

## Intolerance of Uncertainty in Children and Adolescents: Developmental Trends and Implications a Systematic Literature Review

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### ABSTRACT

This study examines how Intolerance of Uncertainty (IU) affects the mental health of children and adolescents. Using a Systematic Literature Review (SLR) and PRISMA methodology, 33 studies published between 2020-2024 were analyzed. Findings confirm that IU significantly influences mental development, increasing worry and emotional distress. The study highlights IU as a key factor in anxiety and other psychological issues, emphasizing the need for targeted interventions. Understanding IU in child and adolescent development is crucial for effective mental health assessment and treatment. The study suggests implementing therapeutic strategies to help young individuals manage uncertainty adaptively, ultimately improving their overall well-being.

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## **INTRODUCTION**

Uncertainty is perceived as something unpleasant (Lauriola, 2023) and as something threatening (Korkmaz, 2021). In everyday life, individuals tend to avoid, reduce, and eliminate uncertainty (Sankar 2017). Uncertainty can be a trigger for negative emotions, biased expectations, and inflexible responses, which are key components in the development of anxiety disorders (Gu, 2020). The emotional and cognitive responses to uncertainty promote the development and maintenance of intolerance of uncertainty (IU) and ultimately lead to mental health problems (Freeston, 2020). Intolerance of uncertainty (IU), the ability of an individual to tolerate uncertainty in daily life, has been identified as a vulnerability factor for anxiety disorders and depression. (Probert-Lindström, 2023).

IU is the tendency of individuals to feel distressed by unknown situations without regard to possible outcomes and is characterized by negative beliefs and reactions to uncertainty (Lauriola, 2023). Carleton (2016) defines IU as a individual's dispositional inability to cope with aversive reactions triggered by the absence of important information and the perception of uncertainty that accompanies it. At the core of IU is a fear of the unknown (Carleton, 2016). IU can manifest as worry, avoidance towards uncertainty, emotional distress, and ineffective problem solving (Korte, 2022).

High IU individuals have difficulty tolerating and modulating negative emotions caused by uncertainty. When faced with uncertain situations, individuals experience negative emotional, behavioral, and cognitive responses (Freeston, 2020). Meanwhile, according to Cormer (2009), individuals with high IU find ambiguity intolerable. Individuals find it difficult to function in uncertain situations (Korte, 2022). The IU-based worry model (Dugas and Koerner, 2005) hypothesizes that individuals with high IU are more prone to worry. IU triggers a sequence of worry, problem orientation, negative problem orientation, and cognitive avoidance, as well as directly affects problem orientation and cognitive avoidance (Osmanağaoğlu, 2018). According to Palitz (2019), the transdiagnostic model of IU suggests that difficulty tolerating uncertainty contributes to developing cognitive, emotional, and maladaptive behaviors. The pressure felt by individuals with high IU is considered to be caused by a dysfunctional way of processing uncertainty (Ryan, 2024).

IU was initially proposed by Dugas (1998) as a major factor contributing to concerns about generalized anxiety disorder (GAD) symptoms (Wong, 2023). In recent decades, however, research on IU has increased and it has been conceptualized as a transdiagnostic pathway leading to various disorders (Friedberg, 2022). In adults, IU is associated with a variety of anxiety and mood disorders and has been proposed as a transdiagnostic factor in the development of emotional disorders (Cornacchio, 2018). According to Hawes (2021), IU has a strong conceptual relationship with worry and is associated with a range of anxiety problems, including generalized anxiety, social anxiety, obsessive-compulsive disorder, panic disorder, and agoraphobia. In addition, IU is proposed to be a transdiagnostic construct that underlies and perpetuates a number of psychological disorders, including depression, eating disorders,

autism spectrum disorders, and is associated with increased comorbidity of disorders.

