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Validation of the intolerance of uncertainty scale-12 in a sample of pregnant people



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Abstract

Background Intolerance of uncertainty (IU) has been proposed as a transdiagnostic mechanism driving anxiety, depression, and eating disorder symptoms. Pregnancy is a time of significant uncertainty, yet few studies have examined the measurement of IU and its impacts on pregnant people. The current study aimed to examine the psychometric performance of two versions of the Intolerance of Uncertainty Scale (IUS-27 and IUS-12) and their associations with psychopathologies common in pregnancy.

Methods This study is a secondary analysis of participants (n = 254) recruited for a larger study of a single-session intervention targeting disordered eating in pregnancy. We examined fit of participant baseline data with IUS-27 and IUS-12 factor structures using confirmatory factor analyses. We also assessed associations between IU and emotion dysregulation and depression and eating disorder symptoms, controlling for age, parity, and perceived social status.

Results The IUS-12 provided superior fit to the data (CFI=0.95; TLI=0.93; RMSEA=0.09) compared to the IUS-27. The IUS-12 was significantly (all p < 0.05) correlated with measures of emotion dysregulation (r=0.67), depression (r=0.58), and eating disorders (r=0.37). Inhibitory IU rather than prospective IU was generally significantly associated with greater psychopathology (β range=0.46 – 3.51, p's < 0.01).

Conclusions Results from this study provide initial support for the IUS-12 as a valid measure of IU in pregnant people and suggest that IU is strongly associated with measures of depression, emotion dysregulation, and eating disorder behaviors in this population. Severe psychological distress in pregnancy has been linked to complications in gestation and delivery and overall poor birth outcomes. Clinicians and doctors should consider using the IUS-12 as a general measure of psychological distress among pregnant patients.

Trial registration The trial from which these data were drawn is registered at clinicaltrials.gov, NCT06129461 (registered on November 10, 2023).

Keywords Intolerance of uncertainty, Pregnancy, Factor structure, Intolerance of uncertainty scale, Confirmatory factor analysis

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Background

Pregnancy is typically a time characterized by both excitement and uncertainty [45]. Each pregnancy involves changing internal and physical states as well as concurrent worries about fetal viability and maternal health. In pregnant populations, greater uncertainty has been associated with less social support and poorer psychological well-being [12, 29]. Prolonged stress, in turn,



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is associated with increased risk of adverse outcomes during pregnancy, delivery, and the postpartum period [67]. Given our understanding of the potential significant impacts of uncertainty on the experience of pregnancy and mental health outcomes it is important to determine appropriate measurement of this construct in pregnant individuals.

Intolerance of uncertainty (IU) is a dimensional trait defined as an intolerance of ambiguity and/or uncertainty across different domains [10]. People with high levels of IU tend to report uncertainty as threatening, distressing, and unacceptable accompanied by heightened physiological arousal and stronger negative affective states [20, 53, 53, 54, 54]. This intolerance can lead to significant adverse psychological and behavioral outcomes. Research to date has demonstrated a significant association between IU and excessive worry [6], maladaptive emotion regulation [61], anxiety disorders [27, 40], and eating disorders [8] in non-pregnant samples. IU has been additionally linked to depression [6, 27], this association is typically similar to effect estimates of IU on anxiety disorders [49]. Based on these findings, IU has been proposed as a transdiagnostic mechanism that could potentially be targeted to relieve a variety of psychological symptoms [6, 49]. Interventions targeting IU have demonstrated effectiveness in reducing anxiety [23, 35].

Pregnancy is a high-risk period for the development and exacerbation of diverse psychopathologies. Perinatal anxiety and depression are two well-studied complications during pregnancy as they both significantly predict birth complications and post-partum anxiety and depression [22, 37]. Though these psychiatric disorders and symptoms occur frequently in pregnant people, oftentimes they go undetected [30]. Additionally, women with a history of or an active eating disorder are more likely to experience cognitive symptoms of an eating disorder and exhibit eating disorder behaviors throughout pregnancy [51]. Early detection and treatment are essential to mitigating risk and suffering in both parents and children.

Among pregnant people, higher IU is associated with lower levels of psychological well-being regardless of objective risk of negative outcomes or complications during pregnancy [14], though those with higher risk pregnancies tend to have qualitatively higher levels of IU compared to those with low risk pregnancies [12]. Most pregnant people experience some level of fear around the birthing experience regardless of parity status. More severe fear of childbirth was associated with higher levels of IU [25, 33]. These preliminary findings suggest that understanding measurement accuracy and exogenous factors that impact IU is important to the detection, prevention, and treatment of psychological disorders in the perinatal period. Currently, the Intolerance of Uncertainty Scale-27 (IUS-27; [9]) and the Intolerance of Uncertainty Scale-12 [63] are the most used self-report measures of IU. The IUS-27 has been demonstrated to be a valid and reliable measure of IU among clinical [46, 50] and community samples [5]. One study to date has explored the predictive validity of the IUS-27 in pregnant people and found that this measure is a useful metric for screening and detecting perinatal anxiety disorders [26]. However, since IU is demonstrated to be a transdiagnostic mechanism [6], examination of IU and its relation to symptoms of other psychiatric disorders in pregnancy is warranted. Furthermore, the validity of measures of IU has not been examined among pregnant populations.

This study sought to examine the psychometric properties of both the IUS-27 and IUS-12 in a sample of pregnant people using a series of confirmatory factor analyses (CFA) to determine the most appropriate measure of IU during pregnancy. This study further examined the relationship of IU as a transdiagnostic risk and maintaining factor for emotion dysregulation, depression, and eating disorder symptoms. We planned to use the measure with the best fit indices (IUS-27 vs. IUS-12) to explore the measurement's associations with measures of emotion dysregulation, depression, and eating disorder symptoms. We predicted that the best fit measure of IU will be more strongly associated with measures of emotion dysregulation and eating disorders, and less strongly associated with a measure of depression.

