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The Role of Intolerance of Uncertainty in Anxiety Disorders: A Systematic Review of the Literature

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Abstract

Intolerance of Uncertainty (IU), defined as the tendency to react negatively to uncertain situations, has gained recognition as a transdiagnostic factor implicated in various anxiety disorders. This systematic review explores the relationship between IU and anxiety disorders, emphasizing its conceptualization, measurement, and treatment. Anxiety disorders, including generalized anxiety disorder, social anxiety disorder, and obsessive-compulsive disorder, affect millions globally and significantly impair quality of life. Although existing treatments provide some relief, a deeper understanding of IU may enhance the development of targeted and effective interventions. This review systematically searched Scopus and Web of Science databases using predefined keywords related to "anxiety disorder" and "intolerance of uncertainty," yielding 2,299 initial records. Following a rigorous screening process based on PRISMA guidelines, including title/abstract screening, full-text review, and quality assessment, 42 studies met the inclusion criteria. The findings were organized into three main themes: (1) conceptualizing and measuring IU, including the development and validation of assessment tools; (2) examining IU in specific contexts and populations across developmental stages, catastrophic events and disorders; and (3) evaluating interventions targeting IU, such as Cognitive Behavioral Therapy (CBT), Acceptance and Commitment Therapy (ACT), and mindfulness-based approaches. Where applicable, quantitative synthesis explored correlations between IU and anxiety symptom severity. The review concludes that IU is a significant factor in the development and maintenance of anxiety disorders. Future research should focus on refining measurement tools, identifying mechanisms linking IU to specific anxiety presentations, and further developing targeted interventions. These findings have important implications for clinical practice and future research, underscoring the need to address IU in the treatment of anxiety disorders.

Keywords: Anxiety Disorders, Intolerance Uncertainty, Cognitive Behavior Therapy, Acceptance and Commitment Therapy, Mindfulness Therapy

Introduction

Anxiety disorders are among the most prevalent and debilitating mental health conditions globally, significantly impacting individuals' functioning and quality of life (Alomari et al., 2022; Humer et al., 2020). The disorders are characterized by persistent fear, excessive worry, and avoidance behaviors, which interfere with daily activities and emotional well-being (Abend, 2023). Within the broader landscape of cognitive vulnerabilities associated with anxiety, intolerance of uncertainty (IU) has emerged as a critical factor influencing the onset, maintenance, and severity of the symptoms (Bakioğlu et al., 2021; Satici et al., 2022).

IU refers to a dispositional difficulty in accepting the unknown. Individuals with high IU often experience discomfort, distress, or anxiety in situations involving ambiguity or unpredictability. This trait frequently leads to maladaptive responses such as chronic worry, reassurance-seeking, and avoidance of uncertain circumstances (Inozu et al., 2023). While IU was initially conceptualized within models of generalized anxiety disorder (GAD), research increasingly recognizes it as a transdiagnostic construct underlying various anxiety-related conditions, including obsessive-compulsive disorder (OCD), social anxiety disorder (SAD) and panic disorder (PD) (Carleton et al., 2012; McEvoy & Mahoney, 2012; Penney et al., 2020).

The influence of IU on these disorders lies in how uncertainty is perceived and processed. Individuals with high levels of IU often interpret uncertain situations as inherently threatening, which can lead to exaggerated cognitive appraisals and heightened anxiety (Mento et al., 2022; Neville et al., 2021). For example, in GAD, IU contributes to pervasive and uncontrollable worry about future events. In OCD, it manifests in compulsive behaviors aimed at reducing ambiguity. In the context of health anxiety, minor or ambiguous bodily sensations are catastrophically interpreted as indicators of serious illness, further increasing psychological distress (Grayson, 2010; Wilson et al., 2023; Korte et al., 2022).

These psychological mechanisms are also reflected in neurobiological research. Studies have shown that individuals with high IU exhibit heightened activity in the amygdala and prefrontal cortex, which are brain regions involved in emotional regulation and threat detection (Simmons et al., 2008). Neuroimaging findings suggest that this neural hyper-responsivity to uncertainty contributes to an overactive fear response and physiological dysregulation (Brosschot et al., 2015).

Cultural and contextual variables further shape how IU is expressed and its impact on mental health. In societies that emphasize control, certainty, and rigid belief systems, individuals may be more prone to developing high levels of IU, which can increase their vulnerability to anxiety disorders (Cargile & Bolkan, 2013; Liao et al., 2016). On the other hand, adaptive psychological strategies, such as mindfulness practices and cognitive-behavioral interventions, can help individuals develop greater tolerance for uncertainty by reducing catastrophic thinking and encouraging more flexible responses (Evers et al., 2023; Fang et al., 2022).

From a clinical standpoint, addressing IU through established therapeutic approaches such as cognitive-behavioral therapy and exposure-based treatments has shown promising results. These interventions can help reduce anxiety symptoms by enhancing emotional resilience and enabling individuals to manage ambiguous situations more effectively

(Robichaud, 2013). Incorporating IU-specific techniques into existing treatment frameworks may further improve outcomes, particularly for those who are highly sensitive to uncertainty.

In summary, IU is a core transdiagnostic process that influences the cognitive and emotional patterns seen in multiple anxiety disorders. A deeper understanding of IU, informed by psychological, neurobiological, and cultural perspectives, can guide the development of more targeted and effective therapeutic interventions. Continued research in this area is crucial for advancing clinical practice and enhancing mental health outcomes across diverse populations.

Literature Review

IU has increasingly been recognized as a significant factor in the onset and maintenance of anxiety disorders. It is characterized by a cognitive bias in which individuals interpret uncertain situations as threatening, often resulting in maladaptive responses, such as worry and rumination (Yook et al., 2010). Although IU was initially identified as central to GAD, research has since expanded its relevance to other anxiety-related conditions, including OCD and SAD (Boelen & Reijntjes, 2009; Holaway et al., 2006).

The transdiagnostic nature of IU has been supported by numerous empirical studies demonstrating its significant association with GAD, OCD, and SAD. Importantly, these associations often remain even when controlling for comorbid symptoms such as depression (Boelen & Reijntjes, 2009; Carleton et al., 2012). Moreover, IU has been shown to mediate the relationship between neuroticism and anxiety symptoms, further highlighting its relevance as a potential therapeutic target (McEvoy & Mahoney, 2012).

Research has also begun to explore IU in children and adolescents. A meta-analysis by Osmanağaoğlu et al. (2018) found that IU accounts for a substantial proportion of the variance in anxiety and worry among younger populations. IU has similarly been linked to health anxiety and anxiety sensitivity in youth, reinforcing its broad influence across developmental stages (Wright et al., 2016). Theoretical models propose that both trait-level IU and disorder-specific IU contribute to anxiety symptoms, often indirectly via cognitive vulnerabilities (Shihata et al., 2017). These findings underscore the importance of including IU in clinical models and interventions for anxiety disorders across the lifespan (Carleton, 2012).

Numerous studies support the conceptualization of IU as a dispositional tendency to respond negatively to uncertainty. While traditionally emphasized in GAD, IU has been implicated in a wide range of anxiety disorders, including SAD, OCD, panic disorder, and post-traumatic stress disorder (PTSD) (Carleton et al., 2012; Mahoney & McEvoy, 2012). For instance, individuals with SAD and OCD exhibit elevated IU levels, suggesting that IU exacerbates both the cognitive and emotional symptoms of these conditions (Holaway et al., 2006; Shihata et al., 2017; Counsell et al., 2017). Such findings indicate that IU may act as a shared underlying process in anxiety pathology.

The relationship between IU and anxiety is further complicated by its interaction with other cognitive constructs. IU has been associated with maladaptive beliefs, including a fear of negative evaluation, negative metacognitive beliefs, and cognitive inflexibility (Shihata et al., 2017; Ren et al., 2021). Although IU is commonly linked to GAD and OCD, its impact

appears more modest in panic disorder (Holaway et al., 2006; Gentes & Ruscio, 2011), indicating potential disorder-specific expressions. Understanding these differences is crucial for developing nuanced, disorder-sensitive interventions (Mahoney & McEvoy, 2012; Counsell et al., 2017; McEvoy et al., 2019).

In the context of trauma, individuals with high IU tend to experience increased worry and catastrophic thinking, contributing to elevated PTSD symptoms (Arbona et al., 2022). IU appears to foster cognitive rigidity, hindering trauma processing and encouraging avoidance behaviors that maintain symptom severity (Fetzner et al., 2013). High IU also promotes maladaptive coping strategies such as reassurance-seeking, safety behaviors, and cognitive avoidance (Carleton et al., 2012). This tendency to interpret ambiguous stimuli as threatening may contribute to chronic anxiety and prolonged psychological distress (Doruk et al., 2015).