While there is a large body of research on IU in adults, there are still gaps, especially regarding IU in children and adolescents. A growing body of research suggests that many cognitive processes are associated with understanding and responding to uncertainty. The development of self-awareness and the ability to retrieve predicted outcomes develops gradually during childhood and adolescence. This raises questions about the early factors that determine the development of IU in children (Hawes, 2021). Children with high IU may misinterpret uncertainty, leading to increased anxiety and worry that may contribute to the development of generalized and social anxiety disorders (Korte, 2022). A better understanding of how children and adolescents respond to uncertainty has implications for development and mental health. Therefore, this study aims to determine how IU manifests and trends across different age groups of children and adolescents, as well as the impact of IU on mental health, academic achievement, and social functioning in young populations.

## LITERATURE REVIEW

The concept of IU began to emerge in the early 1990's, initially identified as fearing the unknown (Gu, 2020). Freeston et al. were the first to propose an operational definition of IU as a cognitive, emotional, and behavioral response to unfamiliar situations and unknown phenomena (Wang, 2023). Buhr & Dugas (2002) defined IU as a tendency that reflects fear of unpredictable and uncertain future events and belief that feelings of uncertainty are undesirable (Bottesi, 2020). Maladaptive cognitive, behavioral, and emotional responses that have been implicated in a variety of mental disorders are typical of individuals with high levels of IU (Ye, 2024).

Intolerance of uncertainty (IU) theory posits that individuals perceive uncertainty as negative or threatening, leading to increased anxiety and worry (Eible, 2024). Individuals with high IU experience heightened anxiety and engage in excessive generalization of both positive and negative stimuli, as evidenced by increased behavioral responses and neural activation in specific brain regions related to anxiety disorders (Wu, 2024). Individuals who struggle to cope with uncertainty tend to interpret and react negatively to it, contributing to various mental health issues, including anxiety, depression, and potentially influencing psychotic symptoms like delusions and paranoia (Morris, 2024).

IU can be divided into two subscales: Prospective IU, which involves the desire for predictability, and Inhibitory IU, characterized by paralysis in the face of uncertainty (Hermans, 2023). Prospective intolerance of uncertainty (IU-P) involves anticipating future uncertainty negatively, while inhibitory intolerance of uncertainty (IU-I) relates to the inability to act due to uncertainty. Prospective intolerance of uncertainty refers to the fear of the unknown and the anticipation of negative outcomes (Yang, 2024). Inhibitory intolerance of uncertainty involves a negative interpretation of current uncertainties, leading to avoidance behaviors (Shapiro, 2020). Prospective intolerance of uncertainty (IU) refers to the difficulty in tolerating uncertainty about future events, leading to anxiety about potential

