

The Role of Safety Behaviors in the Relationship Between Intolerance of Uncertainty and Anxiety in Anxiety Disorders

Luyuqian Tian *

Faculty of Social Science/Psychology, Western University, London, ON N6A 3K7, Canada

* Corresponding Author Email: selenett26@gmail.com

Abstract. Anxiety largely stems from an individual's negative expectations of uncertain future outcomes. Intolerance of Uncertainty (IU) is an important mechanism for maintaining anxiety. This paper examines the relationship between IU and safety behavior. It reviews how IU influences individuals' processing of threat-related information, and how they are more likely to engage in safety behaviors to reduce anxiety in uncertainty situations. From the perspective of learning theory, this study analyses how safety behaviors are negatively reinforced through short-term emotional relief, and examines their role in blocking inhibitory learning and maintaining threat expectations. This paper synthesises relevant research and proposes that IU forms a cyclical mechanism that maintains anxiety by promoting the repeated use of safety behaviors and limiting adaptive learning. It offers a new perspective on understanding the maintenance of anxiety disorders. Future research should further differentiate among various types of safety behaviors and examine their specific roles in sustaining anxiety.

Keywords: Intolerance of Uncertainty; Anxiety Disorders; Safety Behaviors; Inhibitory Learning; Threat Expectancy.

1. Introduction

Anxiety refers to an individual's negative expected response to uncertain outcomes when facing potential threats in the future. Its defining feature lies not in the threat itself, but in the uncertainty surrounding the outcome [1]. When individuals cannot tolerate this state of uncertainty, they will remain vigilant about potential threats and even overinterpret them. Taking generalized anxiety disorder (GAD) as an example, it is characterized by persistent anxiety and an exaggerated negative expectation of future threats. In recent years, a growing number of studies have linked this persistent anxiety to intolerance of uncertainty (IU). IU is not only significantly associated with anxiety symptoms; it is also linked to symptom manifestation in individuals with GAD and may play a role in maintaining anxiety [2]. Specifically, individuals with high IU tend to develop cognitive biases when processing threat-related information [3]. As a result, they may overestimate both the likelihood and severity of potential threats, and adopt coping strategies aimed at reducing uncertainty[3].

Research suggests that individuals with high IU often use safety behaviors to cope with this discomfort and quickly reduce their anxiety [4]. However, when individuals have difficulty tolerating uncertainty, safety behaviors may provide short-term relief from anxiety. At the same time, they can reduce opportunities to directly face uncertain situations, which may weaken tolerance for uncertainty over time and make anxiety more likely to persist. Experimental studies further show that relying on avoidance or protective responses in situations involving potential threat can weaken inhibitory learning when the expected threat does not occur [5-7]. This process makes individuals more likely to maintain their original threat beliefs [5-7]. Therefore, relying on safety behavior in uncertain situations may unintentionally block the correction of threat beliefs. It enables individuals to continuously maintain high expectations of potential threats, promoting the persistence of anxiety. A longitudinal study supports this finding, early measured IU levels can significantly predict the persistent severity of anxiety symptoms many years later [8].

In summary, in generalised anxiety disorder, high levels of IU may lead individuals to rely on safety behaviors to deal with uncertain situations. Though safety behaviors may reduce anxiety in the short

term, they also interfere with corrective learning. These factors render threat expectations difficult to change through experience, thereby increasing the probability of anxiety persisting. Based on the mechanisms outlined above, this paper first introduces the concept of IU and its relationship with threat processing. It then examines why individuals with high IU are more likely to rely on safety behaviors, and how these behaviors are negatively reinforced through short term anxiety reduction. Next, it explores how safety behaviours interfere with corrective learning and maintain threat expectations. Finally, it discusses the role of this mechanism in the maintenance of anxiety disorders.