Research on the impact of exogenous factors on the measurement of IU in pregnant populations remains limited, highlighting the need to explore how these factors influence self-report measures. Certain social factors have been found to exacerbate anxiety, depression, and eating disorder symptoms. Those with a higher perceived social status tend to report overall better physical health, particularly in the United States [19]. Additionally, parity and age have been preliminarily associated with emotional disorders among pregnant populations such that multipara parents typically report higher levels of both anxiety and depression during pregnancy [21]. In addition, age has been demonstrated to have an inverse relationship with symptoms of anxiety [4], while symptoms of depression appear to either follow a U-shaped pattern with lowest levels in middle age [2, 65] or linearly increase across time [64]. Based on these findings, our exploratory hypothesis was that age, parity, and perceived social status will significantly contribute to the variance in scores on the best fitting IU measure.

Methods

Participants

Data for this study came from 269 pregnant people enrolled in a larger study examining the impact of a single session acceptance and commitment therapy intervention on eating disorder symptoms among pregnant people [38]. Participants were recruited via the Prolific platform [56] and provided a waiver of consent prior to completing a battery of self-report online questionnaires. Inclusion criteria for this study required participants to be 18 years or older, reside within the United States, read and write fluently in English, and currently pregnant. Participants (n = 15) were excluded from the study if they reported a due date that was more than 30 days from a probable due date calculated by the researcher from participants' responses to the number of weeks pregnant at the time of survey completion. This resulted in a total of 254 participants included in the analyses reported here.

The Institutional Review Board at the University at Albany, State University of New York approved this study protocol. Participants received monetary compensation for their participation and, as part of the larger study, a subset of participants were provided with a free single session intervention aimed at reducing the adverse impact of food cravings on eating behaviors [38]. All data in this study were collected at baseline prior to the administration of any intervention. Participant demographics are presented in Table 1. Time to complete the survey (M=28.67 min, SD=47.36 min) was examined as a check for data quality, no participants were excluded based on their time to complete the survey.

The larger study from which the data for this study was collected is registered on clinicaltrials.gov (NCT06129461).

Measures

Participants completed a brief demographic survey prior to responding to a battery of self-report questionnaires. Participants were asked their current age, race and ethnicity, and employment. In addition, participants were asked to provide information relevant to their pregnancy, including weeks gestation at the time of survey completion, expected due date, and parity, before completing the following measures:

Intolerance of Uncertainty Scale (IUS-27; [9]): The IUS-27 is a 27-item self-report measure of various cognitive and behavioral aspects of intolerance of uncertainty. Participants rate each item on a five-point Likert scale (1=Not at all characteristic of me; 5 = Entirely characteristic of me) with higher scores indicating a greater intolerance of uncertainty. Items are added to create a total score (range: 27 – 135) and two subscales ("Uncertainty

Table 1 Participant demographics

Variable	N=254 ¹
Age (years)	30.35 (5.28)
Weeks Pregnant	21.96 (9.79)
Number of Babies Currently Pregnant With	
1	244 (96.4)
2	9 (3.6)
Unknown	<5 (<5)
Current BMI	29.83 (8.80)
Unknown	<5 (<5)
Preconception BMI (kg/m ²)	27.60 (8.51)
Unknown	<5 (<5)
Race/Ethnicity	
Asian	13 (5.1)
Black, African, or African American	36 (14.2)
Hispanic or Latine	27 (10.6)
More than One Race	15 (5.9)
Native Hawaiian and Other Pacific Islander	<5 (<5)
Unknown	<5 (<5)
White	160 (63.0)
Gender Identity	
Female	249 (98.0)
Gender Diverse	<5 (<5)
Unknown	<5 (<5)
Perceived Social Status	
1	10 (3.9)
2	23 (9.1)
3	87 (34.3)
4	115 (45.3)
5	17 (6.7)
6	<5 (<5)
Highest Level of Education	
<high school<="" td=""><td><5 (<5)</td></high>	<5 (<5)
High School/GED	26 (10.2)
Some College	50 (19.7)
2-Year College	22 (8.7)
4-Year College	108 (42.5)
Master's Degree	36 (14.2)
Doctoral Degree	<5 (<5)
Professional Degree	<5 (<5)
Technical Degree	<5 (<5)
Marital Status	
Single (Never Married)	48 (19.0)
Married or in a Domestic Partnership	198 (78.3)
Divorced	<5 (<5)
Separated	<5 (<5)
Other	<5 (<5)
Unknown	<5 (<5)
Employment Status	
Full-Time	138 (54.3)
Part-Time	27 (10.6)

Table 1 (continued)

Variable	$N = 254^{1}$
Unemployed & Looking for Work	14 (5.5)
Unemployed & Not Looking for Work	< 5 (< 5)
Student	6 (2.4)
Homemaker	40 (15.7)
Self-Employed	18 (7.1)
Unable to Work	<5 (<5)
Other	6 (2.4)
Total Annual Household Income	
<\$40,000	50 (19.7)
\$40,000-\$59,999	31 (12.2)
\$60,000-\$79,999	43 (16.9)
\$80,000-\$99,000	32 (12.6)
\$100,000 or More	98 (38.6)
Number of Prior Pregnancies	1.51 (1.68)
Number of Prior Births	1.09 (1.37)
Unknown	<5 (<5)
Parity	
Primigravida	84 (33.1)
Multigravida	170 (66.9)

 1 Mean (SD); n (%). Confidentiality of participants was maintained by removing ns of cells with fewer than 5 participants

has negative behavioral and self-referent implications" and "Uncertainty is unfair and spoils everything"; [63]).

Intolerance of Uncertainty Scale-12 (IUS-12; Carleton et al.): The IUS-12 is a short form self-report measure of IU derived from the IUS-27. Items are summed to create a total score and two subscales ("Prospective IU" and "Inhibitory IU"). The IUS-12 has been validated among community [13] and clinical populations [50]. There has been debate over which form of the IUS to use, though preliminary evidence suggests that the IUS-12 is a more accurate measurement of IU and is gender invariant [57]. No studies to date have examined the psychometric properties of the IUS-12 nor the IUS-27 in pregnant people.