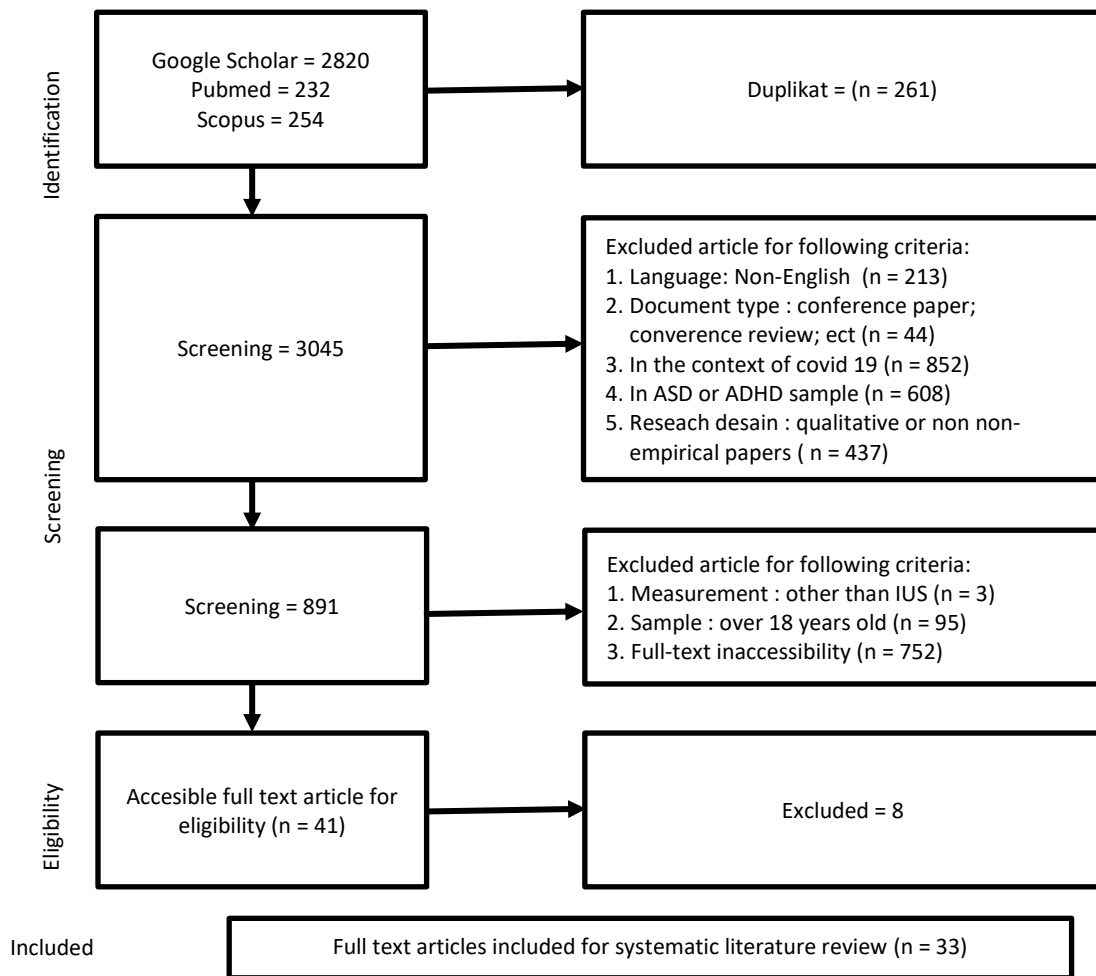
negative outcomes. In contrast in hibitory IU involves a fear of uncertainty that inhibits action or decision-making (O'Bryan, 2021).

## **METHODOLOGY**

This study employed a systematic literature review (SLR) to find appraise, and comprehensively analyze studies of IU in children and adolescents, focusing on developmental trends and psychological implications. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method (Moher, 2009) was used for the analysis to comprehensively analyze IU in children and adolescents. Scopus was used for the literature search, PubMed, and Google Scholar electronic databases published in the last 5 years (2020 to December 2024). The search keywords used included a combination of keywords related to intolerance of uncertainty and age group (e.g., "child," "adolescent," "youth," "pediatric"), such as "intolerance of uncertainty" AND ("children" OR "adolescents"). The selection process is carried out in four stages according to the PRISMA diagram: identification, screening, eligibility and inclusion.

Studies were considered eligible if they met the following criteria: 1) the study was an English-language article, 2) the study used a quantitative design, 3) it was original research using the IUS-12 questionnaire measurements, 4) the research sample was individuals under the age of 18. Excluded research criteria in this study included: 1) in the context of Covid-19, 2) research samples are individuals with ASD or ADHD, 3) IU-related research using instruments other than the IUS-12. After removing duplicate articles, each article was screened for eligibility using the title, abstract, or full text. Data extraction included: study characteristics (author, year of publication, country); sample characteristics (sample size, age range); study design (cross-sectional, longitudinal); outcomes/findings.