2. Definition of IU and Its Relation to Threat Perception

Anxiety typically refers to an individual's negative anticipatory response to potential future threats [1]. In particular, intolerance of uncertainty (IU) is regarded as a key cognitive variable in the development of anxiety. It is also considered a core mechanism in cognitive models of various anxiety disorders. IU refers to a dispositional tendency in which an individual finds it difficult to tolerate the uncertainty of future outcomes, regardless of their actual probability [1]. For individuals with high IU, even if the objective probability of a negative event occurring is extremely low, they will still feel anxious due to the uncertainty of the outcome. This sense of unease may arise because IU can systematically alter how individuals process threat-related information [1]. This includes changes in attention allocation, interpretation of information, and risk evaluation [1]. In high IU individuals, uncertainty is perceived as threatening [1]. IU increases an individual's tendency to interpret ambiguous cues in a threatening manner [1]. When external information has multiple possible meanings, individuals with high IU are more likely to prioritise threatening interpretations and overlook neutral or positive possibilities. This cognitive bias causes individuals to exaggerate the threat signals in their environment during everyday situations. IU also leads individuals to overestimate the probability of negative events occurring and exaggerate the severity of potential consequences [1]. This anxiety prompts individuals to repeatedly engage with negative predictions, thereby intensifying their concerns about uncertain future situations and enhancing their anxiety response [1].

Overall, IU is a key cognitive variable influencing the processing of threatening information. It shapes an individual's cognitive processing of uncertain situations, including their understanding methods, information interpretation and risk assessment strategies. As a result, individuals are more inclined to perceive unknown situations as dangerous and uncontrollable, maintaining their anxiety response. Consequently, IU is considered an important cognitive risk factor shared across various anxiety disorders. IU not only influences an individual's emotional responses but may also affect their behavioral coping patterns in uncertain situations.

3. Increased Safety Behavior Use in Individuals With High IU

In anxious situations, individuals often adopt a series of behavioral strategies to reduce their sense of threat. Such behavior is called safety behavior. Safety behavior refers to the coping methods adopted by individuals when they perceive potential dangers to prevent adverse outcomes or alleviate anxiety responses. The aim is to enhance a sense of subjective safety and increase the sense of control over the situation [7]. Safety behaviors are typically manifested as specific actions, such as repeatedly checking one's environment for safety, seeking companionship from others, carrying particular objects, or taking preventive measures. These behavioral forms have certain commonalities across different anxiety disorders.

The methods individuals adopt to cope with uncertainty are usually influenced by their personal assessment of that uncertainty. For individuals with higher levels of IU, uncertainty may be seen as a potential threat. Therefore, they may be more likely to use specific behaviors to reduce this sense of uncertainty. In such situations, taking specific actions to increase the previsibility or controllability of the situation often becomes a way for individuals to cope with uncertainty. Safety behavior is a common coping style. It can enhance an individual's sense of control over the situation in the short

term and reduce the anxiety experience caused by unknown outcomes. In this case, safety behavior may become a behavioral strategy that individuals use to regulate their emotions and maintain a sense of subjective security when facing uncertain situations. In an experience sampling study based on everyday decision-making, 247 participants were asked to report real-life decisions six times a day. They also recorded their momentary indecision, decision characteristics, IU levels, and use of safety behaviors [9]. Individuals' IU levels were related to how often they used safety behaviors in daily life [9]. The findings showed that participants with higher IU were more likely to engage in behaviors such as avoidance, over-preparation, and repeated checking when facing uncertainty [9]. IU can shape both how people interpret threat-related information and how they respond to it [9]. When uncertainty is difficult to handle, people usually adopt safety behaviors. This approach can make the situation seem less dangerous and easier to deal with. Those with a higher IU are more likely to rely on such reactions in uncertain situations. While these behaviors may reduce anxiety initially, over time individuals may begin to employ them repeatedly across similar situations.

4. Negative Reinforcement of Safety Behaviors

Many safety behaviors are covert in nature because they often take the form of seemingly reasonable precautions or thorough preparation. Therefore, it is easily regarded by individuals as a necessary coping measure rather than an evasive response. From a functional perspective, safety behaviors may be regarded as a coping strategy aimed at controlling threats. This is manifested as a process through which individuals regulate their anxiety by engaging in specific actions within uncertain situations. In anxious situations, individuals typically experience negative emotions such as nervousness, unease, or worry. This state of negative emotion prompts individuals to actively seek ways to alleviate it. When individuals reduce their anxiety levels through avoidance or safety behaviors, emotional relief intensifies the recurrence of such behaviors [10]. For instance, when individuals with social anxiety choose to avoid social situations, their anxiety levels decrease accordingly. This outcome gradually intensifies their reliance on avoidance strategies. In addition, avoidance and safety behaviors tend to be repeated across similar situations. This is because such behaviors can either prevent threatening events or reduce their impact. Once people notice that a certain action helps ease threat or discomfort, they tend to use it again and rely on it in similar anxious situations. In this process, safety behaviors gradually evolve from a rapid reaction response to a more stable coping strategy.