Difficulties in Emotion Regulation Scale (DERS-36; [31]): The DERS-36 is a 36-item self-report measure of multiple aspects of emotion regulation including emotional awareness, activation, and acceptance. Participants rate each item on a five-point Likert scale (1=Almost Never; 5=Almost Always). The DERS-36 has six subscales, but the current study examined the total score exclusively which is the sum of all items (Cronbach's α =0.96). Total scores on the DERS-36 range from 36 – 180, and among community samples scores of 75.26 are considered normal and scores 116.13 and above indicate severe emotion dysregulation [11]. The DERS-36 was included here based on prior work suggesting that

greater difficulties in emotion regulation are indicative of elevated levels of depression [42], anxiety [15], and eating disorders [47].

Edinburgh Postnatal Depression Scale (EPDS; [17]): The EPDS is a 10-item self-report measure of depressive symptoms during the perinatal period. Items are rated on a four-point Likert scale and summed to create a total score (range: 0–30; baseline Cronbach's α =0.90). A total score of 12/13 or higher is used as a cutoff for a high likelihood of a depressive disorder and 9/10 as "possible depression" [17]. The EPDS has been widely validated as a screening measure for depression among pregnant people though it is best used as a rule-out for depression rather as a rule in [28]. The measure was included here to try and replicate documented links between IU and depressive symptoms in non-pregnant populations.

Prenatal Eating Behaviors Screening Tool (PEBS; [16]): The PEBS is a 12-item self-report measure of eating attitudes and behaviors specifically during pregnancy and suitable for screening pregnant people for eating disorders across all trimesters. Participants rate each item on a five-point Likert scale and a total score is derived from adding all items together. A total score of 39 or higher is indicative of an eating disorder [16]. The PEBS was administered to examine hypothesized links between IU and disordered eating behaviors in pregnancy. Baseline Cronbach's α was 0.88 for this study.

Perceived Social Status Scale (PSS; [3]): The perceived social status scale is a measure of subjective social status and has been demonstrated to significantly correlate with psychological and physical well-being [62]. Participants are asked to consider their position in society including education, salary, and living situation and then place themselves on a rung of an imagined ladder. The ladder has six rungs, with the sixth and highest rung representing people who are most well-off and the first and lowest rung representing people who are worst-off.

Statistical analyses

All statistical analyses were conducted in RStudio v. 4.3 [60]. Responses to all psychological measures that were above or below the 95th and 5th percentiles, respectively, were winsorized and included in analyses. We assessed fit of the data with the established IUS-27 and IUS-12 factor structures in confirmatory factor analysis (CFA) using the "lavaan" package [59] and specifying an oblique rotation following what was done by Sexton and Dugas [63] and Carleton et al. [13]. We examined the comparative fit indices (CFI), Tucker-Lewis Index (TLI), and root mean square error of approximation (RMSEA) for model fit using recommended coefficients [39].

The IUS has a robust theoretical foundation with a well-defined factor structure that has been replicated

in diverse populations. We conducted CFA, rather than exploratory factor analyses, because our main aim was to test whether these established structures hold in a novel population of pregnant individuals, rather than exploring potential new factor structures. This approach is comparable to that taken in similar prior studies [36, 44, 68]. This study is a secondary analysis of an existing data set; as such, there was no a priori power analysis. Of note, our sample size exceeded the common recommendation of a minimum 4:1 ration of respondents to variables to ensure stability of a factor solution [48], and approximates the more conservative guidance to include at least 10 respondents per parameter [43].

Regression analyses using the "lavaan" package [59] were used to examine the relationships between the best fitting measure of IU and relevant and related measures of depression and eating disorder symptoms. Given that IU has been strongly implicated in emotion regulation processes, we examined the relationship between the IUS-12 and DERS-36 to determine convergent validity. Age, parity, and perceived social status were added to the models as covariates on theoretical grounds. For all regression analyses only participants with complete data were included (n = 224).

Results

Item means, standard deviations, and skewness are reported in Table 2 for all 27-items on the IUS. Higher scores on IUS-27 items are reflective of a higher intolerance of uncertainty. Average scores on the EPDS were above the threshold for possible depression (M=9.76, SD=5.90) and participants also endorsed elevated levels of difficulties in emotion regulation on the DERS-36 (M=87.99, SD=25.18). On measures of eating disorder symptoms and behaviors, participants reported a mean score on the PEBS of 20.15 (SD=7.02), which is below the established cutoff of 39 for the possible presence of an eating disorder diagnosis.

Confirmatory factor analysis of the IUS-27

Item reliability measures for all 27-items indicated excellent internal reliability (Cronbach's α =0.97; omega=0.97). Participants reported a mean total score of 73.78 (*SD*=22.81). Participants on average reported similar mean scores on both IUS-27 subscales ("Uncertainty has negative behavioral and self-referent implications:" M=37.14, *SD*=13.58, Cronbach's α =0.95; "Uncertainty is unfair and spoils everything:" M=36.76; *SD*=11.35, Cronbach's α =0.94). The two-factor structure of the IUS-27 resulted in good fit to the data (CFI=0.90; TLI=0.89; RMSEA=0.08). Path diagrams showing standardized path coefficients are represented in Fig. 1A.

