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Expecting the Worst: Why Uncertainty is Scary (But Often Isn't)

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Abstract

The present article describes and provides empirical support for a novel theory of affective reactions to uncertain situations, from which we derive five interrelated hypotheses. The theory holds that people's past experiences, both long- and short-term, inform their expectations for future outcomes, particularly when the specific outcomes in a situation are unknown. More positive past experiences lead to positive expectations and hence positive affective reactions and approach behaviors related to uncertainty, and more negative past experiences lead to negative expectations and hence negative affective reactions and avoidance behaviors related to uncertainty. While short-term outcomes dominate future expectations in their immediate aftermath, long-term outcomes lead to more stable dispositional optimism or pessimism. In the present article, we describe how this theory explains much prior research on intolerance of uncertainty in several psychological fields, as well as how it can inform interventions aimed at attenuating the negative effects of intolerance of uncertainty, which range from anxiety disorders to involvement in violent extremist groups.

Keywords: Uncertainty; Past experiences; Affective reactions to uncertainty

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Introduction

Carleton (2016) called the unknown the "one fear to rule them all" (p. 5), explaining the clear evolutionary basis for humans' dislike of uncertainty. Consider the following simplified scenario: Two early humans are foraging for food when they come across two patches of berries. The smaller of the two includes a smattering of berries with which the humans are quite familiar. The larger patch is rife with berries the humans have never seen before. One of the humans goes straight for the larger patch – after all, gathering so many berries will be beneficial to themselves and to their entire community. The second human avoids the patch of novel berries and instead selects the safe option, gathering a smaller number of familiar berries. On the way back to their community, the first human samples one of the new berries, which turns out to be poisonous. She dies before mating and producing offspring. Meanwhile, the other human returns to the community and warns the others that this type of berry is unsafe to eat. An evolutionary victory for the fearful!

Yet, the story of uncertainty does not end with early humans foraging for berries. Consider a slightly more contemporary example: The year is 1975 and Ric Weiland is a senior at Stanford University. His high school friends, Paul Allen and Bill Gates, invite Ric to postpone his last year of college and move to Albuquerque to work for their new company. It is a risky decision; most new companies fail (Eisenmann, 2021). Evolutionary logic would tell a brilliant student at a top university to stay put – he is far more likely to land a lucrative, stable job after graduation. And yet, Ric takes a leap of faith and agrees to join his old friends in New Mexico. He becomes the lead programmer for Microsoft, retires in 1985, and dies in 2006 after donating millions to LGBTQ+ organizations (Stiffler, 2017). In an alternate universe, fear of uncertainty would have prevented Ric from joining Microsoft, to the detriment of the company and to all the people helped by his philanthropy in his later years.

Why is it that uncertainty is seen as a basic, primordial fear (Carleton, 2016), when plenty of people enjoy and seek out uncertainty (Sorrentino et al., 1984), and when intolerance of uncertainty is a hallmark of impairing psychological disorders such as generalized anxiety disorder (Dugas et al., 2004), obsessive compulsive disorder (Tolin et al., 2003), and panic disorder (Kim et al., 2016), among others? In the present article, we present a novel theory that intolerance and tolerance of uncertainty are not based on uncertainty as such, but rather on people's expectations of negative and positive outcomes to uncertain events, respectively. We posit that such expectations are based in people's past experiences, both long- and short-term (Kruglanski et al., 2023).

