hypothesis, Buhr and Dugas (6) showed that doubts and checking behaviors in people with obsessive-compulsive disorder symptoms are most associated with intolerance of uncertainty. However, contrary to the research hypothesis and previous research findings (18), the relationship between IU-OCD and

obsessive-compulsive disorder symptoms was not significant. That is, IU-OCD did not lead to the obsessive-compulsive disorder symptoms. This finding may indicate that obsessive-compulsive disorder symptoms are more related to trait intolerance of uncertainty rather than IU-OCD. In addition, contrary to our hypothesis, the indirect pathway between trait intolerance of uncertainty and symptoms of obsessive-compulsive disorder was not significant through inflated responsibility. This finding was in line with the research of Shihata et al. (18). Also, Myers et al. (51) represented that inflated responsibility did not predict obsessive compulsive disorder symptoms. This finding was inconsistent with previous research showing the relationship between inflated responsibility and obsessive-compulsive disorder symptoms (18). The finding may suggest that people with symptoms of obsessive-compulsive who are not able to tolerate general uncertain situations, may represent obsessive-compulsive disorder symptoms, even without inflated responsibility. Therefore, intolerance of uncertainty may be more important in obsessive-compulsive disorder symptoms.

The findings of this study showed that trait intolerance of uncertainty lead to symptoms of panic disorder through two pathways. The first pathway was mediated by IU-PD, which was the strongest pathway for predicting symptoms of panic disorder and consistent with prior research (18). It can be said that uncertainty about the likelihood of a panic attack in the future eventuates attention to physical symptoms (such as a gradual increase in heart rate) and worries, and one may develop maladaptive avoidance behaviors that reduce uncertainty (52). The second pathway was mediated by agoraphobic cognitions, which was in line with the findings of Shihata et al.'s study (18). Thus, with increasing levels of trait intolerance of uncertainty and IU-PD, the severity of symptoms of panic disorder would increase with and without the mediation of agoraphobic cognitions. Contrary to the research hypothesis and previous research (18), when IU-PD and agoraphobic cognitions were considered in the pathway, trait intolerance of uncertainty had no significant direct effect on panic disorder symptoms. This finding was in contradiction with evidence showing that trait intolerance of uncertainty has a significant direct relationship with panic disorder symptoms (16, 52). It is worth mentioning that these studies only examined trait intolerance of uncertainty, and IU-PD had not been taken into account. However, the current finding was in line with some previous research (17, 30), which exhibited that IU-PD compared to trait intolerance of uncertainty has a greater effect on panic disorder symptoms. In general, it can be said that a cognitive core such as agoraphobic cognitions as well as IU-PD about the potential catastrophic consequences of somatic and physical symptoms may be the maintaining factors of panic disorder symptoms.

## 5. Conclusion

The findings suggest that individuals with anxiety disorders tend to have threatening interpretations of uncertain information, leading to higher levels of worry. In general, the results revealed that in social anxiety disorder symptoms and panic disorder symptoms, the disorder-specific intolerance of uncertainty explained more variance of the symptoms. However, in obsessive-compulsive disorder symptoms and generalized anxiety disorder symptoms, the trait intolerance of uncertainty explained more variance of the disorder symptoms, indicating that general states of uncertainty may be involved in the development and maintenance of symptoms of the obsessive-compulsive disorder and generalized anxiety disorder. Therefore, the findings of this study were in synchrony with a large number of studies identifying intolerance of uncertainty as a metacognition and general vulnerability to anxiety (4).

Interpretation and generalization of the findings of the present study should be done according to its limitations. First, the present study was conducted using a cross-sectional approach, which prevents the inference of causal relationships between variables. Therefore, future studies can examine the relationships between the variables studied in the present study through prospective longitudinal, and experimental studies. Second, in the present study, self-report tools were used to measure variables. This may put the findings at risk of bias. For this reason, prospective studies are needed to investigate more precisely the role of Intolerance of Uncertainty in anxiety disorders using multiple assessment tools. Finally, further research is needed to assess the generalizability of the findings to other demographic groups such as general and clinical populations.