Empirical studies have reinforced IU's role in PTSD. For example, Oglesby et al. (2017) found that individuals high in IU experienced prolonged distress following traumatic exposure, with increased rumination and difficulty adapting to uncertainty. This aligns with Ehlers and Clark's (2000) cognitive model of PTSD, which posits that IU facilitates negative trauma appraisals, intrusive memories, and avoidance patterns that maintain distress.

Given its significance, IU has become a focus of therapeutic interventions. CBT, particularly in forms adapted to address IU, has shown effectiveness in reducing anxiety symptoms (Dugas & Robichaud, 2007). These interventions often include cognitive restructuring to challenge maladaptive beliefs about uncertainty and behavioral experiments to build tolerance. Dugas et al. (2010), for example, developed IU-focused CBT protocols that incorporate psychoeducation, cognitive modification, and exposure to uncertain scenarios.

In parallel, mindfulness-based therapies such as Acceptance and Commitment Therapy (ACT) and Mindfulness-Based Stress Reduction (MBSR) have demonstrated effectiveness in decreasing IU (Fayazbakhsh & Mansouri, 2019; Kraemer et al., 2016). These approaches help individuals accept uncertainty without attempting to eliminate it, thereby reducing the anxiety linked to avoidance and control efforts (Roemer et al., 2009). Exposure-based strategies, such as imaginal and in vivo exposure, also help desensitize individuals to uncertainty and reduce their fear responses over time (Mahoney & McEvoy, 2012).

Pharmacological interventions, particularly Selective Serotonin Reuptake Inhibitors (SSRIs), have been considered as a means to address IU-related anxiety (Garakani et al., 2020; Zemestani et al., 2021). However, the evidence is currently inconclusive, with psychological therapies generally demonstrating more consistent results in modifying IU-related cognitive processes.

Research Questions

Research questions are central to a systematic literature review (SLR), as they establish the direction, scope, and analytical focus of the entire review process. They serve as the foundation for identifying relevant studies, determining inclusion and exclusion criteria, and synthesizing findings. A well-formulated research question ensures the review remains focused, systematic, and comprehensive, thereby minimizing bias and enhancing the reliability of the results. Moreover, clearly defined questions support structured data

extraction and thematic analysis, allowing for the generation of meaningful and actionable conclusions.

Research questions not only guide the literature search and data synthesis but also enhance the transparency and reproducibility of the SLR. By articulating precise questions, the review process becomes more traceable, enabling other researchers to replicate or expand upon the study. Ultimately, research questions align the literature review with the overarching goals, whether identifying knowledge gaps, evaluating the effectiveness of interventions, or tracking conceptual trends in a particular domain, thus forming the backbone of a rigorous and impactful review.

Following the guidance of Kitchenham (2007), this study emphasizes that specifying research questions is not only essential during the planning phase but is also the most critical component throughout the entire review process. Given the objective of this SLR, to identify and analyze the role of Intolerance of Uncertainty (IU) in anxiety disorders, the PICo framework was used to structure the research questions. This framework, commonly used in qualitative research, was proposed by Lockwood et al. (2015) and comprises three key elements:

a) Population (P): The group or demographic under investigation, such as a particular patient group or community.
b) Interest (I): The central phenomenon or issue being explored, such as experiences, behaviors, or psychological traits.
c) Context (Co): The situational or environmental setting in which the research is situated, including cultural or geographical aspects.

This approach ensures clarity and comprehensiveness when developing research questions. Using the PICo model, this review addressed the following three research questions:

a) How can IU be effectively conceptualized and measured in individuals with anxiety disorders across diverse cultural contexts?
b) How does IU influence the development and persistence of anxiety symptoms in trauma survivors, and what role does it play in post-traumatic stress?
c) What are the most effective therapeutic interventions for reducing IU and alleviating anxiety symptoms in individuals with high IU?

Materials and Methods

This review adopted the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology to ensure transparency, consistency, and completeness throughout the review process, as outlined by Page et al. (2021). PRISMA provides a structured framework for conducting systematic reviews, thereby enhancing the rigor and credibility of evidence synthesis. It also emphasizes the importance of randomized studies and empirical research in minimizing bias and improving the robustness of findings.

Two comprehensive and reputable databases, Scopus and Web of Science, were selected for the literature search due to their extensive coverage of peer-reviewed publications in psychology and related fields. The search process adhered to the four key

phases of the PRISMA approach: identification, screening, eligibility assessment, and data abstraction.

Identification

The review began with an extensive literature search using carefully selected keywords and related terms derived from dictionaries, thesauri, encyclopedias, and prior studies. The search strings were designed to target articles addressing both "anxiety disorders" and "intolerance of uncertainty." These strings were applied to Scopus and Web of Science databases, resulting in an initial yield of 2,299 records. Table 1 below presents the database-specific search parameters and filters used.

Table 1
The Research Strings

Scopus	**TITLE-ABS-KEY (anxiety AND disorder AND intolerance AND uncertainty) AND (LIMIT-TO (PUBYEAR , 2024)) AND (LIMIT-TO (SUBJAREA , "PSYC")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j"))** **Date of Access: February 2025**
WoS	Refine results for anxiety AND disorder AND intolerance AND uncertainty (All Fields) and 2024 (Publication Years) and Article (Document Types) and Psychology Multidisciplinary (Web of Science Categories) and Psychology (Research Areas) **Date of Access: February 2025**

Screening

In the screening phase, duplicate entries were removed (n=5), and the remaining records (n=2,294) were assessed for relevance based on title and abstract. Articles were excluded if they failed to address IU or anxiety disorders. A total of 75 records remained after the initial screening and were assessed against specific inclusion and exclusion criteria, as shown in Table 2.

Table 2
The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2024	< 2023
Literature type	Journal (Article)	Conference, Book, Review
Publication stage	Final	In Press
Subject area	Psychology	Besides Psychology

Only articles published in English during 2024 and appearing in final publication form within psychology journals were included.

Eligibility

At the eligibility stage, 75 full-text articles were reviewed in detail to determine alignment with the review objectives. Articles were excluded for various reasons, including irrelevance to the study's focus at IU, lack of empirical data, unavailability of full-text access, or poor alignment with the study's conceptual framework. As a result, 33 studies were excluded, leaving a final sample of 42 articles for full review and synthesis.

Data Abstraction and Analysis

The final 42 articles underwent an integrative analysis, combining findings across multiple study designs (primarily quantitative) to identify relevant themes and subthemes. The process began with data extraction, wherein each article was reviewed for content aligned with the study's objectives. Figure 1 illustrates the PRISMA flow diagram, representing the selection and analysis process. The details of the primary studies database are shown in Table 3.

Authors collaborated to analyze and compare the content of each study, identifying patterns and differences in findings related to IU and anxiety disorders. A logbook was maintained to track observations, emerging codes, and analytical reflections throughout the process. Any disagreements in thematic categorization were resolved through discussion among the authors.

To ensure validity, an expert panel comprising specialists in psychology and counseling reviewed the emerging themes. This step enhanced domain relevance and clarity. Adjustments were made based on expert feedback, and themes were refined to ensure conceptual consistency and applicability.