A Theory of Affective Reactions to Uncertainty

The presently discussed theory of affective reactions to uncertainty refers to people's positive (e.g., excitement, thrill) and negative (e.g., anxiety, fear) reactions to uncertain – that is, unknown, unpredictable – events. The theory posits that people's affective reactions to uncertainty are based on their expectancy of positive or negative outcomes to uncertain situations. These generalized expectations of positive or negative outcomes are, in essence, an individual's level of optimism or pessimism, respectively. And optimism and pessimism, in turn, are predicted by an individual's long- and short-term history of positive and negative outcomes. Whereas the effects of long-term history of outcomes persists over time, leading to stable, dispositional optimism or pessimism, recent experiences of positive and negative outcomes lead to a spike in situational optimism or pessimism that decays over time. Of course, people's specific expectations about the current situation also play a role in determining people's affective reactions to uncertainty, such that when the subjective weight of situation-specific expectancies increases, the influence of past outcomes decreases, and vice versa. These hypotheses can be summarized in a single equation [1], wherein a person's affect in a given situation (As), is dependent on the valence of their long-term history of outcomes (VLH), the subjective weight of their long-term history of outcomes (wL), their recent history of outcomes (VRH), and their specific expectancies for the given situation (VS), which is comprised of the sum of the product of the valences and probabilities of all imagined outcomes to the situation ():

$$A_S \sim |1/V_S| * [w_L V_{LH} + 1/\text{Time} * V_{RH} * |V_{LH} - V_{RH}|] + V_S * |V_S - V_{RH}| \quad [1]$$

Empirical Evidence

The presently described theory of affective reactions to uncertainty is supported by scores of empirical evidences. In the forthcoming section, we describe such evidence for each of five hypotheses derived from the theory and the equation presented above.

Hypothesis 1

Hypothesis 1 holds that individuals' degree of optimism and pessimism will determine their affective response to novel situations (Kruglanski et al., 2023). Indeed, optimism has long been linked to positive responses to novelty, including sensation-seeking (Konowalczyk et al., 2019), risk-taking (Anderson & Galinsky, 2006), and positive coping with the uncertainty involved in chronic, severe illness (Frain et al., 2008; Scheier & Carver, 1985; Fox, 2013; Schiavon et al., 2017).

Hypothesis 2

Hypothesis 2 holds that one's long-term history of outcomes will affect an individual's affective response to uncertain situations, when the valence of the possible outcomes to those uncertain situations are unknown. In other words, people with more positive long-term histories will react more positively to uncertainty, and people with more negative long-term histories will react more negatively to uncertainty (Kruglanski et al.,

2023). Hypothesis 2 is supported by evidence from several studies conducted by Ellenberg (2023), demonstrating among a diverse sample of American adults that increased numbers of adverse childhood experiences (i.e., more negative long-term outcomes) predicted more negative reactions to a set of neutrally valanced uncertain events (as determined by a principal components analysis of a set of 14 positive, negative, and neutral uncertain events: the first day of school, a blind date, a job interview, the birth of a new sibling, a game of bingo, a pop quiz). And more positive perceptions of one's parents during childhood (i.e., more positive long-term outcomes) predicted more positive reactions to the same set of uncertain events. These effects were serially mediated by pessimism/optimism and intolerance/tolerance of uncertainty, respectively. Consistent with these findings, in prior research, negative life experiences were associated with high intolerance of uncertainty (Mittal & Griskevicius, 2014).

Support for Hypothesis 2 is also provided by relevant findings from cross-cultural psychology. Uncertainty avoidance was one of Hofstede's (2001) primary dimensions of culture, and in a 33-nation sample, Gelfand and colleagues (2011) found that individual intolerance of uncertainty was associated with ecological and historical threats (i.e., negative past outcomes) in their country. This finding was replicated across different states in the United States (Harrington & Gelfand, 2014).

Hypothesis 3

The third hypothesis derived from our theory of affective reactions to uncertainty is parallel to the second, holding that one's recent history of outcomes will affect an individual's affective response to uncertain situations, when the valence of the possible outcomes to those uncertain situations are unknown. In other words, people with more positive recent outcome histories will react more positively to uncertainty, and people with more negative recent outcome histories will react more negatively to uncertainty (Kruglanski et al., 2023). This hypothesis is supported by several experiments conducted by Erev and colleagues (2020), demonstrating deviations from rational choice. Specifically, participants were found to overestimate the likelihood of a gain, ignoring objective probabilities, in a gambling activity if their immediate past trials resulted in gains. And if their immediate past trials resulted in losses, they overestimated the likelihood of a loss in their subsequent trial, even if objective probabilities suggested otherwise.