Variable	Mean	SD	Skewness	
IUS 1	2.84	1.15	0.04	
IUS 2	2.15	1.07	0.72	
IUS 3	2.39	1.12	0.58	
IUS 4	2.69	1.21	0.24	
IUS 5	2.76	1.27	0.15	
IUS 6	3.33	1.24	-0.40	
IUS 7	2.98 1.26		-0.06	
IUS 8	S 8 3.54		-0.49	
IUS 9	2.48	1.21	0.41	
IUS 10	3.21	1.12	-0.36	
IUS 11	2.97	1.26	-0.06	
IUS 12	2.40	1.19	0.45	
IUS 13	2.17	1.10	0.63	
IUS 14	2.38	1.15	0.48	
IUS 15	2.49	1.20	0.43	
IUS 16	2.77	1.35	0.17	
IUS 17	2.77	1.24	0.11	
IUS 18	3.36	1.14	-0.44	
IUS 19	2.87	1.30	0.06	
IUS 20	2.75	1.26	0.12	
IUS 21	3.24	1.12	-0.39	
IUS 22	2.54	1.19	0.31	
IUS 23	2.38	1.28	0.49	
IUS 24	2.52	1.24	0.38	
IUS 25	2.33	1.13	0.50	
IUS 26	2.84	1.21	0.08	
IUS 27 2.94 1.30			0.02	

IUS Intolerance of uncertainty scale, SD Standard deviation

Confirmatory factor analysis of the IUS-12

Participants in our sample reported a mean total score on the IUS-12 of 34.56 (SD = 10.30) and significantly higher scores on the Prospective IU scale (M = 22.19, SD = 6.56) than on Inhibitory IU (M = 12.43, SD = 5.01), t(500) = 18.7, p < 0.001. Internal reliability coefficients indicated that the IUS-12 had excellent internal reliability (Total score Cronbach's $\alpha = 0.94$; omega = 0.94; Prospective IU Cronbach's $\alpha = 0.89$; Inhibitory IU Cronbach's $\alpha = 0.89$). The IUS-12 had excellent fit to the data (CFI=0.95; TLI=0.93; RMSEA=0.09) and standardized path coefficients are represented in Fig. 1B. Even though the data demonstrated acceptable fit with both the IUS-27 and IUS-12 factor structure, the short version of the scale performed relatively better as reflected in the fit statistics examined. We therefore chose to proceed with the IUS-12 for all subsequent analyses.



Fig. 1 Standardized fit coefficients for confirmatory factor analyses. *Note.* Figure A depicts confirmatory factor analyses for the Intolerance of Uncertainty Scale-27; "fac1"="Uncertainty has negative behavioral and self-referent implications"; "fac2"="Uncertainty is unfair and spoils everything"; IUS = Intolerance of Uncertainty Scale. Figure B depicts confirmatory factor analyses for the Intolerance of Uncertainty Scale-12; "fac1"="Prospective Intolerance of Uncertainty"; "fac2"="Inhibitory Intolerance of Uncertainty"; "fac2"="Inhibitory Intolerance of Uncertainty"]

 Table 3
 Means, standard deviations, and correlations with confidence intervals

Variable	М	SD	1	2	3
1. IUS-12	34.56	10.30			
2. PEBS	20.15	7.00	.35**		
			[.24, .46]		
3. DERS-36	88.00	24.22	.64**	.40**	
			[.56, .71]	[.30, .50]	
4. EPDS	9.76	5.90	.58*	.41**	.66**
			[.49, .65]	[.30, .51]	[.58, .72]

M and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation [18]. * indicates p < .05. ** indicates p < .01. *IUS-12* Intolerance of Uncertainty Scale-12, *PEBS* Perinatal Eating Behaviors Scale, *DERS-36* Difficulty in Emotion Regulation Scale, *EPDS* Edinburgh Postnatal Depression Scale

Validity and regression analyses

Parametric correlations were run between the IUS-12 total scores and total scores of the other self-report measures (Table 3). The IUS-12 total scores demonstrated convergent validity with the DERS-36 (r=0.64) and EPDS (r=0.58). The IUS-12 was significantly and moderately correlated with the PEBS (r=0.35).

Next, we used a stepwise analysis to assess the amount of variance for each outcome accounted for by IU. The first step of the model included demographic variables (i.e., age, parity, perceived social status), and the second step introduced scores for the two subscale of the IUS-12 (Table 4). Step two models accounted for more variance in outcome scores on the EPDS, DERS-36 and PEBS compared to step one (ΔR^2 range=0.16 – 0.41). When incorporating IUS-12 subscale scores, age, parity, and trimester did not significantly contribute to any models. The higher rungs on PSS scale (levels 3–6) significantly contributed to the step one model for the EPDS, but only rungs 4–5 were significant predictors in step two of lower levels of perinatal depression (β 's = -3.26 and -4.48, respectfully),. The Inhibitory IU subscale (Factor 2) was the only subscale that was significantly predictive of total scores on the EPDS (β =0.62, p<0.01), DERS-36 (β =3.51, p<0.01) and PEBS (β =0.46, p<0.01).

Discussion

Given that pregnancy is a time characterized by significant uncertainty for most, the reliable measurement of IU across all trimesters is critical. The objective of this study was to determine the most appropriate measure of IU among pregnant people using a series of confirmatory factor analyses. Though both CFAs suggested adequate fit, overall, the IUS-12 provided the best fit to the data. Specifically, the Inhibitory IU subscale was the most significant contributor to the association with depressive symptoms, difficulties in emotion regulation and pathological eating behaviors.

IU has been described as a transdiagnostic trait that is associated with anxiety, depression, and eating disorders [49]. Pregnant people are susceptible to these psychological symptoms, but emphasis is typically placed on medical care of both the mother and baby at the expense of mental health. Psychological symptoms are still largely stigmatized and mostly conceptualized to be a postpartum issue [24, 55]. Early detection across diagnoses is essential to better treatment outcomes for most psychiatric disorders and to reduce suffering among patients [41].