Table 3
Number and details of Primary Studies Database

No.	Authors	Title	Year	Scopus	WoS
1	Patel D.S., Webster S.N., Dowling E.J., Knowles C.R., Lockwood-Taylor G., Coutts-Bain D., Simons L.E., Diver E.J., Chilcot J., Schapira L., Heathcote L.C.	Scanxiety and Fear of Recurrence in Young Adult Female Breast and Gynaecological Cancer Survivors: Investigating Shared Mechanisms	2024	/	
2	Kou Y., Xing H., Zheng R., Wu Y., Feng S., Zou F., Zhang M.	Excessive avoidance bias towards uncertain faces in non-clinical social anxiety individuals	2024	/	
3	Zhou X., Huang L., Becker B., Dou H., Wang J., Zhang X., Mei Y., Li H., Lei Y.	Intolerance of uncertainty enhances adolescent fear generalization in both perceptual-based and category-based tasks: fNIRS studies	2024	/	
4	Underwood S.B., White S.V., Forsyth J.P.	Acceptance and Commitment Therapy (ACT) and Self-Compassion for	2024	/	

		Generalized Anxiety Disorder and Comorbid Major Depressive Disorder: A Case Study		
5	Li X., Yang Y., Wang R., Zhou L., Zheng X.	Secure attachment priming inhibits the generalization of conditioned fear	2024	/
6	Azadbakht M., Momeni K., Yazdanbakhsh K.	An Evolutionary Model for the Etiology of Obsessive-Compulsive Disorder: The Mediating Role of Emotional Awareness and Uncertainty Intolerance in the Relationship between Childhood Fears and Behavioral Brain Systems with Obsessive-Compulsive Disorder in Secondary School Students of Kouhdasht City	2024	/
7	Sahib A., Chen J., Cárdenas D., Calear A.L., Wilson C.	Emotion regulation mediates the relation between intolerance of uncertainty and emotion difficulties: A longitudinal investigation	2024	/
8	Freeston M., Sermin-Reed L., Whittaker S., Worbey J., Jopling C.	Extreme weather, climate change, climate action and uncertainty distress: an exploratory study using network analysis	2024	/
9	Malbec M., Andreatta M., Wieser M.J.	Multimodal assessment of the role of intolerance of uncertainty in fear acquisition and extinction	2024	/
10	Morriss J., Rodriguez-Sobstel C., Steinman S.A.	Intolerance of Uncertainty is Associated with Heightened Arousal During Extinction Learning and Retention: Preliminary Evidence from a Clinical Sample with Anxiety and Obsessive-Compulsive Disorders	2024	/
11	Breaux R., Naragon-Gainey K., Katz B.A., Starr L.R., Stewart J.G., Teachman B.A.,	Intolerance of uncertainty as a predictor of anxiety severity and trajectory	2024	/

	Burkhouse K.L., Caulfield M.K., Cha C.B., Cooper S.E., Dalmaijer E., Kriegshauser K., Kusmierski S., Ladouceur C.D., Asmundson G.J.G., Davis Goodwine D.M., Fried E.I., Gratch I., Kendall P.C., Lissek S., Manbeck A., McFayden T.C., Price R.B., Roecklein K., Wright A.G.C., Yovel I., Hallion L.S.	during the COVID-19 pandemic			
12	Altan-Atalay A., Abdulcebbar A., Kantarcı L., Yılmaz E.	The roles of intolerance of uncertainty and mindfulness in psychological distress: a two-wave longitudinal study	2024	/	/
13	Morriss J., Lee C.E., Wood A., Zhang J., Seabrooke T.	Attentional bias to uncertainty-based information: a conceptual replication of Fergus et al. (2013)	2024	/	
14	Hülsdonk A., Pohl A., Appel H., Wolters C.	Checking the Uncertain Can Intolerance of Uncertainty and Illness Anxiety Predict Health-Related Safety Behaviors? [Body Checking: Sagen Unsicherheitsintoleranz und Krankheitsangst gesundheitsbezogenes Sicherheitsverhalten vorher?]	2024	/	
15	Jin L., Zamudio G., Wang C.D.C., Lin S.	Insecure attachment and eating disorder symptoms: Intolerance of uncertainty and emotion regulation as mediators	2024	/	
16	Kusec A., Murphy F.C., Peers P.V., Manly T.	Measuring Intolerance of Uncertainty After Acquired Brain Injury: Factor Structure, Reliability, and Validity of the Intolerance of Uncertainty Scale–12	2024	/	
17	Levent-Krauskopff S., Guedj M.	The psychological consequences of long COVID. The effect of uncertainties, coping strategies, social support systems and quality of life	2024	/	

		on the onset of depression [Les conséquences psychologiques du COVID long. Effet des incertitudes, des stratégies de coping, du soutien social et de la qualité de vie sur la dépression]		
18	Broos H.C., Dev A.S., Llabre M.M., Saab P.G., Timpano K.R.	Trait and situation-specific intolerance of uncertainty predict affective symptoms during the COVID-19 pandemic	2024	/
19	Bottera A.R., Dougherty E.N., Todorov S., Wildes J.E.	Fear of negative evaluation and intolerance of uncertainty: Assessing potential internalizing correlates of eating disorder-related clinical impairment and differences across diagnostic presentations	2024	/
20	Byam L.J., Penney A.M.	COVID-19 anxiety and its relation to anxiety-related disorder symptoms and mechanisms	2024	/
21	Anna B., Mónika K.	Psychometric properties of the Hungarian version of the Intolerance of Uncertainty Scale-Short Version (IUS-12) [A rövidített Bizonytalanságtűrés Skála magyar változatának pszichometriai tulajdonságai]	2024	/
22	Sternheim L.C., Bijsterbosch J.M., Wever M.C.M., van Elburg A.A., Frank G.K.W.	Examining anxious temperament in anorexia nervosa: Behavioural inhibition and intolerance of uncertainty and their contribution to trait anxiety in adolescents with anorexia nervosa	2024	/
23	Adamis A.M., Cole D.A., Olatunji B.O.	Intolerance of Uncertainty and Worry Prospectively Predict	2024	/

		COVID-19 Anxiety and Distress: A 4-Year Longitudinal Study		
24	Barnowski A., Brown K., Movahedi Y., Friedberg R.D.	A Toolbox for Use During the Post-Pandemic Era: Preparing Youth for Re-entry	2024	/
25	Goldwert D., Dev A.S., Broos H.C., Broad K., Timpano K.R.	The impact of anxiety and intolerance of uncertainty on climate change distress, policy support, and pro-environmental behaviour	2024	/
26	Zemestani M., Ezzati S., Nasiri F., Gallagher M.W., Barlow D.H., Kendall P.C.	A culturally adapted unified protocol for transdiagnostic treatment of anxiety disorders in adolescents (UP-A): A randomized waitlist-controlled trial	2024	/
27	Iannattone S., Spaggiari S., Di Riso D., Bottesi G.	Profiles of intolerance of uncertainty, separation anxiety, and negative affectivity in emerging adulthood: A person-centered approach	2024	/
28	Kruglanski A.W., Ellenberg M., Contu F., Pierro A.	Expecting the Worst: Why Uncertainty is Scary (But Often Isn't)	2024	/
29	Marsh H.J., Rock A.J., Clark G.I.	Adult attachment and OCD symptoms: the mediating role of intolerance of uncertainty and beliefs about losing control	2024	/
30	Bilge Y., Emiral E., Demirci H.	Early Aftermath of February 6 Earthquakes in Turkey: PTSD, PTG, and Resilience	2024	/
31	Morse J.L., Luong G., Prince M.A., Steger M.F.	Disentangling trait and daily experiences of uncertainty and meaning in life: implications for daily anxiety, negative affect, and somatic symptoms	2024	/
32	Keefer A., Singh V., Jang Y.S., Alon L., Surmacz M., Holingue C., Mostofsky S.H., Vasa R.A.	Exploring the Symptom Profiles of Intolerance of Uncertainty in Autistic Children	2024	/

33	Avila-Toscano, JH; Vargas-Delgado, LJ; Badillo-Rueda, YA; Arrieta, LC; Guerrero, JA	Serial mediation analysis of the relationship between uncertainty intolerance and statistical anxiety in university students	2024	/
34	Hedley, FE; Larsen, E; Mohanty, A; Liu, JZ; Jin, JW	Understanding anxiety through uncertainty quantification	2024	/
35	Chaaya, R; Hallit, R; Postigo, A; Malaeb, D; Sakr, F; Dabbous, M; Alhuwailah, A; Shuwiekh, HAM; Obeid, S; Fekih-Romdhane, F; Hallit, S	Psychometric properties of the Arabic version of the intolerance of uncertainty scale: a multinational study	2024	/
36	Tör-Çabuk, K; Koç, V	Cognitive bias modification for perfectionism and intolerance of uncertainty: A randomized controlled trial	2024	/
37	Ye, HX; Shi, XY; Li, YY; Huang, YK; You, RY; Zhang, XT; Yu, ZJ; Li, HL; Fan, F	A new way to conceptualize intolerance of uncertainty among adolescents: Embracing the network perspective	2024	/
38	Wang, SJ; Zhang, YL; Zhang, YM; Sun, Y	The effect of intolerance of uncertainty on smartphone addiction: a moderated mediation model of self-regulatory fatigue and feeling of the passage of time	2024	/
39	Gao, Y; Fan, M; Li, Y; Zhao, SC; Chen, W; Zhang, DH; Zheng, XF	Contingency Reversal in Conditioned Fear Learning: The Moderated Mediation Model of Intolerance of Uncertainty and Instruction	2024	/
40	Cuesta-Zamora, C; Stokes, C; Ricarte, J; Plateau, CR	The role of intolerance of uncertainty on body dissatisfaction and compulsive exercise in female university students: an experimental study	2024	/
41	Sang, ZY; Chen, HF; Yeung, JWK; Xu, LL	The Association Between Intolerance of Uncertainty and Mobile Phone Addiction Among	2024	/

		Overseas Chinese Students During COVID-19: The Mediating Roles of Perceived Stress and Rumination		
42	Levent-Krauskopff, S; Guedj, M	The psychological consequences of long COVID. The effect of uncertainties, coping strategies, social support systems and quality of life on the onset of depression	2024	/

Quality Appraisal

To ensure methodological rigor and the reliability of synthesized findings, a structured quality appraisal process was conducted for all 42 selected primary studies. The appraisal was based on the framework proposed by Kitchenham and Charters (2007) and employed a six-item checklist developed by Abouzahra et al. (2020). Each study was independently evaluated by three experts in the fields of psychology and counseling.