Hypothesis 3 was also tested directly by Contu and colleagues (2023), who assigned Italian participants to take a brief general knowledge quiz before receiving either positive or negative (false) feedback on their quiz performance (i.e., positive or negative recent outcomes). Participants were then asked to rate their affect using the Positive and Negative Affective Schedule (Watson et al., 1988, Terracciano et al., 2003) after imagining themselves in one of three randomly assigned situations: A known positive situation ("resting after a tiring and productive day"), a known negative situation ("being unable to rest as desired"), or an unknown situation ("resting in a place you have never been before"). ANOVA and subsequent post-hoc analyses revealed that there was no effect of short-term outcomes on participants' affective ratings of the known positive and known negative situations, but there was a significant effect of short-term outcomes on participants' affective ratings of the unknown situation, such that participants in the negative feedback condition rated the unknown situation more negatively, and participants in the positive feedback condition rated the unknown situation more positively (Contu et al., 2023).

Hypothesis 4

Hypothesis 4 highlights when long-term histories of outcomes are more heavily weighted and when short-term outcomes are more heavily weighted in determining individuals' affective reactions to uncertainty. Specifically, Hypothesis 4 holds that in the immediate aftermath of a short-term outcome, the effect of that short-term outcome on affective responses to uncertainty will be greater than the effect of the individual's long-term outcomes. However, this effect of short-term outcomes decays over time, such that long-term outcomes have a greater effect after more time has passed since the short-term outcome. This hypothesis is consistent with the synapse model (Higgins et al., 1985), which holds that chronic priming has a greater effect after a long delay since the more recent prime, but that a recent prime will outweigh a chronic prime when a cue is presented in close proximity to that prime.

Contu and colleagues (2023) conducted a follow-up study to that described previously, in which they manipulated short-term outcomes and measured affective responses to unknown situations as described above, but added a manipulation of delay, in which the affective responses to the known or unknown situations were measured either immediately after the short-term outcome manipulation or two days later. Additionally, participants' long-term histories of positive and negative outcomes were measured. A multiple regression model revealed a significant interaction between short-term outcome condition (positive versus negative) and delay (short versus long), such that short-term outcome condition had a significant effect on participants' positive affective responses to the unknown situation when the delay was short but not when it was long. And conversely, perceptions of long-term past outcomes had a significant effect on positive affective responses to the unknown situation when the delay was long but not when it was short. In other words, participants' positive reactions to unknown situations were affected by short-term outcomes in the immediate aftermath of those outcomes, but were affected instead by long-term outcomes when two days had passed since the presentation of the short-term outcomes. Notably, this interaction was significant only for positive affect related to unknown situations, but not for negative or global affects, which were predicted only by short-term outcome conditions but not by long-term outcomes or by the delay (Contu et al., 2023). As a possible explanation, it could be the case that the "long" delay may not have been long enough for negative affects to return at neutrality. In support of this notion, past research showed important differences about recalling past events between positive and negative affect. For example,

negative (vs. positive) affects have been shown to be associated with better recall of visual details (Kensinger, Garoff-Eaton, & Schacter, 2007). And, importantly, negative events such as receiving a negative outcome strengthen the recall of negative items while weakening that of the surrounding context (Bisby & Burgess, 2017).

Hypothesis 5

The fifth hypothesis derived from the presently described theory of affective reactions to uncertainty links this theory to the oft-studied behavioral reactions to uncertainty. Specifically, this hypothesis holds that negative affective reactions to uncertainty lead people to escape uncertainty and seek certainty, whereas positive affective reactions to uncertainty lead people to approach uncertainty and seek opportunities provided by it.