The IUS-12 showed a notable correlation to measures of emotion regulation and perinatal depression and a smaller, moderate correlation with eating disorders (Table 3). Previous research has examined the IUS-27 as a screening tool for perinatal anxiety [26], but to date, this is the first study to validate the IUS-12 and consider it as a transdiagnostic measure of emotion dysregulation,

	Outcome	EPDS Model 1	EPDS Model 2	DERS-36 Model 1	DERS-36 Model 2	PEBS Model 1	PEBS Model 2
Variable	Ь						
Intercept		21.14**	4.35	134.27**	52.24**	19.35**	4.41
Multigravida		0.05	0.33	-2.08	-0.64	0.89	1.12
Age		-0.21**	-0.04	-0.90**	-0.06	0.03	0.17
Trimester 2		0.41	0.05	3.55	1.90	0.42	0.06
Trimester 3		0.20	0.25	1.11	1.24	0.69	0.77
PSS 2		-1.20	0.78	-12.77	-2.73	-0.67	1.03
PSS 3		-4.48*	-1.61	-18.10*	-3.46	-1.47	0.97
PSS 4		-6.93**	-3.26*	-23.08**	-4.37	-1.64	1.48
PSS 5		-8.14**	-4.48*	-20.97*	-1.46	0.03	2.99
PSS 6		-8.61*	-3.32	-22.62	4.16	3.58	8.12
IUS Factor 1		-	0.04	-	-0.15	-	0.10
IUS Factor 2		-	0.62**	-	3.51**	-	0.46**
R ²		0.17**	0.45**	0.08*	0.50**	0.02	0.17**
ΔR^2		-	0.27**	-	0.41**	-	0.16**

 Table 4
 Unadjusted multiple linear regression results including demographic variables and Intolerance of Uncertainty Scale-12

 subscales as predictors
 Subscales as predictors

Values represent unstandardized regression weights. Model 1 = multiple regression including demographic variables only. Model 2 = multiple regression including demographic variables and IUS-12 subscales. * indicates p < .05. ** indicates p < .01. PSS Perceived social status, IUS Factor 1 "Prospective Intolerance of Uncertainty", IUS Factor 2 "Inhibitory Intolerance of Uncertainty", EPDS Edenborough Perinatal Depression Scale, DERS-36 Difficulty in Emotion Regulation Scale, PEBS Prenatal Eating Behavior Scale

depression, and eating disorder symptoms using factor analysis among pregnant people. The IUS-12 can be used as a valid measure to indicate general psychological distress during pregnancy.

Multiple linear regressions examining the IUS-12 as a predictor of each outcome indicated that IU accounted for a significant amount of the variance across measures and drove a large portion of variance in total scores on the DERS-36, consistent with previous literature [61]. The DERS-36 has been associated with various anxiety disorders [32], eating disorders [34], and obsessive compulsive disorder [32]. The characteristic of viewing uncertain events and situations as threatening and intolerable is associated with both higher levels of anxiety and emotion dysregulation, which makes sense when considering that obsessive and compulsive behaviors are thought to reduce anxiety and uncertainty [1, 66]. These findings also align with previous literature suggesting that IU contributes significantly to eating disorder symptoms [8] and extends these findings to suggest that IU plays a significant role in psychological distress during pregnancy.

When examining exogenous variables that may contribute to outcomes associated with general psychological distress, contrary to our hypotheses, parity and trimester were not associated with measures of eating disorder symptoms, emotional dysregulation, and depression. However middle and higher PSS was associated with lower depression scores above and beyond IU. These findings might suggest that prior experience and pregnancy status do not have much influence on reports of symptomology especially when accounting for IU. Studies examining parity and IU have identified various findings on the impact of parity on anxiety, worry, depression, and IU [7, 58].

Limitations and future directions

Our study was a secondary analysis relying on data from a larger study. Though our sample size was consistent with comparable validation studies of the IUS [9], and fit indices for both the IUS-27 and the IUS-12 were good, they likely would be more substantial with a larger sample size. As our sample was comprised of people interested in participating in an intervention study, it is likely that our sample had a higher incidence of psychiatric symptoms, which may explain a higher average depression score in our sample. Future research should seek to replicate findings in larger clinical and non-clinical samples. Furthermore, our study did not examine IU measurement in relation to other measures of transdiagnostic traits including trait anxiety. Our study was unable to determine the specificity of IU in this population, and a future study would benefit from this consideration [52]. Additionally, future studies should examine the transdiagnostic predictability of the IUS-12 for anxiety, depression, and eating disorders among pregnant people. This current study did not collect information on psychiatric diagnoses and this prevented us from examining predictive validity of the IUS-12 for these various disorders similar to the examination conducted by Furtado et al. [26] on sensitivity and screening for anxiety disorders.

Conclusion

The current study was the first to investigate the factor structure of the IUS-27 and the IUS-12 among pregnant people and its transdiagnostic properties. Results from this study indicate that the IUS-12 would sufficiently capture IU among pregnant people across trimester. Additionally, the short form of the IUS-12 is less of a burden to complete by patients and to score/ interpret by clinicians. Higher scores on the IUS-12 were significantly associated with more severe reports for depression, emotional dysregulation, and eating disorder symptoms. This implies that the IUS-12 would likely assist clinicians in screening for general transdiagnostic psychological distress. Pregnancy is often a time when people have increased contact with medical professionals, which allows for more oversight and opportunities for administering life-saving interventions. Transdiagnostic measurements allow for less patient and clinician burden and may allow for early detection and intervention to take place mitigating risk to both parent and child.

Abbreviations

IU	Intolerance of Uncertainty;
IUS	Intolerance of Uncertainty Scale
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
TLI	Tucker Lewis Index
RMSEA	Root Mean Square Error of Approximation
DERS-36	Difficulties in Emotion Regulation Scale-36
PEBS	Perinatal Eating Behaviors Screening tool
EPDS	Edinburgh Postnatal Depression Scale
PSS	Perceived Social Status

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Authors' contributions

KC: data analysis and interpretation, manuscript preparation, study concept and design; C.A.T: data acquisition, study concept and design, and manuscript revisions; D.A.: manuscript revisions; J.H.: data acquisition, study concept and design, supervision, funding acquisition, project administration, and manuscript revisions.