The following six Quality Assessment (QA) criteria were used:

a) QA1: Is the purpose of the study clearly stated?
b) QA2: Is the interest and the usefulness of the work clearly presented?
c) QA3: Is the study methodology clearly established?
d) QA4: Are the concepts of the approach clearly defined?
e) QA5: Is the work compared and measured with other similar work?
f) QA6: Are the limitations of the work clearly mentioned?

Each criterion was scored as follows:

a) “Yes” (1 point): Criterion fully met
b) “Partly” (0.5 points): Criterion somewhat met with gaps
c) “No” (0 points): Criterion not met

The scores for each criterion were totaled to yield a final quality score per study. A cumulative threshold of >3.0 (out of 6.0) was set as the minimum requirement for inclusion in the thematic synthesis.

The quality scores revealed that most studies performed strongly on criteria such as clearly defined objectives (QA1), relevance (QA2), and methodological clarity (QA3). However, a subset of studies scored lower on conceptual definition (QA4), comparative analysis (QA5), and reporting of limitations (QA6). These patterns highlight ongoing challenges in transparency and conceptual clarity within the IU literature.

Table 4 summarizes the QA scores for all included studies. Studies scoring between 5.0 and 6.0 (e.g., PS3, PS5, PS9, PS10, PS17, PS23, PS26, PS33, PS35, and PS42) demonstrated the highest methodological quality, reflecting well-defined concepts, rigorous methodology, and complete reporting. Lower-scoring studies (e.g., PS13, PS20, PS24, PS27, PS28, PS34, and PS37) often lacked sufficient detail in methodological reporting or theoretical grounding,

although they still met the minimum threshold for inclusion. This appraisal process ensures that the evidence base for the current review is methodologically sound and fit for synthesis. Moreover, it reinforces the importance of a clear research design, conceptual articulation, and disclosure of limitations in future IU-related studies. The consistent use of expert consensus throughout the scoring process enhanced the reliability and validity of the assessments.

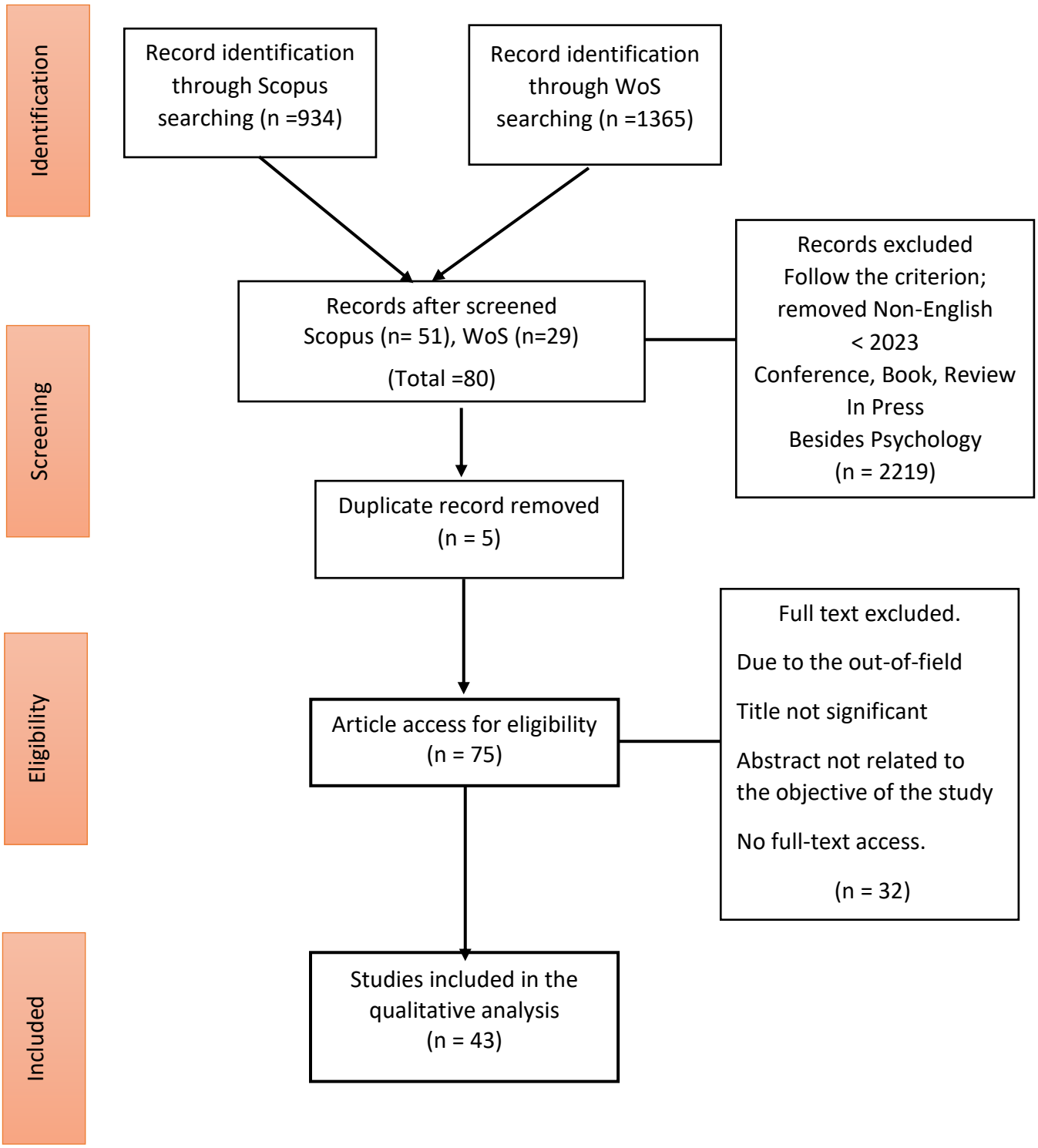

Figure 1. Flow diagram of the proposed searching study

Results and Findings

Background of selected study: Based on quality assessment, Table 4 shows the result of assessment performance for selected primary studies.

Here is the quality assessment table for the selected papers:

Table 4

The quality appraisal table

Paper	QA1	QA2	QA3	QA4	QA5	QA6	Total Mark	Percentage (%)
PS1	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	Y (1)	5.5	91.67%
PS2	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	5.5	91.67%
PS3	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6	100%
PS4	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	Y (1)	5.5	91.67%
PS5	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6	100%
PS6	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	Y (1)	5.5	91.67%
PS7	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6	100%
PS8	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	Y (1)	5.5	91.67%
PS9	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6	100%
PS10	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6	100%
PS11	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	Y (1)	5.5	91.67%
PS12	Y (1)	Y (1)	Y (1)	Y (1)	N (0)	P (0.5)	4.5	75.00%
PS13	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	N (0)	4.0	66.67%
PS14	Y (1)	Y (1)	Y (1)	P (0.5)	N (0)	Y (1)	4.5	75.00%
PS15	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6.0	100.00%
PS16	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5.0	83.33%
PS17	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6.0	100.00%
PS18	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5.0	83.33%
PS19	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	5.5	91.67%
PS20	Y (1)	Y (1)	Y (1)	P (0.5)	N (0)	P (0.5)	4.0	66.67%
PS21	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5	83.3%
PS22	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5	83.3%
PS23	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6	100%
PS24	Y (1)	Y (1)	P (0.5)	P (0.5)	P (0.5)	P (0.5)	4	66.7%

PS25	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	5.5	91.7%
PS26	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6	100%
PS27	Y (1)	Y (1)	P (0.5)	P (0.5)	P (0.5)	P (0.5)	4	66.7%
PS28	Y (1)	Y (1)	P (0.5)	P (0.5)	P (0.5)	P (0.5)	4	66.7%
PS29	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	5.5	91.7%
PS30	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5	83.3%
PS31	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5.0	83.3%
PS32	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5.0	83.3%
PS33	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6.0	100%
PS34	Y (1)	Y (1)	P (0.5)	P (0.5)	N (0)	N (0)	3.0	50.0%
PS35	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6.0	100%
PS36	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5.0	83.3%
PS37	Y (1)	Y (1)	P (0.5)	P (0.5)	P (0.5)	N (0)	3.5	58.3%
PS38	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5.0	83.3%
PS39	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5.0	83.3%
PS40	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	P (0.5)	5.0	83.3%
PS41	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	P (0.5)	5.5	91.7%
PS42	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	Y (1)	6.0	100%

Following quality assessment, 42 primary studies were selected for inclusion. These studies were evaluated based on methodological rigor, relevance to the research questions, and alignment with the review's thematic focus. The quality appraisal table (Table 4) summarizes the scoring outcomes across six evaluation criteria, derived from the guidelines by Kitchenham and Charters (2007) and the quality assessment framework developed by Abouzahra et al. (2020).

