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Learning to Love Uncertainty

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Abstract
Uncertainty has a negative reputation. Not knowing what has happened or is going to happen is typically depicted as undesirable, and people often seek to minimize and avoid it. Research has shown that having a negative attitude toward uncertainty is associated with poor mental health and that certainty seeking can lead to accepting meager rewards and low-quality information. As a remedy for negative views of uncertainty, the present review discusses the functions of some typical responses to uncertainty as well as research on circumstances in which uncertainty can be leveraged to improve well-being. Uncertainty can focus attention, increase effort, and increase the intensity and duration of positive effect. Recognizing that there are situations in which uncertainty is desirable may be a first step toward improving attitudes toward uncertainty.

Keywords
uncertainty, intolerance of uncertainty, emotion, well-being

Uncertainty is often treated as a particularly terrible state. A recent United Nations report focused on how, recently, escalating uncertainties have created "a new uncertainty complex" and identified uncertainty as a contemporary worldwide problem, indeed approaching crisis levels (United Nations Development Programme, 2022).

Uncertainty is a cognitive-emotional state of not knowing which of multiple possibilities is or will be true (FeldmanHall & Shenhav, 2019). Psychological theories about uncertainty often focus on the ways uncertainty contributes to inefficiency, anxiety, and extremism (e.g., Hirsh et al., 2012; Hogg, 2014). People are sometimes willing to make substantial trade-offs to avoid or end uncertainty, even when having more information cannot improve their outcome (e.g., Gneezy et al., 2006). People make choices that make their outcomes worse—simply to reduce uncertainty. Negative attitudes toward uncertainty have also been increasing over time (Carleton et al., 2019).

The proposed brief review will offer a counterpoint by presenting uncertainty in a more positive light. After all, a life without uncertainty would lack adventure, suspense, surprise, novelty, and perhaps even genuinely free choice. First, we review evidence that certainty seeking and a distaste for uncertainty are related to worse mental health and practical outcomes. Then, we seek to improve negative perceptions of uncertainty by addressing the ways psychological responses to uncertainty can be leveraged to improve well-being. We readily acknowledge that uncertainty, like many psychological variables, has both positive and negative aspects. However, the downsides of uncertainty have been widely bemoaned and well documented, and the present review highlights the positives.

Intolerance of Uncertainty

People who accept uncertainty in their lives are better off than those who do not. Intolerance of uncertainty is an individual difference in the inability to handle the aversiveness that accompanies a lack of knowledge (Carleton, 2016; Freeston et al., 1994). A meta-analysis found that intolerance of uncertainty was significantly related to higher rates of generalized anxiety disorder, social anxiety, panic disorder, depression symptoms, and eating disorders (McEvoy et al., 2019). In a study of over 100,000 adolescents, risks of suicide ideation, depression, anxiety, and sleep disturbance were higher

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in adolescents with greater intolerance of uncertainty (Ye et al., 2023). Among participants seeking treatment for anxiety disorders, intolerance of uncertainty was correlated with worry severity and depressive symptoms even after controlling for negative affect (Boswell et al., 2013). Having an ability to tolerate uncertainty may be protective from daily hassles. Daily hassles significantly increased anxiety symptoms across a 1-month period for people high in intolerance of uncertainty but not among people holding a more positive attitude about uncertainty (Chen & Hong, 2010).

Although the individual-difference findings are correlational, there are some data suggesting changes in mental health follow changes in intolerance of uncertainty. Experimentally increasing participants' intolerance of uncertainty (by making them think about statements indicating that uncertainty is difficult and unacceptable) increases the amount of worry and negative affect they report (Mosca et al., 2016). Among people in treatment for anxiety disorders, cognitive behavioral therapy made people more tolerant of uncertainty (Boswell et al., 2013). These increases in tolerance for uncertainty between pre- and posttreatment were correlated with decreases in depression and anxiety symptoms. Some successful treatment options for generalized anxiety disorder incorporate specific interventions to promote greater tolerance of uncertainty (Hebert & Dugas, 2019). These interventions encourage experiences of uncertainty that may challenge clients' negative beliefs about uncertainty. Reducing people's negative attitudes toward uncertainty may improve mental health.