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Data availability

All data is available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

All study procedures were approved by the Institutional Review Board at the University at Albany, State University of New York in accordance with the Helsinki Declaration. The Institutional Review Board granted a waiver of signed informed; all participants reviewed an informed consent form and indicated their consent to participate in the research by completing the study questionnaires.

Consent for publication

All authors read and approved the final manuscript.

Competing interests

The authors declare no competing interests.

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References

- Abramowitz, J. S., Taylor, S., & McKay, D. (2009). Obsessive-compulsive disorder. Lancet. 374(9688), 491–499. https://doi.org/10.1016/S0140-6736(09)60240-3
- Abrams, L. R., & Mehta, N. K. (2019). Changes in depressive symptoms over age among older Americans: Differences by gender, race/ethnicity, education, and birth cohort. SSM - Population Health, 7(100399). https:// doi.org/10.1016/j.ssmph.2019.100399
- Adler NE, Epel ES, Castellazzo G, Ickovics JR. Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy white women. Health Psychol. 2000;19(6):586–92. https://doi.org/10.1037/0278-6133.19.6.586.
- Basevitz P, Pushkar D, Chaikelson J, Conway M, Dalton C. Age-related differences in worry and related processes. The International Journal of Aging and Human Development. 2008;66(4):283–305. https://doi.org/10. 2190/AG.66.4.b.
- Birrell, J., Meares, K., Wilkinson, A., & Freeston, M. H. (2011). Toward a definition of intolerance of uncertainty: A review of factor analytical studies of the Intolerance of Uncertainty Scale. Clin Psych Rev. 31(7), 1198–1208. https://doi.org/10.1016/j.cpr.2011.07.009
- Boswell, J. F., Thompson-Hollands, J., Farchione, T. J., & Barlow, D. H. (2013). Intolerance of uncertainty: A common factor in the treatment of emotional disorders. J Clin Psych. 69(6), 630–645. https://doi.org/10.1002/jclp. 21965
- Brekalo M, Kuljanac A, Nakić Radoš S. Intolerance of uncertainty and fear of childbirth: Role of perceived preparedness for childbirth. Clínica y Salud. 2024;35:35–8. https://doi.org/10.5093/clysa2024a10.
- Brown M, Robinson L, Campione GC, Wuensch K, Hildebrandt T, Micali N. Intolerance of uncertainty in eating disorders: A systematic review and meta-analysis. Eur Eat Disord Rev. 2017;25(5):329–43. https://doi.org/10. 1002/erv.2523.
- Buhr K, Dugas MJ. The Intolerance of Uncertainty Scale: Psychometric properties of the English version. Behav Res Ther. 2002;40(8):931–45. https://doi.org/10.1016/s0005-7967(01)00092-4.
- Buhr K, Dugas MJ. The role of fear of anxiety and intolerance of uncertainty in worry: An experimental manipulation. Behav Res Ther. 2009;47(3):215–23. https://doi.org/10.1016/j.brat.2008.12.004.
- Burton, A. L., Brown, R., & Abbott, M. J. (2022). Overcoming difficulties in measuring emotional regulation: Assessing and comparing the psychometric properties of the DERS long and short forms. Cogent Psych. 9(1). https://doi.org/10.1080/23311908.2022.2060629
- Çankaya S, İbrahimoğlu T. Stress, anxiety, intolerance of uncertainty, and psychological well-being characteristics of pregnant women with and without threatened miscarriage: A case-control study. J Obstet Gynaecol. 2022;42(8):3577–83. https://doi.org/10.1080/01443615.2022.2158319.
- Carleton, R. N., Norton, M. A. P. J., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. J

Anxiety Disorders. 21(1), 105–117. https://doi.org/10.1016/j.janxdis.2006. 03.014