## List Of Abbreviations

Intolerance of Uncertainty = IU; Generalized Anxiety Disorder = GAD; Post-Traumatic Stress Disorder = PTSD; Obsessive-Compulsive Disorder = OCD; Panic Disorder = PD; Intolerance of Uncertainty Scale, Short Form = IUS-12; Social Anxiety Disorder = SAD; Negative metacognitions subscale from the Meta-Cognitions Questionnaire-30 = MCQ-neg; Brief Fear of Negative Evaluation Scale, Straightforward Items = BFNE-S; Responsibility subscale from the Obsessive-Beliefs Questionnaire-44 = OBQ-Res; Agoraphobic Cognitions Questionnaire = ACQ; Generalized Anxiety Disorder-7 = GAD-7; Social Interaction Phobia Scale = SIPS; Obsessive Compulsive Inventory-Revised = OCI-R; The panic Disorder Screener = PADIS; Confirmatory Factor Analysis = CFA; Tucker-Lewis Index = TLI; Comparative Fit Index = CFI, Root Mean square Error of Approximation = RMSEA; Standard Root Mean square Residual = SRMR.

## Declarations

### Ethics approval and consent to participate

participants who agreed to sign a written informed consent were asked to complete the questionnaires. Ethical review board of University of Social Welfare and Rehabilitation Sciences approved the study procedure (Code of Ethics: 1397.144). All methods were carried out in accordance of the institutional guidelines and conforming to the ethical standards of the declaration of Helsinki.

### Consent for publication

Identifiable demographic information has been removed from this manuscript to ensure anonymity. Thus, the consent to publish is not applicable.

### Availability of the data

University of Social Welfare and Rehabilitation Sciences has approved and supported that only researchers of the manuscript will have access to the dataset, so the data used in this study is not available for public view. Still, requests can be written officially to the Farhad Taremian, Email: [fa.taremian@uswr.ac.ir](mailto:fa.taremian@uswr.ac.ir), Tel: (98) 9121451697.

### Competing Interest

The authors have no actual or potential conflicts of interest including any financial, personal or other relationships with other people or organizations within three years of beginning the work submitted that could inappropriately influence their work.

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University of Social Welfare and Rehabilitation Sciences financially supported this research. However, the university had no role in designing, gathering and analyzing the data, and preparing the manuscript.

### Authors' Contribution

RM, FT designed and supervised the research. FM and HP conducted the study. Also, RM analyzed the data and wrote the manuscript. All authors have read and approved the manuscript.

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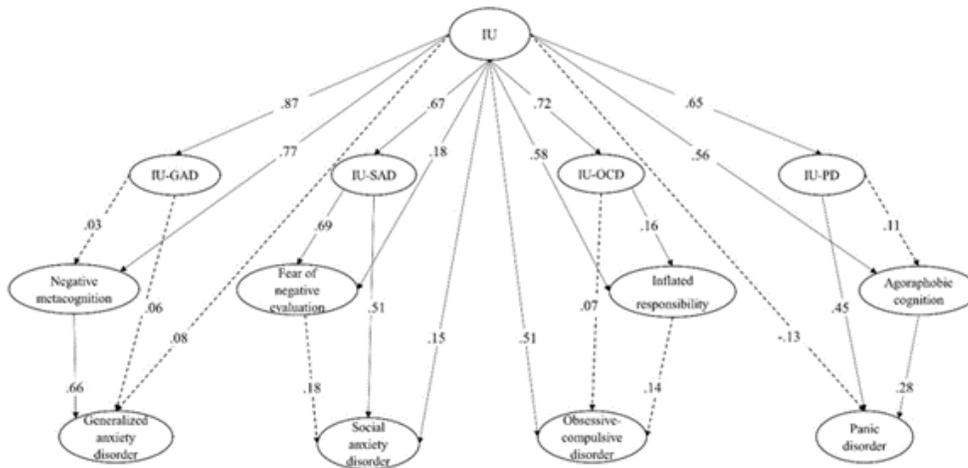
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## Figures



**Figure 1**

Structural model with direct pathways. Standardized path coefficients are shown. Significant pathways are continuous, whereas non-significant pathways are dashed. IU = trait intolerance of uncertainty, GAD = generalized anxiety disorder, SAD = social anxiety disorder, OCD = obsessive-compulsive disorder, PD = panic disorder. IU-GAD, IU-SAD, IU-OCD, and IU-PD are disorder-specific IU latent constructs.  $p < .01$ .