From the perspective of learning theory, the persistence of safety behavior is the result of the repeated action of negative reinforcement mechanisms. In anxious situations, individuals tend to adopt avoidance or safety behaviors as coping strategies to alleviate negative emotional distress. When these behaviors successfully lower anxiety levels, the relief of emotional discomfort will reinforce the behavior and increase the likelihood of it recurring in similar situations. Avoidance behavior is believed to be learned through negative reinforcement [10]. Because such behavior can prevent the occurrence of threatening stimuli or mitigate the adverse effects that such stimuli may bring [10]. During this process, the reduction of anxiety, as a direct result of the behavior, will promote the recurrence of that behavior. As the connection between behavior and emotional relief continues to strengthen, individuals are more likely to prioritize avoidance strategies when facing threat clues [10]. There is no need to go through complex cognitive decision-making any more [10]. Safety behavior can gradually shift from active choice to a more automated response mode through multiple experiences.

A particularly central maintenance mechanism involves attribution bias. When an expected negative event does not occur, individuals may attribute the absence of threat to their own avoidance behaviors [11]. Instead of seeing the situation as safe, they are more likely to believe that their actions prevented the threat [11]. This kind of attribution bias can strengthen the belief that avoidance strategies are effective [11]. As a result, these behaviors are more likely to be used again in similar situations [11].

In conclusion, safety behaviors have two aspects. Safety behaviors can help people reduce anxiety quickly and make them feel safer. They can also bring some emotional relief and a sense of control

in dangerous situations. However, as time goes by, over-reliance on them will make it more difficult for people to directly confront uncertainty. This reduces the chances of updating threat-related beliefs through real experience. Long term reliance on avoidance strategies may weaken an individual's ability to cope with situations, making anxiety responses more likely to recur in similar environments.

5. Safety Behaviors Interfere with Inhibitory Learning

The reduction of anxiety does not mean that the original threat memory is erased. Instead, individuals form new inhibitory associations that compete with the existing threat memory [12]. Inhibitory learning pays more attention to whether an individual corrects their original threat expectations through real experiences. This learning mechanism also constitutes an important theoretical basis for exposure therapy [12]. The therapeutic effect does not depend on whether the emotions are relieved on the spot, but on whether the individual discovers through direct experience that the expected threat has not occurred, thereby correcting the original threat belief. When people originally expected danger but it did not occur in the actual situation, new security connections will form and compete with the existing threat connections [12]. Safety signals and safety behaviors can reduce opportunities to test threat outcomes directly [12]. This makes it harder for individuals to form new safety associations through experience, which can interfere with the development of inhibitory learning [12].

Safety behaviors become an important factor in maintaining anxiety because they interfere with learning that a threat does not occur. This makes it harder for individuals to learn from experience that the situation may actually be safe. Research suggests that maladaptive safety behaviors can maintain fear and anxiety by preventing individuals from learning that the expected threat does not occur [5]. This process is often referred to as “protection from extinction” [5]. Repeated use of protective behaviors can prevent individuals from learning that the threat is no longer present. This allows fear responses to continue.

The experiment found that participants frequently adopted safety behaviors when positive outcomes were absent [5]. Even if negative outcomes no longer occur, these behaviors still persist [5]. It hinders the formation of regression learning and maintains the original fear response [5]. Studies have supported similar mechanisms from a cognitive perspective. Using safety behaviors in relatively safe situations may lead to maladaptive consequences, as such behavior often maintains or even increases threat beliefs [6]. Safety behavior reduces the opportunity for individuals to directly test environmental safety, making it difficult to correct threat beliefs [6]. In an experimental task, participants who continued to use safety behaviors in previously safe situations showed higher threat expectations in a later test phase compared to those who did not use such behaviors [6]. This finding supports the idea that safety behaviors may help maintain threat-related beliefs [6]. Another study compared two conditions: one in which participants were required to use safety behaviors, and another in which safety behaviors were available but not mandated [13]. It was found that even if the safety behaviors were not actually used, as long as they were presented as options, the expected threat level of individuals would decrease significantly, and the learning speed would also slow down [13]. Compared to when safety behaviors were only available, requiring participants to actually use them led to a greater reduction in inhibitory learning [13]. Participants in this condition were also slower to show a decrease in their perception of danger [13]. Safety behaviors can interfere with the critical safety learning process, and thus also affect the persistence of anxiety.