- 14. Çevik S, Yağmur Y. Impact of intolerance of uncertainty on psychological well-being in pregnant women with or without miscarriage risk. Perspect Psychiatr Care. 2018;54(3):436–40. https://doi.org/10.1111/ppc.12297.
- Cisler JM, Olatunji BO, Feldner MT, Forsyth JP. Emotion regulation and the anxiety disorders: An integrative review. J Psychopathol Behav Assess. 2010;32(1):68–82. https://doi.org/10.1007/s10862-009-9161-1.
- Claydon EA, Lilly CL, Ceglar JX, Dueñas-Garcia OF. Development and validation across trimester of the Prenatal Eating Behaviors Screening tool. Archives of Women's Health. 2022;25(4):705–16. https://doi.org/10.1007/ s00737-022-01230-y.
- Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry. 1987;150(6):782–6. https://doi.org/10.1192/bjp.150.6.782.
- Cumming G. The new statistics: Why and how. Psychol Sci. 2014;25(1):7– 29. https://doi.org/10.1177/0956797613504966.
- Cundiff JM, Matthews KA. Is subjective social status a unique correlate of physical health? A meta-analysis Health Psychology. 2017;36(12):1109–25. https://doi.org/10.1037/hea0000534.
- Cupid, J., Stewart, K. E., Sumantry, D., & Koerner, N. (2021). Feeling safe: Judgements of safety and anxiety as a function of worry and intolerance of uncertainty. Behav Res Ther. 147, 103973. https://doi.org/10.1016/j.brat. 2021.103973
- Dipietro JA, Costigan KA, Sipsma HL. Continuity in self-report measures of maternal anxiety, stress, and depressive symptoms from pregnancy through two years postpartum. J Psychosom Obstet Gynecol. 2008;29(2):115–24. https://doi.org/10.1080/01674820701701546.
- Dowse, E., Chan, S., Ebert, L., Wynne, O., Thomas, S., Jones, D., . . . Oldmeadow, C. (2020). Impact of perinatal depression and anxiety on birth outcomes: A retrospective data analysis. Matern Child Health J. 24(6), 718–726. https://doi.org/10.1007/s10995-020-02906-6
- Dugas, M. J., & Ladouceur, R. (2000). Treatment of GAD: Targeting intolerance of uncertainty in two types of worry. Beha Modification. 24(5), 635–657. https://doi.org/10.1177/0145445500245002
- Fleischman EK, Connelly CD, Calero P. Depression and anxiety, stigma, and social support among women in the postpartum period. Nursing for Women's Health. 2022;26(2):95–106. https://doi.org/10.1016/j.nwh.2022. 01.008.
- Flink IK, Engström J, Vastamäki S, Vixner L, Engman L. Expecting the uncertain: The applicability of the intolerance of uncertainty model on fear of childbirth. J Psychosom Obstet Gynecol. 2023;44(1):2243648. https://doi.org/10.1080/0167482X.2023.2243648.
- Furtado M, Frey BN, Green SM. Validation of the Intolerance of Uncertainty Scale as a screening tool for perinatal anxiety. BMC Pregnancy Childbirth. 2021;21(1):829. https://doi.org/10.1186/s12884-021-04296-1.
- Gentes EL, Ruscio AM. A meta-analysis of the relation of intolerance of uncertainty to symptoms of generalized anxiety disorder, major depressive disorder, and obsessive-compulsive disorder. Clin Psychol Rev. 2011;31(6):923–33. https://doi.org/10.1016/j.cpr.2011.05.001.
- Gibson, J., McKenzie-McHarg, K., Shakespeare, J., Price, J., & Gray, R. (2009). A systematic review of studies validating the Edinburgh Postnatal Depression Scale in antepartum and postpartum women. Acta Psychiatrica Scandinavica. 119(5), 350–364. https://doi.org/10.1111/j.1600-0447. 2009.01363.x
- Giurgescu C, Penckofer S, Maurer MC, Bryant FB. Impact of uncertainty, social support, and prenatal coping on the psychological well-being of high-risk pregnant women. Nurs Res. 2006;55(5):356–65. https://doi.org/ 10.1097/00006199-200609000-00008.
- Goodman JH, Tyer-Viola L. Detection, treatment, and referral of perinatal depression and anxiety by obstetrical providers. Journal of Women's Health. 2010;19(3):477–90. https://doi.org/10.1089/jwh.2008.1352.
- Gratz KL, Roemer L. Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the Difficulties in Emotion Regulation Scale. J Psychopathol Behav Assess. 2004;26(1):41–54. https://doi.org/10.1023/B:JOBA.0000007455.08539.94.
- Hallion LS, Steinman SA, Tolin DF, Diefenbach GJ. Psychometric properties of the difficulties in emotion regulation scale (DERS) and its short forms in adults with emotional disorders. Front Psychol. 2018;9:539. https://doi. org/10.3389/fpsyg.2018.00539.

- Han L, Bai H, Lun B, Li Y, Wang Y, Ni Q. The prevalence of fear of childbirth and its association with intolerance of uncertainty and coping styles among pregnant Chinese women during the COVID-19 pandemic. Front Psych. 2022;13: 935760. https://doi.org/10.3389/fpsyt. 2022.935760.
- Haynos AF, Roberto CA, Attia E. Examining the associations between emotion regulation difficulties, anxiety, and eating disorder severity among inpatients with anorexia nervosa. Compr Psychiatry. 2015;60:93–8. https://doi.org/10.1016/j.comppsych.2015.03.004.
- Hebert, E. A., & Dugas, M. J. (2019). Behavioral experiments for intolerance of uncertainty: Challenging the unknown in the treatment of generalized anxiety disorder. Cognitive and behavioral practice. 26(2), 421–436. https://doi.org/10.1016/j.cbpra.2018.07.007
- Helsen K, Van den Bussche E, Vlaeyen JW, Goubert L. Confirmatory factor analysis of the Dutch Intolerance of Uncertainty Scale: Comparison of the full and short version. J Behav Ther Exp Psychiatry. 2013;44(1):21–9. https://doi.org/10.1016/j.jbtep.2012.07.004.
- Heron J, O'Connor TG, Evans J, Golding J, Glover V. The course of anxiety and depression through pregnancy and the postpartum in a community sample. J Affect Disord. 2004;80(1):65–73. https://doi.org/ 10.1016/j.jad.2003.08.004.
- Hormes JM, Timko CA. A clinical trial protocol of a single-session selfguided acceptance-based online intervention targeting food cravings as predictors of disordered eating in pregnant people. Contemp Clin Trials. 2024;140: 107515. https://doi.org/10.1016/j.cct.2024.107515.
- Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equ Model. 1999;6(1):1–55. https://doi.org/10.1080/10705519909540118.
- Jensen D, Cohen JN, Mennin DS, Fresco DM, Heimberg RG. Clarifying the unique associations among intolerance of uncertainty, anxiety, and depression. Cognitive Behavior Therapy. 2016;45(6):431–44. https://doi. org/10.1080/16506073.2016.1197308.
- Johnson D, Dupuis G, Piche J, Clayborne Z, Colman I. Adult mental health outcomes of adolescent depression: A systematic review. Depress Anxiety. 2018;35(8):700–16. https://doi.org/10.1002/da.22777.
- 42. Joormann J, Stanton CH. Examining emotion regulation in depression: A review and future directions. Behav Res Ther. 2016;86:35–49. https:// doi.org/10.1016/j.brat.2016.07.007.
- 43. Kline, R. B. (2016). Principles and practice of structural equation modeling (4 ed.). New York: Guilford Press.
- Kumar S, Saini R, Jain R, Sakshi. Confirmatory factor analysis of the Intolerance of Uncertainty Scale (short form) in India. Int J Ment Health. 2022;51(4):361–80. https://doi.org/10.1080/00207411.2021.1969321.
- Larkin P, Begley CM, Devane D. Women's experiences of labour and birth: An evolutionary concept analysis. Midwifery. 2009;25(2):e49-59. https://doi.org/10.1016/j.midw.2007.07.010.
- 46. Lauriola M, Mosca O, Trentini C, Foschi R, Tambelli R, Carleton RN. The intolerance of Uncertainty Inventory: Validity and comparison of scoring methods to assess individuals screening positive for anxiety and depression. Front Psychol. 2018;9:388.
- Lavender, J. M., Wonderlich, S. A., Engel, S. G., Gordon, K. H., Kaye, W. H., & Mitchell, J. E. (2015). Dimensions of emotion dysregulation in anorexia nervosa and bulimia nervosa: A conceptual review of the empirical literature. *Clinical Psychology Review*, 40, 111–122. https://doi. org/10.1016/j.cpr.2015.05.010
- MacCallum RC, Widaman KF, Preacher KJ, Hong S. Sample Size in Factor Analysis: The Role of Model Error. Multivar Behav Res. 2001;36(4):611– 37. https://doi.org/10.1207/s15327906mbr3604_06.
- McEvoy, P. M., Hyett, M. P., Shihata, S., Price, J. E., & Strachan, L. (2019). The impact of methodological and measurement factors on transdiagnostic associations with intolerance of uncertainty: A meta-analysis. *Clinical Psychology Review*, 73, 101778. https://doi.org/10.1016/j.cpr. 2019.101778
- McEvoy PM, Mahoney AE. Achieving certainty about the structure of intolerance of uncertainty in a treatment-seeking sample with anxiety and depression. J Anxiety Disord. 2011;25(1):112–22. https://doi.org/10. 1016/j.janxdis.2010.08.010.
- Micali N, Treasure J, Simonoff E. Eating disorders symptoms in pregnancy: A longitudinal study of women with recent and past eating disorders and obesity. J Psychosom Res. 2007;63(3):297–303. https://doi.org/10.1016/j. jpsychores.2007.05.003.