Uncertainty-avoidance behaviors have been studied extensively. People with a high need for cognitive closure, for example, tend to "seize and freeze" on information that affords certainty (Kruglanski & Webster, 1996), leading to stereotyping (Kruglanski & Freund, 1983), closed-mindedness (Chirumbolo et al., 2005), black-and-white thinking (Frenkel-Brunswick, 1948), and conspiracy beliefs (Marchlewska, Cichocka, & Kossowska, 2018). Intolerance of uncertainty has also been found to predict other certainty-affording behaviors, such as joining highly entitative groups with strict ingroup-outgroup boundaries, organizational hierarchies, and behavioral norms (Hogg, 2009, 2012). In the realm of clinical psychology, compulsive checking behaviors have been found to afford certainty among individuals with obsessive-compulsive disorder (Toffolo et al., 2016), as has restrictive or ritualistic dieting behaviors among individuals with eating disorders (Kesby et al., 2017).

Such evidence may seem to suggest that all uncertainty-avoiding and certainty-seeking behaviors are maladaptive. Combined with the previously presented evidence related to predictors of negative affective reactions to uncertainty, one might subsequently surmise that everyone with prior negative experiences develops anxiety disorders or joins violent extremist groups! Yet, this is not the case. Several streams of research have found that certainty can also be found through self-affirming behaviors such as endorsing cherished values and a positive sense of self (De Cremer & Sedikides, 2005; Cook et al., 2012); or by voicing one's opinions about an unfair situation (Van den Bos, 2001). Indeed, it appears that affirming one's sense of significance (Kruglanski et al., 2022), through prosocial means, can result in reducing negative affective reactions to uncertainty.

There has been considerably less research on the behavioral outcomes of positive affective reactions to uncertainty. However, an approach orientation toward uncertainty may be conceived as closely related to openness to experience, one of the "Big Five" factors of personality (Hodson & Sorrentino, 1999). Openness to experience describes a willingness to explore and embrace novelty, and is positively associated with creativity (McCrae, 1987; Ivcevic & Brackett, 2015; Li et al., 2015; Tan et al., 2019). Indeed, novel inventions and innovations which have moved society forward surely could not have been accomplished without a great deal of tolerance for uncertainty (Jalonen, 2012; Brouwer, 2000). Similarly, several studies have found a negative correlation between need for closure and creativity (Chirumbolo, et al., 2005; Ortega-Martin et al., 2021; Tadmor et al., 2013).

Closely related to openness to experience, creativity, and positive reactions to uncertainty is exploration. Exploration is critical to healthy child development, and children with secure attachments are consistently more eager to explore their environments than children with insecure attachments, across cultures (Grossman et al., 2008; Rothbaum et al., 2000), further demonstrating the link between positive long-term experiences and positive reactions to uncertainty, as delineated in Hypothesis 2 of our theory (Kruglanski et al., 2023). Beyond childhood, secure attachment to God has been linked to greater religious exploration and greater religious tolerance (Beck, 2006), and priming secure attachment cues has been found to result in greater exploration of novel stimuli (Green & Campbell, 2000).

Relation to Other Theories

In the previous sections, we have hinted at how our theory of affective reactions to uncertainty relates to and is consistent with other theories of uncertainty. In the present section, we briefly elucidate how our theory complements and supplements several of the most well-known such theories. First, Hogg (2007) states in his Uncertainty-Identity Theory that "feelings of uncertainty, particularly about or related to self, motivate people to identify with social groups and to choose new groups with, or configure existing groups to have, certain properties that best reduce, control, or protect from feelings of uncertainty" (p. 69). As we have noted in the present article, feelings of uncertainty in and of themselves may not drive individuals into the arms of extremist groups. Even feelings of uncertainty about oneself may not necessarily be negative for someone with a history of positive outcomes and high self-esteem (e.g., "Am I good or am I great?" "Which top-tier university should I attend?" "Should I leave my well-paying job to join a potentially even better start-up?"). Rather, we posit that when self-uncertainty drives extremism, it is not because of uncertainty in and of itself, but rather because that self-uncertainty engenders negative feelings, namely, insignificance and lack of meaning or purpose (Kruglanski et al., 2022), and negative expectations about the future, thus leading the individual to seek out groups and causes that allow them to regain certainty about their significance and place in the world. Similarly, McGregor and Marigold's (2003) theory of "compensatory conviction" holds that people cling zealously to their beliefs in the face of uncertainty about themselves; our theory explains that such zeal is engendered by the negative feelings associated with self-uncertainty, as described above, rather than by uncertainty itself.