Sacrificing Quantity and Quality for Certainty

In addition to the unhappiness associated with distaste for uncertainty, the quest for certainty can also lead to objectively costly decisions. Decision researchers have labeled one self-defeating pattern the "uncertainty effect" (Gneezy et al., 2006). In a between-subjects design, participants were asked how much they would pay for a $50 gift card or for one of a few different lotteries of varying probabilities that would result in either a $50 or a $100 gift card. Participants who were offered the worst option (guaranteed $50) were willing to pay more than participants who were offered some superior lotteries (e.g., 50% chance of either $50 or $100). Participants implicitly rejected the chance to receive more money to avoid uncertainty. People view uncertain options as less valuable than more certain options, even when the uncertain option is worth objectively more.

Devaluing uncertain options is more pronounced for people who dislike uncertainty. Participants high in intolerance of uncertainty sacrificed some rewards merely to reduce the duration of uncertainty (Luhmann et al., 2011). Participants chose between a 50% chance of a small reward and a 70% chance of a moderately larger reward—but the latter required a short delay in finding out whether they had won. There was no material benefit to finding out faster, but people with the most negative attitudes about uncertainty often chose the worse odds and smaller reward anyway to reduce the time spent being uncertain. People higher in uncertainty intolerance may accept less desirable, but more immediately available, options. Although the amounts of money at stake were small in this study, if the pattern were to extend to choice among careers and romantic partners, the consequences could be momentous. To be sure, we cannot rule out the idea that choices would be very different if much bigger amounts or outcomes were at stake. Nevertheless, these choices are already irrational even with small stakes, suggesting a fairly primitive mental attitude that uncertainty is bad, period.

Reduced monetary rewards are not the only objective error that can stem from a distaste of uncertainty. Similar to intolerance of uncertainty (and moderately correlated with it; Whitecross & Smithson, 2023), deprivation curiosity is an individual difference in the tendency to experience lack of knowledge (uncertainty) as aversive rather than intriguing (Litman & Jimerson, 2004). People high in deprivation curiosity are more likely to report believing a variety of types of misinformation than people who do not (Zedelius et al., 2022). For example, people high in deprivation curiosity are more likely than those low in deprivation curiosity to claim familiarity with nonexistent constructs and to rate computer-generated nonsense statements ("Attention and intention are the mechanics of manifestation") as profound. Being unable to tolerate uncertainty can lead to preferring inaccurate or shallow information over a lack of information. Essentially, one becomes a sucker for any suggested solution, eager to get rid of the uncertainty and ambiguity. Learning to accept uncertainty may improve objective outcomes and knowledge.

An Antidote to Negative Perceptions of Uncertainty

One antidote to intolerance of uncertainty may be to help people appreciate uncertainty. This appreciation may be cultivated by helping people understand the functions of the effects of uncertainty and leverage those effects to improve well-being when possible.

Uncertainty is an amplifier of experiences, both good and bad. This amplification helps call people's attention to aspects of their lives they do not completely understand and situations where an outcome has not been

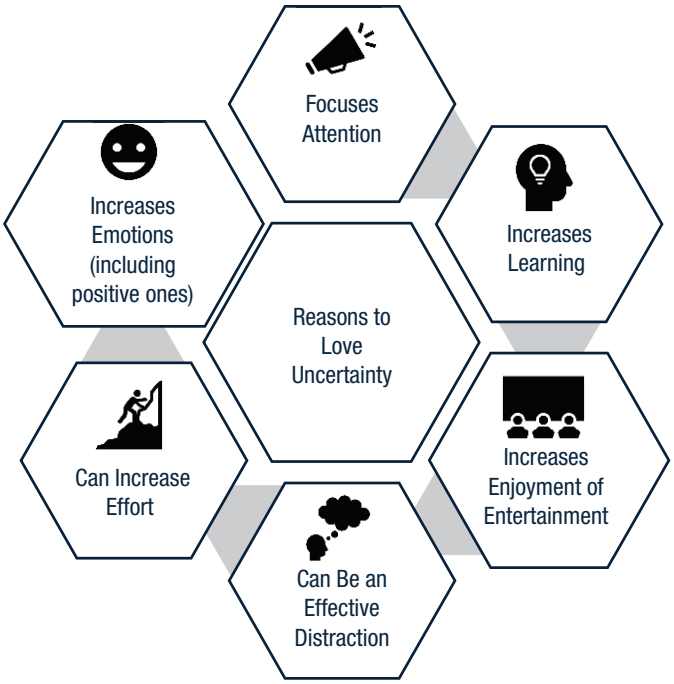

Fig. 1. Research-based reasons to love uncertainty.

decided yet (and potentially may still be influenced; Alquist & Baumeister, 2023). Uncertainty increases attention, improves learning, increases arousal, increases effort, and increases emotion (see Figure 1). One can easily imagine how uncertainty's effects can lead to more intense negative experiences, but here we highlight the ways uncertainty's effects can also increase the enjoyability of positive experiences.