Evidence from clinical treatment processes also supports the importance of inhibitory learning. Exposure therapy is a core approach in the treatment of anxiety disorders [14]. The efficacy of exposure therapy is associated with changes in threat expectations rather than short-term emotional responses [14]. A study found through the treatment process that the decline in threat expectations played a significant mediating role between exposure therapy and the improvement of anxiety symptoms [14]. This means that anxiety symptoms will only be alleviated when individuals gradually correct their original threat expectations in real situations [14]. This discovery has been verified at the clinical level, indicating that the therapeutic effect of the inhibitory learning model depends on

whether the new safe learning has truly taken place. If individuals continue to rely on safety behaviors during exposure, threat expectations may be less likely to change [14]. This can limit the development of inhibitory learning and reduce treatment effectiveness [14].

In conclusion, these findings indicate that safety behaviors are a common way to deal with anxiety related situations. However, by interfering with inhibitory learning, they can help maintain anxiety at a mechanical level. When individuals rely on safety behaviors, it can weaken learning that the threat does not occur. This means existing threat beliefs are maintained, and anxiety continues in uncertain situations.

6. The Cyclical Mechanism of Anxiety Maintenance

Existing studies have shown that safety behaviors play a significant role in the maintenance of anxiety symptoms. When individuals facing potential threats continuously rely on safety behaviors, threat expectations that might otherwise be corrected through experience may remain unchanged. A reduction in anxiety does not mean that the original threat expectation has been fully removed. Instead, individuals may gradually form new expectations of safety through experience, which can inhibit their original threat judgments. If individuals continue to use safety behaviors in a situation, they may not fully experience that the threat does not occur. This reduces opportunities to form new learning. In a fear conditioning experiment, the learning processes of the participants under conditions where safety behaviors were allowed and not allowed were compared [5]. Research has found that when participants are able to use safety behaviors, it is more difficult for individuals to learn through experience that the threat outcome will not occur [5]. Because security behavior reduces the opportunity to directly confront the outcome of the situation, the original threat expectations are more likely to persist [5]. This learning mechanism is also consistent with the role of IU in anxiety. Individuals with a higher IU tend to be less tolerant of the uncertainty of future outcomes and are inclined to interpret ambiguous or uncertain information as potential threats [1]. When uncertainty feels hard to handle, people are more likely to turn to avoidance or safety behaviors to bring their anxiety down in the moment. This can help at first, but it also means they have fewer chances to face uncertainty directly. Over time, it becomes harder to shift their expectations about threat, and anxiety can stick around.

Overall, IU may have indirectly maintained anxiety by promoting the use of safety behaviors. When individuals rely on safety behaviors in uncertain situations, their ability to update threat outcomes becomes limited. This makes it harder for existing threat beliefs to change. Over time, this pattern may form a cyclic process. High IU prompts individuals to use safety behaviors more frequently, and safety behaviors in turn block adaptive learning to uncertainty, thus perpetuating anxiety responses.

7. Conclusion

In conclusion, this article mainly focuses on the role of IU and safety behaviors in maintaining anxiety. Existing research indicates that individuals with high IU tend to rely on safety behaviors when confronting uncertainty. While these behaviors may alleviate distress in the short term, they ultimately limit opportunities to update threat expectations and contribute to the persistence of anxiety. In this sense, the persistence of anxiety is not only related to the threat itself, but also to how individuals handle uncertainty and respond to it. Therefore, when understanding anxiety disorders, attention should be paid to the behavioral patterns of individuals in uncertain situations and their impact on the learning process. Future research can further distinguish different types of safety behaviors and their roles in maintaining anxiety. This may help clarify how they affect inhibitory learning and provide information for developing more effective intervention measures.

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