Each study was independently reviewed by experts who assessed the following criteria: clarity of purpose, significance, methodological soundness, conceptual definitions, comparative analysis, and acknowledgment of limitations. A scoring rubric was applied, with each criterion rated as "Yes" (1 point), "Partly" (0.5 points), or "No" (0 points). Studies needed a cumulative score above 3.0 to qualify for inclusion. This approach ensured that only methodologically sound and relevant research contributed to the findings.

The majority of included studies demonstrated high methodological standards, particularly in clearly defining objectives, employing appropriate research methods, and presenting useful comparative analyses. Conversely, studies with lower scores often lacked

detailed explanations of limitations or provided insufficient information on sampling and statistical analyses.

These trends highlight a critical need for future research to adopt more rigorous methodological practices and transparent reporting, particularly in areas such as construct measurement, cross-cultural validation, and analysis of IU across clinical populations.

To ensure conceptual integrity and consistency, three experts reviewed the emergent subthemes. Discrepancies during analysis were addressed through collaborative discussion and expert feedback. The resulting themes were refined to ensure both theoretical alignment and practical relevance.

Conceptualizing and Measuring IU

Recent studies have refined the conceptualization and assessment of IU, advancing from a unidimensional to a multidimensional construct. This shift emphasizes the need to distinguish IU from related traits such as neuroticism or anxiety sensitivity to accurately identify its unique contribution to anxiety pathology (Kusec et al., 2024; Sahib et al., 2024; Altan-Atalay et al., 2024). To support this effort, multiple studies have developed and validated psychometric tools that demonstrate reliability across diverse cultural and clinical populations.

Cross-cultural adaptation of IU measures, such as translated or modified versions of the Intolerance of Uncertainty Scale (IUS), has been a focal point, ensuring the applicability of assessment tools beyond Western samples (Zemestani et al., 2024). Additionally, researchers have begun to investigate the distinct components of IU, namely, prospective IU (concern about future uncertainty) and inhibitory IU (difficulty acting in uncertain contexts), to better understand their specific roles in anxiety-related processes (Iannattone et al., 2024).

Beyond measurement, studies have examined IU's interaction with cognitive and emotional factors, such as attentional bias, emotional dysregulation, and maladaptive cognitive patterns, including rumination and worry (Sahib et al., 2024; Morriss et al., 2024; Tör-Çabuk & Koç, 2024). For example, individuals with high IU tend to show increased vigilance toward ambiguous or threatening stimuli, reinforcing anxiety. IU has also been linked to insecure attachment patterns, suggesting that early relational experiences may influence an individual's capacity to tolerate uncertainty (Gao et al., 2024; Marsh et al., 2024).

Neuroimaging research has added further depth to the understanding of IU, with studies identifying hyperactivity in neural circuits involved in processing uncertainty and generating fear responses (Zhou et al., 2024). Investigations into neurotransmitter and hormonal regulation provide a biological framework for IU, with implications for future pharmacological treatment options (Patel et al., 2024). These interdisciplinary findings underscore the importance of a multifaceted approach to understanding and measuring IU.

IU in Specific Contexts and Populations

IU has been investigated across various contexts and demographic groups, revealing its nuanced role in anxiety pathology. One prominent focus is its relationship with trauma. Research indicates that trauma survivors often exhibit elevated IU, which exacerbates anxiety

by intensifying avoidance, emotional numbing, and catastrophic thinking (Kou et al., 2024; Sternheim et al., 2024). High IU in trauma-exposed individuals contributes to persistent distress and impairs adaptive processing of traumatic memories.

Global crises, such as the COVID-19 pandemic, have further highlighted IU's impact. Studies show that individuals with elevated IU experienced greater anxiety due to uncertainty surrounding the virus, its transmission, and evolving public health information (Adamis et al., 2024; Byam & Penney, 2024). This heightened IU has been linked to increased precautionary behavior, reassurance-seeking, and emotional dysregulation. Similarly, extreme weather events have been shown to heighten IU and contribute to prolonged anxiety symptoms, reinforcing the need to consider environmental and societal stressors in IU-related research (Freeston et al., 2024).

Beyond context, population-specific studies have explored IU in individuals with insecure attachment styles, suggesting that early caregiving experiences marked by unpredictability may increase vulnerability to IU (Jin et al., 2024). IU has also been examined to fear of negative evaluation, a core feature of social anxiety, with findings showing that individuals with high IU struggle to manage the ambiguity of social judgments (Bottera et al., 2024). Understanding IU in these unique populations supports the development of targeted interventions that address both underlying vulnerabilities and environmental triggers.

Interventions and Strategies for Addressing IU

Multiple intervention strategies have been developed to target IU directly, with evidence indicating promising outcomes in anxiety reduction. ACT has been widely employed, encouraging individuals to accept uncertainty rather than resist it, thereby enhancing psychological flexibility (Underwood et al., 2024). ACT interventions help individuals engage in valued actions despite ambiguity and reduce maladaptive avoidance strategies.

CBT remains a cornerstone treatment, with modifications that specifically address IU. These techniques include cognitive restructuring, challenging maladaptive beliefs about uncertainty, and conducting behavioral experiments that promote gradual exposure to uncertain scenarios (Ye et al., 2024). Such adaptations enable individuals to develop tolerance to ambiguity and shift their perceptions of uncertainty from a threat to a manageable challenge.

Innovative tools such as Virtual Reality (VR) are also being explored. VR-based interventions offer immersive, controlled exposure to uncertain situations (e.g., unpredictable social settings), which can be safely used to enhance real-world coping strategies (Ye et al., 2024). Mindfulness-based approaches similarly support IU reduction by cultivating present-moment awareness and reducing the impulse to control ambiguous situations (Underwood et al., 2024).

Self-help strategies also contribute to IU reduction. Engaging in novel, unpredictable activities in a graduated manner (e.g., spontaneous decision-making or unfamiliar social interactions) builds tolerance over time (Dugas et al., 2024). Encouraging individuals to adopt a curious, growth-oriented mindset fosters resilience by transforming uncertainty from a source of distress into an opportunity for learning and adaptation.

Discussion and Conclusion

This systematic review highlights the critical role of IU in the development and maintenance of anxiety disorders. Across the literature, IU is increasingly conceptualized as a multifaceted construct, rather than a single trait, comprising both prospective IU (anticipatory fear of future uncertainty) and inhibitory IU (difficulty taking action in the face of uncertainty). This nuanced understanding allows for more precise measurement and better differentiation from related constructs such as neuroticism and anxiety sensitivity.

Efforts to improve IU assessment have led to the development of psychometric tools that demonstrate robust validity and reliability across diverse cultural contexts. These tools facilitate cross-population comparisons and support the identification of IU as a transdiagnostic factor in anxiety disorders. Furthermore, research has established strong links between IU and cognitive-emotional processes, including worry, rumination, negative appraisal, and attentional bias toward threat. These processes amplify anxious responses, particularly in individuals who interpret ambiguous or unpredictable situations as inherently threatening.

IU has also been linked to attachment insecurity, suggesting that early relational experiences may impact an individual's ability to tolerate uncertainty later in life. Neurobiological research supports this view by identifying increased activation in brain regions responsible for fear and emotion regulation, such as the amygdala and prefrontal cortex, in individuals with high IU. Moreover, investigations into neurotransmitter systems and hormonal influences open new avenues for potential pharmacological interventions. Taken together, these cognitive, emotional, and neurobiological findings reinforce IU as a core vulnerability in anxiety pathology.