## RESEARCH RESULT



Based on the analysis of 33 articles related especially children and adolescents who are unable to tolerate ambiguity, it can be concluded that intolerance of uncertainty (IU) is a psychological factor that has a significant impact on the mental development of children and adolescents. The inability to tolerate uncertainty is linked to psychological suffering, failure to think logically, and catastrophizing, which can contribute to increased negative emotions/affects (Jones, 2024). According to Zemestani (2023), IU has been reported to be significantly associated with certain adolescent anxiety and related disorder symptoms, including generalized anxiety, separation anxiety, social anxiety, panic disorder/agoraphobia, and obsessive-compulsive disorder in adolescents. According to Sperling (2022), a higher level of IU in children is associated with a higher level of anxiety and functional impairment. According to Panarello (2021), IU is a powerful predictor of worry and has a strong association with anxiety components. This is linear with of Kendall (2020) that IU is involved in the development and maintenance of anxiety symptoms in adolescents. According to Zemestani (2023), adolescents with higher IU scores had significantly higher levels of anxiety disorder symptoms.

The results of this review of the literature have also highlighted the research that explains the relationship between IU and individuals with anorexia nervosa.

According to Bijsterbosch (2021), IU inhibitors co-occurred with weight and body shape concerns in a sample of adolescents with anorexia. It has been reported that adolescents with anorexia have a significantly higher level of behavioral inhibition than their peers (Sternheim, 2024). Behavioral inhibition and IU may contribute to anxiety in individuals with anorexia, whereas their peers may have developed better executive functioning and social-emotional skills to cope with uncertainty. This may be an indication of the importance of core cognitive anxiety-related processes such as IU in adolescent girls with anorexia nervosa.

Besides the direct relationship between IU as a transdiagnostic factor in various mental problems, IU also acts as a mediator in the relationship between various psychological factors and mental problems. The results of Ghaderi (2020) show that IU mediates the relationship between child maltreatment and non-suicidal self-injury behavior in adolescents. Yao (2023) also found a significant mediating effect between social anxiety and self-injurious behavior. The mediating effect of IU on suicidal ideation was also found in Zhuo (2023), which states that by increasing intolerance of uncertainty and anxiety symptoms, negative perfectionism exacerbates suicidal ideation. In addition, Ye (2024) found that IU mediated the relationship between negative life events and persistent sleep problems. Du (2021) showed that future expectations were significantly negatively related to Internet addiction. The relationship was mediated by adolescents' intolerance of uncertainty. While the relationship between future expectations and intolerance of uncertainty was moderated by perceived social support (Du, 2021).

Compared to adults, the relationship between worry and IU is relatively stronger in adolescents (Watts, 2021). The study by Ye (2023) of 108,540 young people in China showed that high IU profiles are more common in female groups, older young people and with certain socio-demographic characteristics, such as: parents with lower education level, parents who don't have a steady job, chronic physical illness, history of psychiatric illness, poor parental marital status, family history of psychiatric illness, alcohol consumption, etc. According to Lauriola (2023), avoidance towards uncertainty, negative beliefs about uncertainty, and uncertainty-reducing behaviors may interfere with adolescents' emotional processing. This may ultimately make adolescents more vulnerable to IU. However, the tolerance for uncertainty and the regulation of emotions may be enhanced during adolescence due to the development of brain regions that support these processes (Lauriola, 2023). This suggests that the ability to tolerate uncertainty may develop with age and experience. As a result, these components may have a diminishing effect on the severity of worry with age (Watts, 2021).

Research finding by Vinayan (2023) found a substantial negative association between authoritative parenting style and teenage intolerance of uncertainty, as well as a significant positive relationship between adolescent intolerance of uncertainty with authoritarian and permissive parenting styles. This finding is consistent with the results of Shen (2020), which shows that the results of multi categorical mediation analysis show that there are differences in worry between children with supportive parenting and children with tough parenting that are fully mediated by IU. Children with supportive parenting tend to have lower

levels of IU. Besides parenting, adversity and maltreatment also influence how individuals develop IU. According to Jones (2024), adverse childhood experiences are frequently unpredictable and out of control. Hypersensitivity to future stressors may result from this repeated exposure during childhood. This phenomenon may lead to a diminished capacity to effectively cope with uncertain circumstances, consequently resulting in an elevated IU. However, according to Shen (2024), childhood maltreatment is associated with increased levels of uncertainty stress, which may act as a catalyst for future exploratory behavior. From a developmental perspective, childhood maltreatment, which includes: physical abuse, emotional abuse, sexual abuse, physical neglect, and emotional neglect emerges as an important influential factor on exploratory activities in uncertain situations. Life history theory suggests that individuals who experience adverse childhood experiences tend to adopt a rapid strategy aimed at optimizing immediate gains (Shen, 2024).