Uncertainty increases attention and improves learning

The function. Uncertainty draws attention, and this attention helps people learn. Participants were exposed to a stimulus that was paired with an aversive sound on 0%, 50%, or 100% of trials (Hogarth et al., 2008). Participants were not explicitly told the pairings, but over time, participants gazed longer when exposed to the uncertain stimuli (50%) versus the certain stimuli (0%, 100%). However, participants who failed to look longer on the uncertain trials also failed to learn which stimuli produced the aversive sound. Although causal conclusions cannot be drawn from correlational evidence, this finding suggests that there is a relationship between attending to and learning from uncertainty.

Attention can also be directed to uncertain situations via increased arousal. A probability-learning study by de Berker et al. (2016) found that more uncertain probabilities (i.e., closer to 50-50) led to greater arousal. Moreover, participants whose arousal was greater when the probabilities were more uncertain learned faster and thereby were shocked less frequently for the wrong answer than participants whose arousal did not as closely follow the uncertainty of the probabilities. Experiencing arousal associated with uncertainty can help individuals learn. This suggests that people may benefit from being aware of when situations are uncertain.

Leveraging for well-being. Of course, when a situation is purely negative, the increased attention and arousal that come with uncertainty can lead to negative outcomes. For example, among college students with chronic medical conditions, illness uncertainty is associated with greater arousal, which is associated with poorer sleep quality (Fisher et al., 2023). However, the increased attention and arousal associated with uncertainty can also be used in specific situations to improve well-being.

Because uncertainty captures attention, uncertain positives serve as excellent distractions and can take people's minds off unpleasant things. Participants assigned to watch a low-quality video enjoyed their experience more if they were given a gift wrapped in opaque packaging (uncertain about gift) than if they were given a gift wrapped in clear packaging (certain about gift; Isikman et al., 2016). Although distraction has a negative reputation, distraction is a relatively effective way to reduce negative emotions in response to distressing stimuli (Van Dillen & Koole, 2007) or among people in depressed moods (Nolen-Hoeksema & Morrow, 1993). Uncertain treats and entertainment (suspenseful novels and shows, a grab-bag subscription) may provide better distractions from unpleasant realities than less uncertain treats.

Meanwhile, uncertainty can increase the enjoyment of entertainment. People prefer to watch live sports events and reality television events as compared with taped or scripted ones, because they find the live ones more exciting (Vosgerau et al., 2006). Note that viewers did not know the outcome in either case—but knowing that the outcome had not been decided made the experience more appealing anyway. Other research has shown that people view situations where the outcome is yet determined as more uncertain than situations where they simply lack knowledge of an outcome (Brun & Teigen, 1990). Uncertainty is increased and has particular potential to be enjoyable when the outcome has not yet been determined (Alquist & Baumeister, 2023). Live entertainment often capitalizes on the positives of uncertainty.

Uncertainty can motivate effort

The function. Uncertainty about an outcome can also increase effort. Under some conditions, uncertainty is

experienced because an outcome has not been determined yet, which may mean it could still be influenced in a desired direction. Because of this, uncertainty can be a cue to invest more effort in the hope of a particular outcome.

Leveraging for well-being. Participants randomly assigned to think about a time when they were worried that a potential partner did not want a relationship with them reported being more willing to invest in the relationship than participants in a control condition (Eastwick & Finkel, 2008). Even uncertainty of reward quantity can increase effort. Participants who were told a coin flip would determine whether they received a $1 or a $2 reward were more likely to complete a task successfully than participants who were told they would receive $2 (Shen et al., 2015). In other words, they worked harder for a possibly lower reward than for a definite (certain) one. Recognizing uncertain situations may be critical to putting in the effort to move an outcome in the desired direction.

Uncertainty increases emotional intensity and duration

The function. The AREA (attend, react, explain, adapt) model of affective adaptation states that people attend to and have emotional responses to uncertain things until they can explain them (Wilson & Gilbert, 2008). As a result, uncertainty can increase both the duration (Wilson et al., 2005) and intensity of emotions (Bar-Anan et al., 2009).