The role of IU becomes especially salient in specific contexts, such as trauma and global crises. Individuals with high IU are more prone to catastrophic interpretations of traumatic experiences and are less likely to effectively process them, contributing to sustained symptoms of PTSD. Similarly, IU has been shown to mediate anxiety responses to large-scale stressors, such as the COVID-19 pandemic and extreme weather events. These findings illustrate that contextual uncertainty, when paired with high dispositional IU, can significantly intensify psychological distress.

Population-specific research has also identified IU as a risk factor in groups characterized by insecure attachment or heightened sensitivity to social judgment. For instance, individuals with social anxiety disorder may struggle with the ambiguity of interpersonal interactions, leading to a fear of negative evaluation that is exacerbated by high IU. Recognizing these variations allows for the development of more tailored, population-specific interventions. Programs focused on improving emotion regulation, fostering secure attachment, and reducing reliance on avoidance behaviors are particularly beneficial for individuals with elevated IU.

From a treatment perspective, interventions targeting IU have demonstrated consistent efficacy in reducing anxiety symptoms. ACT encourages individuals to accept uncertainty rather than attempt to eliminate it, promoting psychological flexibility. CBT, when adapted to target IU directly, uses techniques such as cognitive restructuring and exposure to

uncertainty to challenge maladaptive beliefs and behaviors. Additionally, novel modalities like VR therapy and mindfulness-based approaches offer promising strategies for building tolerance to ambiguity.

Self-help strategies further complement clinical treatments by encouraging individuals to engage in novel, uncertain experiences and adopt a growth-oriented mindset. These approaches help reframe uncertainty as a manageable and potentially enriching part of life, rather than a threat to be avoided. By promoting resilience and confidence in handling unpredictability, these strategies can serve as valuable tools for maintaining long-term mental health.

In conclusion, this review confirms that IU is a robust transdiagnostic factor implicated in multiple forms of anxiety. It influences cognitive, emotional, behavioral, and neurobiological processes, and its expression varies across contexts and populations. Addressing IU through targeted interventions holds substantial promise for improving outcomes in anxiety treatment. Future research should continue to refine IU measurement tools, explore their neurobiological correlates, and evaluate the effectiveness of both traditional and innovative interventions. Moreover, studies should further investigate IU in underrepresented populations and examine how cultural, developmental, and contextual variables shape its manifestation. A comprehensive, interdisciplinary understanding of IU will be essential in advancing both theoretical models and practical approaches to anxiety prevention and treatment.

Theoretical and Contextual Contributions

This review makes a substantial theoretical contribution by consolidating and extending the conceptualization of IU as a multidimensional, transdiagnostic construct that underpins a wide range of anxiety disorders. By integrating psychological, neurobiological, and cultural perspectives, the findings refine existing theoretical models, highlighting the interplay between cognitive-emotional processes, attachment patterns, and neurobiological mechanisms in shaping IU. Contextually, the synthesis underscores how IU operates across diverse populations and settings, from trauma survivors to individuals navigating global crises such as pandemics and climate change. This cross-contextual insight not only advances the understanding of IU's role in anxiety pathology but also provides culturally sensitive, evidence-based directions for intervention. In doing so, the review bridges theoretical knowledge with real-world application, offering a framework that can inform both global mental health strategies and locally tailored clinical practices.

References

Abend, R. (2023). Understanding anxiety symptoms as aberrant defensive responding along the threat imminence continuum. In *Neuroscience and Biobehavioral Reviews*. 152, 105305. https://doi.org/10.1016/j.neubiorev.2023.105305

Abouzahra, A., Sabraoui, A., & Afdel, K. (2020). Model composition in Model Driven Engineering: A systematic literature review. *Information and Software Technology*, *125*(May), 106316. https://doi.org/10.1016/j.infsof.2020.106316

Adamis, A. M., Cole, D. A., & Olatunji, B. O. (2024). Intolerance of Uncertainty and Worry Prospectively Predict COVID-19 Anxiety and Distress: A 4-Year Longitudinal Study. *Behavior Therapy*, *55*(2), 320–330. https://doi.org/10.1016/j.beth.2023.07.009

Alomari, N. A., Bedaiwi, S. K., Ghasib, A. M., Kabbarah, A. J., Alnefaie, S. A., Hariri, N., Altammar, M. A., Fadhel, A. M., & Altowairqi, F. M. (2022). Social Anxiety Disorder: Associated Conditions and Therapeutic Approaches. *Cureus*. 14(12), 32687. https://doi.org/10.7759/cureus.32687

Altan-Atalay, A., Abdulcebbar, A., Kantarci, L., & Yilmaz, E. (2024). The roles of intolerance of uncertainty and mindfulness in psychological distress: a two-wave longitudinal study. *CURRENT PSYCHOLOGY*, *43*(31), 25621–25628. https://doi.org/10.1007/s12144-024-06243-7

Arbona, C., Rodriguez, L., Dragomir-Davis, M., Olvera, N., de Dios, M. A., & Cano, M. A. (2022). Intolerance of Uncertainty and DSM-5 PTSD Symptom Severity among Trauma Exposed Latina College Women. *Journal of Aggression, Maltreatment and Trauma*. 31(3), 304-321. https://doi.org/10.1080/10926771.2020.1866132

Bakioğlu, F., Korkmaz, O., & Ercan, H. (2021). Fear of COVID-19 and Positivity: Mediating Role of Intolerance of Uncertainty, Depression, Anxiety, and Stress. *International Journal of Mental Health and Addiction*. 19, 2369–2382. https://doi.org/10.1007/s11469-020-00331-y

Boelen, P., & Reijntjes, A. (2009). Intolerance of uncertainty and social anxiety. *Journal of Anxiety Disorders*, *23 1*, 130–135. https://doi.org/10.1016/j.janxdis.2008.04.007

Bottera, A. R., Dougherty, E. N., Todorov, S., & Wildes, J. E. (2024). Fear of negative evaluation and intolerance of uncertainty: Assessing potential internalizing correlates of eating disorder-related clinical impairment and differences across diagnostic presentations. *Eating Behaviors*, *53*. https://doi.org/10.1016/j.eatbeh.2024.101869

Brosschot, J. F., Verkuil, B., & Thayer, J. F. (2015). The default response to uncertainty and the importance of perceived safety in anxiety and stress: An evolution-theoretical perspective. In *Journal of Anxiety Disorders*. 41, 22-34. https://doi.org/10.1016/j.janxdis.2016.04.012

Byam, L. J., & Penney, A. M. (2024). COVID-19 anxiety and its relation to anxiety-related disorder symptoms and mechanisms. *Acta Psychologica*, *244*, 104179. https://doi.org/10.1016/j.actpsy.2024.104179

Cargile, A. C., & Bolkan, S. (2013). Mitigating inter- and intra-group ethnocentrism: Comparing the effects of culture knowledge, exposure, and uncertainty intolerance. *International Journal of Intercultural Relations*. 37(3), 345-353. https://doi.org/10.1016/j.ijintrel.2012.12.002

Carleton, N. R., Mulvogue, M. K., Thibodeau, M. A., McCabe, R. E., Antony, M. M., & Asmundson, G. J. G. (2012). Increasingly certain about uncertainty: Intolerance of uncertainty across anxiety and depression. *Journal of Anxiety Disorders*. 26(3), 468-479. https://doi.org/10.1016/j.janxdis.2012.01.011

Carleton, R. N., Norton, M. A., & Asmundson, G. J. (2007). Fearing the unknown: a short version of the Intolerance of Uncertainty Scale. Journal of anxiety disorders, 21(1), 105–117. https://doi.org/10.1016/j.janxdis.2006.03.014

Carleton, R. (2012). The intolerance of uncertainty construct in the context of anxiety disorders: theoretical and practical perspectives. *Expert Review of Neurotherapeutics*, *12*, 937–947. https://doi.org/10.1586/ern.12.82

Counsell, A., Furtado, M., Iorio, C., Anand, L., Canzonieri, A., Fine, A., Fotinos, K., Epstein, I., & Katzman, M. (2017). Intolerance of uncertainty, social anxiety, and generalized anxiety: Differences by diagnosis and symptoms. *Psychiatry Research*, *252*, 63–69. https://doi.org/10.1016/j.psychres.2017.02.046