Several streams of research have explored the link between intolerance of uncertainty and authoritarianism and support for

authoritarian leaders, finding that people who are predisposed to avoid uncertainty display a preference for authoritarian leaders, alongside dichotomous thinking, ethnocentrism, and stereotyping (Adorno et al., 1950; Contu et al., 2024; Frenkel-Brunswick, 1948; Sanford et al., 1950). More recent research has found that the "prejudice-prone personality" described by Allport (1954) is explained not only by the individual's need for cognitive closure, but also by their adherence to binding moral foundations (Albarello et al., 2023), which may be particularly strong in times of negatively-valenced self-uncertainty. Beyond dispositional intolerance for uncertainty, research in the field of organizational psychology has also found that under conditions of uncertainty, people prefer strong, authoritarian leaders and are willing to grant their leaders more power and authority (Haller & Hogg, 2014; Rast III et al., 2012). The present theory would suggest that these results arise because when people expect negative outcomes to uncertain situations (and indeed Adorno and colleagues (1950) hypothesized a link between negative childhood experiences and intolerance of ambiguity), they are more willing to support and turn over responsibility to leaders who promise to bring them certainty and moral clarity, even at the expense of their freedom. In contrast, people with more positive life experiences who expect positive outcomes to uncertain situations feel less of a need to relinquish power to a strong leader because they are more interested in exploring the opportunities provided by such uncertainty. Perhaps relatedly, leaders with a higher tolerance for uncertainty are less authoritarian and more transformational in their leadership style, resulting in more positive, creative, and productive work environments (O'Connor et al., 2022).

Other theories related to uncertainty have arisen in the fields of judgment and decision making, focusing on the ways that people use heuristics and biases when making decisions under uncertainty (Tversky & Kahneman, 1974), and of developmental psychology, focusing on infants' behavior in "strange" – that is, novel and uncertain – situations (Ainsworth & Bell, 1970). In these fields and others, the present theory supplements existing work by demonstrating why people seek to avoid uncertainty and why exploring uncertainty under certain conditions is emblematic of positive, secure attachment styles. Indeed, with regard to attachment theory (Ainsworth et al., 1971, 1978), securely attached infants are expected to explore the strange situation only when their caregiver is present; they are expected to exhibit distress when their caregiver leaves. Consistent with our theory of affective reactions to uncertainty, infants do not know to expect that their caregiver will return after they leave, so they do not react positively to such an event. But, securely attached infants do expect that when their caregiver is present, they are safe to explore – they expect positive outcomes to uncertain situations. In contrast, infants with avoidant attachment styles, who may have histories of abuse or neglect, are unaffected by their caregiver leaving them, because they do not associate such uncertainty with negative outcomes, but they also do not feel safe to explore their environments when their caregivers are present. And infants with anxious attachment, who may have histories of inconsistent parenting, show intense distress upon their caregiver leaving and cling to their caregiver upon their return, demonstrating that they do not trust that they can safely explore uncertain situations (Ainsworth et al., 1971, 1978). Hence, babies' affective reactions to uncertainty, like adults', are closely linked to their past experiences and their expectations about the outcomes to uncertain events.

Changing Affective Reactions to Uncertainty

Our theory of affective reactions to uncertainty therefore supplements the existing psychological literature on reactions to uncertainty by explaining why uncertainty can be so distressing for some people, in some situations, but not for other people, or in other situations. This explanation, based on people's long- and short-term past experiences and their subsequent expectations about the outcomes to uncertain situations, lends itself well to informing interventions aimed at increasing people's positive reactions to uncertainty and decreasing their negative reactions to uncertainty, which can lead to harm to both themselves and others (Jones et al., 2024; Hogg, 2012).