Particular temperament trait in early childhood have also been found to be markers of risk for difficulty coping with uncertainty in later life (Hawes, 2021). The presence of heightened negative emotions, or neuroticism, and diminished positive emotions, or extraversion, as measured by age three temperament, was found to be a salient factor in predicting heightened levels of internalized uniqueness (IU) in early to mid-adolescence (Hawes, 2021). Evans (2020) finds that irritability predicts higher intolerance of uncertainty. Dimensions of emotion regulation, including: resistance to emotional responses, difficulty engaging in goal-directed behavior When feeling bad emotions, difficulties restraining urges, use of emotion regulation strategies that are considered less effective, and lack of ability to understand emotions, are significantly correlated with intolerance of uncertainty and various manifestations of anxiety (Iannatone, 2023).

## DISCUSSION

The dispositional trait known as Intolerance of Uncertainty (IU) inability to endure the distress of uncertainty that promotes maladaptive cognitive, emotional, and behavioral responses to uncertainty (Ye, 2024). Intolerance of Uncertainty (IU) in children is characterized by a strong fear of ambiguity and difficulty functioning in uncertain situations. It manifests as worry, emotional distress, and avoidant behavior (Korte, 2024). IU has a broad impact on multiple aspects of children's and adolescents' lives, particularly mental health and social functioning. Meta-analyses consistently show that IU is a significant transdiagnostic factor for several mental health problems in child and adolescent populations. These include symptoms of anxiety, increased worry, depression, stress, generalized anxiety, social anxiety, obsessive-compulsive symptoms, anorexia, and self-injurious behaviors. In addition, IU also acts as a mediator in the relationship between various psychological factors and mental health problems. These findings strengthen the understanding of the central role of IU in the development and maintenance of mental health problems in children and adolescents.

In children, IU is often associated with higher levels of anxiety and functional impairment. Children with high IU tend to experience an inability to

regulate emotions and have greater threat expectancies, leading to increased anxiety and stress responses. Children and adolescents with high IU show poorer outcomes in emotional stability and anxiety compared to those with low IU. Children with high IU tend to develop negative emotional, cognitive, and behavioral responses to uncertain situations. According to Ryan (2024), children with high IU often show negative emotional responses such as increased worry and anxiety, especially in uncertain situations. Encouraging curiosity in children can help reduce the negative effects of IU, as curious children tend to engage in more adaptive information-seeking behaviors.

Adolescence is a critical period for the development of IU, which can affect social interactions, mental health, and coping strategies. Adolescent IU development is influenced by neurological factors and psychosocial theories of development (Marakova, 2023). Adolescents may experience a different relationship with uncertainty than adults, potentially affecting their decision-making and learning strategies (Jepma, 2020). Adolescents exhibit greater intolerance of uncertainty and less psychological flexibility than adults (Okayama, 2023). IU in adolescent is strongly associated with generalized anxiety, social anxiety, and obsessive-compulsive symptoms. Adolescents with high IU also show higher levels of worry and difficulty making decisions. In addition, IU is also associated with sleep problems in adolescents, which can affect their daily functioning.

The developmental trend of IU from childhood to adolescence shows that IU is relatively stable during adolescence and tends to improve with age, which is related to emotion regulation skills that generally develop during adolescence. Gender differences were also found, with girls tending to have higher levels of IU. Higher levels of IU in girls compared to boys during preadolescence (Osmanağaoğlu, 2021). Therefore, gender appears to be an important factor associated with IU. IU may also be influenced by biological, physiological, and socioeconomic differences (Ye, 2023). In the context of brain development, IU is associated with abnormal activity in the anterior insula area and prefrontal cortex, suggesting a link between IU and response to uncertainty at the neurological level.