- Morriss, J. (2023). Let's get specific about intolerance of uncertainty and emotion regulation. Personality and Individual Differences. 214, 112336. https://doi.org/10.1016/j.paid.2023.112336
- Morriss J, Abend R, Zika O, Bradford DE, Mertens G. Neural and psychophysiological markers of intolerance of uncertainty. Int J Psychophysiol. 2023;184:94–9. https://doi.org/10.1016/j.ijpsycho.2023.01.003.
- Morriss J, Goh K, Hirsch CR, Dodd HF. Intolerance of uncertainty heightens negative emotional states and dampens positive emotional states. Front Psych. 2023;14:1147970. https://doi.org/10.3389/fpsyt.2023.1147970.
- Pinto-Foltz MD, Logsdon MC. Stigma towards mental illness: A concept analysis using postpartum depression as an exemplar. Issues Ment Health Nurs. 2008;29(1):21–36. https://doi.org/10.1080/01612840701748698.
- 56. Prolific. In. (2024). (Version May, 2024) www.prolific.com
- Roma VG, Hope DA. Are we certain about which measure of intolerance of uncertainty to use yet? Cogn Behav Ther. 2017;46(4):327–38. https:// doi.org/10.1080/16506073.2016.1252792.
- Rondung E, Ekdahl J, Sundin Ö. Potential mechanisms in fear of birth: The role of pain catastrophizing and intolerance of uncertainty. Birth. 2019;46(1):61–8. https://doi.org/10.1111/birt.12368.
- 59. Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. J Stat Software. 48(2), 1–36. https://doi.org/10.18637/jss.v048.i02
- 60. RStudio Team. (2019). RStudio: Integrated development for R (Version 4.0) [Software]. RStudio, Inc, PBC. https://www.rstudio.com/.
- Sahib, A., Chen, J., Cárdenas, D., & Calear, A. L. (2023). Intolerance of uncertainty and emotion regulation: A meta-analytic and systematic review. Clin Psych Rev. 101, 102270. https://doi.org/10.1016/j.cpr.2023.102270
- Scott, K. M., Al-Hamzawi, A. O., Andrade, L. H., Borges, G., Caldas-de-Almeida, J. M., Fiestas, F., . . . Kessler, R. C. (2014). Associations between subjective social status and DSM-IV mental disorders: Results from the world mental health surveys. JAMA Psych. 71(12), 1400–1408. https://doi. org/10.1001/jamapsychiatry.2014.1337
- Sexton KA, Dugas MJ. Defining distinct negative beliefs about uncertainty: Validating the factor structure of the Intolerance of Uncertainty Scale. Psychol Assess. 2009;21(2):176–86. https://doi.org/10.1037/a0015827.
- Stordal, E., Mykletun, A., & Dahl, A. A. (2003). The association between age and depression in the general population: A multivariate examination. Acta Psychiatrica Scandinavica. 107(2), 132–141. https://doi.org/10.1034/j. 1600-0447.2003.02056.x
- Sutin AR, Terracciano A, Milaneschi Y, An Y, Ferrucci L, Zonderman AB. The trajectory of depressive symptoms across the adult life span. JAMA Psychiat. 2013;70(8):803–11. https://doi.org/10.1001/jamapsychiatry.2013.193.
- Tolin, D. F., Abramowitz, J. S., Brigidi, B. D., & Foa, E. B. (2003). Intolerance of uncertainty in obsessive-compulsive disorder. J Anxiety Dis. 17(2), 233–242. https://doi.org/10.1016/S0887-6185(02)00182-2
- Traylor CS, Johnson JD, Kimmel MC, Manuck TA. Effects of psychological stress on adverse pregnancy outcomes and nonpharmacologic approaches for reduction: An expert review. American Journal of Obstetrics & Gynecology MFM. 2020;2(4): 100229. https://doi.org/10.1016/j. ajogmf.2020.100229.
- Wilson EJ, Stapinski L, Dueber DM, Rapee RM, Burton AL, Abbott MJ. Psychometric properties of the Intolerance of Uncertainty Scale-12 in generalized anxiety disorder: Assessment of factor structure, measurement properties and clinical utility. J Anxiety Disord. 2020;76: 102309. https://doi.org/10.1016/j.janxdis.2020.102309.

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