Expecting Positive Outcomes

One clear way to increase people's positive affective reactions to uncertainty is to increase their expectations of positive outcomes. Several interventions have already been developed to teach people to expect good outcomes (i.e., "learned optimism"; Seligman, 2006). Other interventions focus on reframing failures as opportunities to grow, thus aiming to reduce fear of failure in novel situations (i.e., "growth mindset"; Dweck, 2006). Similarly, interventions based on the psychology of "grit" aim to translate adversity into success (Duckworth, 2016), rather than predicting expectations of failure. Whereas clinical interventions based on these theories have been found to reduce intolerance of uncertainty among individuals with anxiety disorders (Robichaud & Dugas, 2006), research has yet to demonstrate the efficacy of teaching people to expect positive outcomes in non-clinical populations.

Detaching from Outcomes

Another possible mode for altering people's affective reactions to uncertainty does not aim to change people's expectations of the outcomes to uncertain situations. Rather, the present theory suggests that if reactions to uncertainty are based in expectations about outcomes, then decreasing the importance of those outcomes should similarly decrease the distress of the uncertain situation itself, as well as decreasing positive affective reactions to uncertainty. The Buddhist principle of non-attachment to outcomes has been incorporated into the practice of mindfulness meditation, which has become increasingly popular around the world (Smith, 2022). In a study conducted by Ellenberg (2023), participants were randomly assigned to complete a mindfulness meditation activity based on this principle of non-attachment or to complete a brief writing task before rating their affective reactions to 14 uncertain situations. As described

above, a principal components analysis resulted in the use of the mean rating for the six most emotionally ambiguous events (the first day of school, a blind date, a job interview, the birth of a new sibling, a game of bingo, a pop quiz) as the final measure of affective reactions to uncertain situations. Participants in the mindfulness meditation group rated the uncertain events significantly more neutrally (that is, closer to the midpoint of the scale) than participants in the control group ($t(398) = 2.379$, $p < .05$), demonstrating that even a brief intervention focused on non-attachment to outcomes can result in less extreme emotional reactions to uncertainty.

Conclusion

Consider the case of the early human foragers described at the outset of this article. The person who opted not to eat the poisonous berry knew from prior experience that novelty often has painful consequences – their fear of uncertainty was well-founded and evolutionarily beneficial. In many cases, that type of learning persists in modern society, particularly among children who learn not to talk to strangers or to hold their parents' hand when encountering a new situation. But as they grow, they hopefully learn to be more curious about the world around them, confident that they will be safe. Of course, an adult who cannot talk to a new person without the presence of a parent is not securely attached! One such adult who learned to embrace uncertainty was Ric Weiland, also discussed at the outset of this article. Ric had positive life experiences, and positive impressions of his friends, Paul Allen and Bill Gates, which led him to expect that joining Microsoft would lead to positive outcomes. Certainly, not all instances of uncertainty will lead to either death by poisonous berry or becoming a multimillionaire, but expecting positive outcomes, while preparing for negative ones, can improve people's wellbeing and that of those around them.

The presently discussed theory of affective reactions to uncertainty posits that such reactions to uncertainty, are based on several factors, each of which is supported directly or indirectly by empirical evidence. Perceived valence of the imagined outcomes to the specific situation has a hydraulic relationship with the valence of recent outcomes, whose weight decreases over time, and long-term outcomes (Kruglanski et al., 2023). Thus, in cases when the outcome of a situation is unknown, people's affective reactions are driven by their long- and short-term past experiences, including adverse childhood experiences and positive parenting styles leading to secure attachment, and these experiences inform whether they expect positive or negative outcomes to uncertain events. These expectations often present as optimism or pessimism but may also manifest as perceptions of one's own self-efficacy, resilience, or ability to cope with negative outcomes, should they arise (Ellenberg, 2023). Thus, changing people's expectations of outcomes to uncertain events, as in learned optimism, or detaching from outcomes altogether, as in mindfulness meditation, are both promising methods of decreasing the negative outcomes that have long been associated with uncertainty and intolerance thereof.

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The authors have no relevant financial or non-financial interests to disclose.

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