In one series of studies, participants were asked to watch either positive or negative video clips while repeating phrases associated with either uncertainty ("I wonder") or certainty ("I see what's happening"). Participants who were assigned to repeat the uncertain phrases reported stronger emotions in line with the video they saw than participants who were assigned to repeat certain phrases. That is, whatever the emotion was, uncertainty amplified the emotion, including making good feelings even stronger. The effect was mediated by participants' curiosity about the clips, suggesting that information seeking may play a role in the relationship between uncertainty and emotion.

Leveraging for well-being. In happy situations, uncertainty can increase happiness (e.g., Lee & Qiu, 2009; Wilson et al., 2005). In one study, participants exchanged information with fictional other participants and received positive feedback about their profile (Wilson et al., 2005). Some participants were told which participant gave them which feedback (certain condition), and some were not (uncertain condition). Participants in the uncertain condition were significantly happier 15 min after getting the feedback than participants in the certain condition. In other words, happiness lasts longer after learning that an unknown "somebody" likes you than after learning that a specific person likes you.

Research on the "teasing effect" has also shown that people also enjoy a positive outcome more if the positive outcome was preceded by some uncertainty (Ruan et al., 2018). In one study, some participants were assigned to experience uncertainty by having a gift card they could win gradually emerge from an envelope. Compared with participants who were immediately shown the Target gift card, participants who had the gift card revealed gradually reported feeling better and liking Target more. Preceding a desirable event with some uncertainty enhances the experience.

People do not anticipate the positive emotional effects of positive uncertainty. Wilson et al. (2005) coined the term "the pleasure paradox," which is the idea that although people are motivated to seek certainty even for positive events, certainty actually reduces the duration of positive feelings. In studies showing increased happiness from positive uncertainty, a separate group of participants were asked whether they would prefer the certain or the uncertain condition (Lee & Qiu, 2009; Ruan et al., 2018; Wilson et al., 2005). The overwhelming majority chose the certain option. Uncertainty can make positive feelings last, but people do not anticipate this benefit.

Future Directions

This article takes the perspective that intolerance of uncertainty may be improved by learning about the functions of uncertainty and encouraging people to embrace positive uncertainties. The idea that improving attitudes toward uncertainty could improve intolerance of uncertainty is supported somewhat by research showing the effectiveness of multiple-week therapy protocols that aim to improving intolerance of uncertainty, in part through encouraging people to experience uncertainty (Hebert & Dugas, 2019). However, future research should test whether specifically educating people on the function and potential benefits of experiencing uncertainty can decrease intolerance of uncertainty. Previous research has shown that people's lives can be improved by changing how they interpret the things that happen in their lives (for a review, see Walton & Wilson, 2018). Similarly, it seems possible that learning about the function and positives of uncertainty could improve people's ability to manage and face uncertainty.

There are multiple potential routes to improving people's attitudes toward uncertainty. One route to improving people's attitudes toward uncertainty

involves explicitly trying to change their attitude toward uncertainty, such as by educating them and asking them to write a letter using that information to encourage another person through an uncertain situation. People may benefit from being reminded or convinced that experiencing uncertainty is a normal human experience and that it has a purpose.

Another route to improving attitudes toward uncertainty involves encouraging people to engage in more situations that make them uncertain in order for the experience to reduce negative impressions of uncertainty. These two routes overlap in that explicitly cultivating a more a positive attitude toward uncertainty may help people embrace more uncertain experiences and that positive, chosen uncertain experiences may help foster a more positive explicit attitude toward uncertainty.

Concluding Remarks

Eliminating uncertainty is not an achievable or even desirable goal. True, too much uncertainty can produce chaos and anxiety, but too little uncertainty yields boredom and ennui. The progress of civilization has improved life by reducing many sources of uncertainty but also improved life by creating plenty of others. Uncertainty can be the "spice of life" and contributes to excitement, effort, and duration of positive emotions. Life may sometimes be improved by adding or consciously allowing some uncertainty. Seeking uncertainty in low-risk situations may make daily life more engaging while also increasing one's ability to handle unsought uncertainties (Hebert & Dugas, 2019).

Psychological research has demonstrated that a negative view of uncertainty is associated with poor mental health. Fortunately, psychological research is also equipped to answer the question, "What is there to like about uncertainty?" We hope this review can be a constructive corrective to the broadly dismal view of uncertainty.

Recommended Reading

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Transparency

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