Dugas, M. J., Brillon, P., Savard, P., Turcotte, J., Gaudet, A., Ladouceur, R., Leblanc, R., & Gervais, N. J. (2010). A randomized clinical trial of cognitive-behavioral therapy and applied relaxation for adults with generalized anxiety disorder. Behavior therapy, 41(1), 46–58. https://doi.org/10.1016/j.beth.2008.12.004

Dugas, M. J., & Robichaud, M. (2007). Cognitive-behavioral treatment for generalized anxiety disorder: Targeting intolerance of uncertainty. Guilford Press. 20(3), 251-263. https://doi.org/10.1177/13623613221119749

Doruk, A., Dugenci, M., Ersöz, F., & Öznur, T. (2015). Intolerance of Uncertainty and Coping Mechanisms in Nonclinical Young Subjects. Noro psikiyatri arsivi, 52(4), 400–405. https://doi.org/10.5152/npa.2015.8779

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. Behaviour research and therapy, 38(4), 319–345. https://doi.org/10.1016/s0005-7967(99)00123-0

Evers, K., Gijbels, E., Maljaars, J., Rumball, F., Spain, D., Happé, F., & Noens, I. (2023). Mental health of autistic adults during the COVID-19 pandemic: The impact of perceived stress, intolerance of uncertainty, and coping style. *Autism*. *27*(3), 832-847. https://doi.org/10.1177/13623613221119749

Fang, A., Berman, N. C., Hoeppner, S. S., Wolfe, E. C., & Wilhelm, S. (2022). State and Trait Risk and Resilience Factors Associated with COVID-19 Impact and Obsessive–Compulsive Symptom Trajectories. *International Journal of Cognitive Therapy*. 15, 168–190. https://doi.org/10.1007/s41811-021-00128-4

Fayazbakhsh, E., & Mansouri, A. (2019). Effectiveness of Acceptance and Commitment Therapy on Intolerance of Uncertainty, Experiential Avoidance, and Symptoms of Generalized Anxiety Disorder in Individuals With Type II Diabetes. International Archives of Health Sciences 6(1), 30-35. DOI: 10.4103/iahs.iahs_52_18

Freeston, M., Sermin-Reed, L., Whittaker, S., Worbey, J., & Jopling, C. (2024). Extreme weather, climate change, climate action and uncertainty distress: an exploratory study using network analysis. *Cognitive Behaviour Therapist*, *17*, 31. https://doi.org/10.1017/S1754470X24000205

Gao, Y., Fan, M., Li, Y., Zhao, S. C., Chen, W., Zhang, D. H., & Zheng, X. F. (2024). Contingency Reversal in Conditioned Fear Learning: The Moderated Mediation Model of Intolerance of Uncertainty and Instruction. *PSYCHOLOGY RESEARCH AND BEHAVIOR MANAGEMENT*, *17*, 1007–1020. https://doi.org/10.2147/PRBM.S447426 WE - Social Science Citation Index (SSCI)

Garakani, A., Murrough, J. W., Freire, R. C., Thom, R. P., Larkin, K., Buono, F. D., & Iosifescu, D. V. (2020). Pharmacotherapy of Anxiety Disorders: Current and Emerging Treatment Options. Frontiers in psychiatry, 11, 595584. https://doi.org/10.3389/fpsyt.2020.595584

Gentes, E., & Ruscio, A. (2011). A meta-analysis of the relation of intolerance of uncertainty

to symptoms of generalized anxiety disorder, major depressive disorder, and obsessive-compulsive disorder. *Clinical Psychology Review*, *31 6*, 923–933. https://doi.org/10.1016/j.cpr.2011.05.001

Grayson, J. B. (2010). OCD and intolerance of uncertainty: Treatment issues. *Journal of Cognitive Psychotherapy*. 24(1), 3-15. https://doi.org/10.1891/0889-8391.24.1.3

Holaway, R., Heimberg, R., & Coles, M. (2006). A comparison of intolerance of uncertainty in analogue obsessive-compulsive disorder and generalized anxiety disorder. *Journal of Anxiety Disorders*, *20 2*, 158–174. https://doi.org/10.1016/J.JANXDIS.2005.01.002

Humer, E., Pieh, C., & Probst, T. (2020). Metabolomic biomarkers in anxiety disorders. *International Journal of Molecular Sciences*. *21*(13), 4784. https://doi.org/10.3390/ijms21134784

Iannattone, S., Spaggiari, S., Di Riso, D., & Bottesi, G. (2024). Profiles of intolerance of uncertainty, separation anxiety, and negative affectivity in emerging adulthood: A person-centered approach. *Journal of Affective Disorders*, *345*, 51–58. https://doi.org/10.1016/j.jad.2023.10.108

Inozu, M., Gök, B. G., Tuzun, D., & Haciomeroglu, A. B. (2023). Does cognitive flexibility change the nature of the relationship between intolerance of uncertainty and psychological symptoms during the COVID-19 outbreak in Turkey? *Current Psychology*. 42, 17412–17423. https://doi.org/10.1007/s12144-021-02450-8

Jin, L., Zamudio, G., Wang, C. D. C., & Lin, S. (2024). Insecure attachment and eating disorder symptoms: Intolerance of uncertainty and emotion regulation as mediators. *Journal of Clinical Psychology*, *80*(7), 1673–1688. https://doi.org/10.1002/jclp.23685

Kitchenham, B. (2007). Guidelines for performing systematic literature reviews in software engineering. *Technical Report, Ver. 2.3 EBSE Technical Report. EBSE*.

Korte, C., Friedberg, R. D., Wilgenbusch, T., Paternostro, J. K., Brown, K., Kakolu, A., Tiller-Ormord, J., Baweja, R., Cassar, M., Barnowski, A., Movahedi, Y., Kohl, K., Martinez, W., Trafalis, S., & Leykin, Y. (2022). Intolerance of Uncertainty and Health-Related Anxiety in Youth amid the COVID-19 Pandemic: Understanding and Weathering the Continuing Storm. *Journal of Clinical Psychology in Medical Settings*. 29, 645–653. https://doi.org/10.1007/s10880-021-09816-x

Kou, Y., Xing, H., Zheng, R., Wu, Y., Feng, S., Zou, F., & Zhang, M. (2024). Excessive avoidance bias towards uncertain faces in non-clinical social anxiety individuals. *Journal of Anxiety Disorders*. *108*, 102944. https://doi.org/10.1016/j.janxdis.2024.102944

Kraemer, K., O'Bryan, E. & Mcleish, A.C. (2016). Intolerance of Uncertainty as a Mediator of the Relationship between Mindfulness and Health Anxiety. Mindfulness, 7(4), 1-8. DOI: 10.1007/s12671-016-0524-x

Kusec, A., Murphy, F. C., Peers, P. V, & Manly, T. (2024). Measuring Intolerance of Uncertainty After Acquired Brain Injury: Factor Structure, Reliability, and Validity of the Intolerance of Uncertainty Scale–12. *Assessment*, *31*(4), 794–811. https://doi.org/10.1177/10731911231182693

Liao, K. Y. H., Weng, C. Y., & West, L. M. (2016). Social connectedness and intolerance of uncertainty as moderators between racial microaggressions and anxiety among black individuals. *Journal of Counseling Psychology*. *63*(2), 240–246. https://doi.org/10.1037/cou0000123

Lockwood, C., Munn, Z., & Porritt, K. (2015). Qualitative research synthesis: Methodological guidance for systematic reviewers utilizing meta-aggregation. *International Journal of Evidence-Based Healthcare*, *13*(3), 179–187.

https://doi.org/10.1097/XEB.0000000000000062

Mahoney, A., & McEvoy, P. (2012). A Transdiagnostic Examination of Intolerance of Uncertainty Across Anxiety and Depressive Disorders. *Cognitive Behaviour Therapy*, *41*, 212–222. https://doi.org/10.1080/16506073.2011.622130

Mahoney, A. E., & McEvoy, P. M. (2012). Changes in intolerance of uncertainty during cognitive behavior group therapy for social phobia. Journal of behavior therapy and experimental psychiatry, 43(2), 849–854. https://doi.org/10.1016/j.jbtep.2011.12.004

Marsh, H. J., Rock, A. J., & Clark, G. I. (2024). Adult attachment and OCD symptoms: the mediating role of intolerance of uncertainty and beliefs about losing control. *Clinical Psychologist*, *28*(2), 155–168. https://doi.org/10.1080/13284207.2024.2336962