Parenting style emerged as a highly influential factor in the formation and development of IU. Supportive parenting styles were shown to reduce IU and worry in children, and authoritative parenting styles were negatively correlated with IU. In addition, childhood adversity and certain early temperamental traits were identified as risk factors for the development of IU later in life, emphasizing the importance of early identification and intervention. The clinical implications of these findings are substantial. Understanding IU as a transdiagnostic construct provides a valuable framework for assessment and intervention across multiple psychological disorders. Therapeutic approaches that specifically target coping with uncertainty may be particularly effective in improving overall mental health outcomes for children and adolescents.

## CONCLUSIONS AND RECOMMENDATIONS

Overall, the results of the meta-analysis highlight the importance of understanding IU in the context of child and adolescent development and the need for effective intervention strategies to promote adaptive coping with uncertainty. This systematic literature review provides substantial evidence that Intolerance of Uncertainty (IU) is a significant transdiagnostic factor that influences the psychological development and mental health of children and adolescents. The findings consistently demonstrate that IU plays an important role in the development and maintenance of several psychiatric illnesses, including anxiety disorders, depression, obsessive-compulsive symptoms, eating disorders, self-injurious behaviors, and social difficulties. Adolescents with high IU experience higher levels of anxiety, difficulty regulating emotions, and poor coping mechanisms when faced with uncertain situations. Moreover, IU serves as a transdiagnostic factor across multiple psychological conditions and can mediate the link between negative childhood experiences and mental health problems.

The developmental trajectory of IU reveals important patterns across age groups. While IU appears to be relatively stable during adolescence, there is evidence suggesting that tolerance for uncertainty may improve with age as emotion regulation skills develop. The neurobiological underpinnings of IU are beginning to emerge, with research indicating abnormal activity in the anterior insula and prefrontal cortex regions when processing uncertainty. In the other hand, environmental factors, such as parenting styles, childhood adversity, and early temperament play crucial roles in shaping IU levels, indicating the importance of early intervention to mitigate its long-term effects, play a crucial role in the development of IU.

The findings highlight the importance of considering IU in the assessment and treatment of mental health problems in children and adolescents. IU should be considered in mental health assessments and interventions, with a focus on strategies to enhance coping mechanisms and adaptive responses to uncertainty. Research should focus on developing and evaluating preventive interventions targeting IU in early childhood, particularly for children with identified risk factors such as specific temperamental traits or adverse childhood experiences. More comprehensive longitudinal research is needed to track the developmental trajectory of IU from early childhood through adolescence and into adulthood. Such studies would provide valuable insights into how IU evolves over time and identify critical periods for intervention. Research also should focus on developing and evaluating preventive interventions targeting IU in early childhood, particularly for children with identified risk factors such as specific temperamental traits or adverse childhood experiences.

## ADVANCED RESEARCH

Building on the current evidence base, advanced research should prioritize the integration of neurodevelopmental, psychological, and environmental frameworks to deepen our understanding of Intolerance of Uncertainty (IU) as a multifaceted construct influencing child and adolescent mental health. Future studies should employ longitudinal, multi-method

approaches incorporating neuroimaging, behavioral assessments, and ecological momentary assessments to map the dynamic interplay between IU, brain maturation, and socio-environmental influences across critical developmental windows. Special attention should be given to identifying neurocognitive markers and sensitive periods during which IU related vulnerabilities may be most amenable to intervention. Moreover, the development of precision-targeted, developmentally attuned interventions such as digital therapeutics, resilience-building programs, and parent-mediated strategies could significantly enhance the capacity to buffer at-risk youth against the long-term impact of IU. Cross-cultural investigations are also essential to determine the generalizability of IU mechanisms and to inform culturally responsive interventions. Ultimately, such integrative and forward-looking research will provide the empirical foundation for translational efforts aimed at fostering adaptive uncertainty tolerance from early childhood through emerging adulthood.

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