McEvoy, P., Hyett, M., Shihata, S., Price, J., & 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, P. M., & Mahoney, A. E. J. (2012). To Be Sure, To Be Sure: Intolerance of Uncertainty Mediates Symptoms of Various Anxiety Disorders and Depression. *Behavior Therapy*. 43(3), 533-545. https://doi.org/10.1016/j.beth.2011.02.007

Mento, C., Silvestri, M., Amezaga, P., Muscatello, M., Romeo, V., Bruno, A., & Cedro, C. (2022). Anxiety sensitivity, uncertainty and recursive thinking: A continuum on Cyberchondria conditions during the Covid Outbreak. *Journal of Mind and Medical Sciences*. 9(1), 78-87. https://doi.org/10.22543/7674.91.p7887

Morriss, J., Lee, C. E., Wood, A., Zhang, J., & Seabrooke, T. (2024). Attentional bias to uncertainty-based information: a conceptual replication of Fergus et al. (2013). *Current Psychology*, *43*(29), 24279–24286. https://doi.org/10.1007/s12144-024-06067-5

Neville, A., Kopala-Sibley, D. C., Soltani, S., Asmundson, G. J. G., Jordan, A., Carleton, R. N., Yeates, K. O., Schulte, F., & Noel, M. (2021). A longitudinal examination of the interpersonal fear avoidance model of pain: the role of intolerance of uncertainty. *Pain*. 162(1), 152-160. https://doi.org/10.1097/j.pain.0000000000002009

Oglesby, M. E., Boffa, J. W., Short, N. A., Raines, A. M., & Schmidt, N. B. (2016). Intolerance of uncertainty as a predictor of post-traumatic stress symptoms following a traumatic event. Journal of anxiety disorders, 41, 82–87. https://doi.org/10.1016/j.janxdis.2016.01.005

Osmanağaoğlu, N., Creswell, C., & Dodd, H. (2018). Intolerance of Uncertainty, anxiety, and worry in children and adolescents: A meta-analysis. *Journal of Affective Disorders*, *225*, 80–90. https://doi.org/10.1016/j.jad.2017.07.035

Page, M. J., McKenzie, J. E., Bossuyt, P., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The prisma 2020 statement: An updated guideline for reporting systematic reviews. *Medicina Fluminensis*, *57*(4), 444–465. https://doi.org/10.21860/medflum2021_264903

Patel, D. S., Webster, S. N., Dowling, E. J., Knowles, C. R., Lockwood-Taylor, G., Coutts-Bain, D., Simons, L. E., Diver, E. J., Chilcot, J., Schapira, L., & Heathcote, L. C. (2024). Scanxiety and Fear of Recurrence in Young Adult Female Breast and Gynaecological Cancer Survivors: Investigating Shared Mechanisms. *Psycho-Oncology*, *33*(12). https://doi.org/10.1002/pon.70050

Penney, A. M., Rachor, G. S., & Deleurme, K. A. (2020). Differentiating the roles of intolerance

of uncertainty and negative beliefs about worry across emotional disorders. *Journal of Experimental Psychopathology*. 11(4). https://doi.org/10.1177/2043808720970072

Ren, L., Wei, Z., Li, Y., Cui, L.-B., Wang, Y., Wu, L., Wei, X., Peng, J., Li, K., Jin, Y.-C., Li, F., Yang, Q., & Liu, X.-F. (2021). The relations between different components of intolerance of uncertainty and symptoms of generalized anxiety disorder: a network analysis. *BMC Psychiatry*, *21*, 488. https://doi.org/10.1186/s12888-021-03455-0

Robichaud, M. (2013). Cognitive Behavior Therapy Targeting Intolerance of Uncertainty: Application to a Clinical Case of Generalized Anxiety Disorder. *Cognitive and Behavioral Practice*. 20(3), 251-263. https://doi.org/10.1016/j.cbpra.2012.09.001

Sahib, A., Chen, J., Cárdenas, D., Calear, A. L., & Wilson, C. (2024). Emotion regulation mediates the relation between intolerance of uncertainty and emotion difficulties: A longitudinal investigation. *Journal of Affective Disorders*, *364*, 194–204. https://doi.org/10.1016/j.jad.2024.08.056

Satici, B., Saricali, M., Satici, S. A., & Griffiths, M. D. (2022). Intolerance of Uncertainty and Mental Wellbeing: Serial Mediation by Rumination and Fear of COVID-19. *International Journal of Mental Health and Addiction*. 20, 2731–2742. https://doi.org/10.1007/s11469-020-00305-0

Shihata, S., McEvoy, P., & Mullan, B. (2017). Pathways from uncertainty to anxiety: An evaluation of a hierarchical model of trait and disorder-specific intolerance of uncertainty on anxiety disorder symptoms. *Journal of Anxiety Disorders*, *45*, 72–79. https://doi.org/10.1016/j.janxdis.2016.12.001

Simmons, A., Matthews, S. C., Paulus, M. P., & Stein, M. B. (2008). Intolerance of uncertainty correlates with insula activation during affective ambiguity. *Neuroscience Letters*. 430(2), 92-97. https://doi.org/10.1016/j.neulet.2007.10.030

Sternheim, L. C., Bijsterbosch, J. M., Wever, M. C. M., van Elburg, A. A., & Frank, G. K. W. (2024). Examining anxious temperament in anorexia nervosa: Behavioural inhibition and intolerance of uncertainty and their contribution to trait anxiety in adolescents with anorexia nervosa. *Journal of Affective Disorders*, *348*, 116–123. https://doi.org/10.1016/j.jad.2023.12.035

Tör-Çabuk, K., & Koç, V. (2024). Cognitive bias modification for perfectionism and intolerance of uncertainty: A randomized controlled trial. *PSYCH JOURNAL*, *13*(4), 679–691. https://doi.org/10.1002/pchj.742

Underwood, S. B., White, S. V, & Forsyth, J. P. (2024). Acceptance and Commitment Therapy (ACT) and Self-Compassion for Generalized Anxiety Disorder and Comorbid Major Depressive Disorder: A Case Study. *Clinical Case Studies*, *23*(6), 479–496. https://doi.org/10.1177/15346501241278297

Wilson, E. J., Abbott, M. J., & Norton, A. R. (2023). The impact of psychological treatment on intolerance of uncertainty in generalized anxiety disorder: A systematic review and meta-analysis. In *Journal of Anxiety Disorders*. 97, 102729 https://doi.org/10.1016/j.janxdis.2023.102729

Wright, K., Lebell, M. A. N. A., & Carleton, R. (2016). Intolerance of uncertainty, anxiety sensitivity, health anxiety, and anxiety disorder symptoms in youth. *Journal of Anxiety Disorders*, *41*, 35–42. https://doi.org/10.1016/j.janxdis.2016.04.011

Ye, H. X., Shi, X. Y., Li, Y. Y., Huang, Y. K., You, R. Y., Zhang, X. T., Yu, Z. J., Li, H. L., & Fan, F. (2024). A new way to conceptualize intolerance of uncertainty among adolescents: Embracing the network perspective. *BRITISH JOURNAL OF PSYCHOLOGY*. 116(1), 89-107. https://doi.org/10.1111/bjop.12736

Yook, K., Kim, K.-H., Suh, S., & Lee, K. (2010). Intolerance of uncertainty, worry, and rumination in major depressive disorder and generalized anxiety disorder. *Journal of Anxiety Disorders*, *24(6)*, 623–628. https://doi.org/10.1016/j.janxdis.2010.04.003

Zemestani, M., Ezzati, S., Nasiri, F., Gallagher, M. W., Barlow, D. H., & Kendall, P. C. (2024). A culturally adapted unified protocol for transdiagnostic treatment of anxiety disorders in adolescents (UP-A): A randomized waitlist-controlled trial. *Psychological Medicine*, *54*(2), 385–398. https://doi.org/10.1017/S0033291723001903

Zemestani, M., Beheshti, N., Rezaei, F., van der Heiden, C., & Kendall, P. C. (2021). Cognitive Behavior Therapy Targeting Intolerance of Uncertainty Versus Selective Serotonin Reuptake Inhibitor for Generalized Anxiety Disorder: A Randomized Clinical Trial. Behaviour Change, 38(4), 250–262. doi:10.1017/bec.2021.16

Zhou, X., Huang, L., Becker, B., Dou, H., Wang, J., Zhang, X., Mei, Y., Li, H., & Lei, Y. (2024). Intolerance of uncertainty enhances adolescent fear generalization in both perceptual-based and category-based tasks: fNIRS studies. *Behaviour Research and Therapy*, *183*. https://doi.org/10.1016/j.brat.2024.104650