

There is Nothing Certain but Uncertainty: Manipulation of Uncertainty and its Association with Worry and Intolerance of Uncertainty

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Abstract

Intolerance of uncertainty is related to a variety of clinical and nonclinical concepts including clinical and nonclinical levels of worry (Buhr & Dugas, 2002) as well as several disorders, including general anxiety disorder (GAD), obsessive-compulsive disorder (OCD), and social anxiety disorder (Einstein et al., 2014). Since it has been found to be a transdiagnostic concept, research has suggested that it could be a target of intervention (Dugas & Ladouceur, 2000). However, little research about the manipulation of uncertainty exists. This study sought to examine how manipulation of uncertainty in a vignette-based intervention alters individuals' levels of global worry, as well as their worry about the COVID-19 pandemic. Additionally, this study hypothesized that this relationship would be moderated by an individual's preexisting intolerance of uncertainty. The results of this study support the idea that intolerance of uncertainty is associated with increased worry and GAD symptoms. However, the study failed to find an association between manipulation of uncertainty through a vignette-based intervention and overall levels of worry.

Keywords: uncertainty, intolerance of uncertainty, worry, COVID-19, generalized anxiety disorder

Uncertainty is an unavoidable facet of everyday life. While not pleasant for anyone, some individuals find this more distressing than others. Individuals vary in their ability to tolerate uncertainty in their world. Uncertainty tolerance has been examined and defined in several different ways, but a conceptual analysis conducted by Hillen and colleagues (2017) defined it as “the set of negative and positive psychological responses -- cognitive, emotional, and behavioral-- provoked by the conscious awareness of ignorance about particular aspects of the world” (pg.70). Intolerance of uncertainty has been linked to a variety of disorders and appears to be an important predictive and maintenance factor for these disorders (Dugas & Ladouceur, 2000). As such, it is worth further investigation as it could be a potential point of intervention for treatment.

Intolerance of Uncertainty and Worry

One of the primary concepts on which intolerance of uncertainty has been shown to operate is worry. Worry has traditionally been defined as a preoccupation with and concern over future events about which the outcome is unclear (MacLeod et al., 1991). There are several psychological concepts that have been linked to worry, including procrastination, perfectionism, and depression (Stöber & Joormann, 2001; Starcevic, 1995). Additionally, previous research has shown a strong link between intolerance of uncertainty and worry (Buhr & Dugas, 2002). In fact, research suggests that intolerance of uncertainty may be a fundamental and driving factor in worrying behaviors such that individuals who are more intolerant of uncertainty display more worrying behaviors (Freeston et al., 1994).

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This has been found in both clinical and non-clinical populations (Dugas et al., 2001). The association between intolerance of uncertainty and worry is typically conceptualized as something that affects clinical populations, so research on its effects at the subclinical level is less common. However, research indicates that the relationship still exists even when the individual does not qualify for a disorder, meaning that individuals who have a higher intolerance of uncertainty are more likely to report frequent worrying behaviors (Dugas et al., 2001).

Additionally, research on non-clinical populations indicates that intolerance of uncertainty may be related to other personality features, such as perfectionism. More recent research has examined the mediating role that intolerance of uncertainty might play in perfectionism and maladaptive outcomes (Kawamoto & Furutani, 2018). Specifically, perfectionism and concern over mistakes are positively correlated with intolerance of uncertainty (Kawamoto & Furutani, 2018). Furthermore, intolerance of uncertainty mediates the association between both perfectionism and concern of mistakes (Kawamoto & Furutani, 2018). As such, it is important to recognize that research on intolerance of uncertainty benefits not only clinical applications but also benefits the population at large.

Intolerance of Uncertainty and Disorders

Intolerance of uncertainty has been shown to be related to a variety of disorders. The primary disorder to which it is linked is generalized anxiety disorder (GAD). GAD is characterized by excessive anxiety and worry in relation to several events or activities that are difficult to control (American Psychiatric Association, 2013). Additionally, there are a variety of physical symptoms including restlessness, fatigue, irritability, and sleep disturbance (American Psychiatric Association, 2013).

Since worry is a core feature of GAD, there exists a wealth of research on the associations between intolerance of uncertainty and GAD (Buhr & Dugas, 2012). Previous research has indicated that higher levels of intolerance of uncertainty are significantly associated with the GAD diagnostic criteria (Buhr & Dugas, 2012). Some research has identified key reactions to uncertainty, one of which is to become fearful (Hillen et al., 2017). While there are more adaptive responses such as seeking more information, this reaction in particular can be viewed as an anxiety response. Additionally, intolerance of uncertainty has also been a target for intervention for GAD (Dugas & Ladouceur, 2000).

Research suggests that individuals who received treatment focused on their intolerance of uncertainty saw reductions in their worrying and GAD symptoms (Dugas & Ladouceur, 2000). The treatment involved 14 to 18 sessions that included rationale for treatment, awareness training, worry interventions, and relapse prevention (Dugas & Ladouceur, 2000). This treatment specifically targeted uncertainty by helping participants more effectively cope with uncertain situations, as well as exposing them to uncertain situations (Dugas & Ladouceur, 2000). If intolerance of uncertainty can be targeted as a point for intervention, it is acting as a maintenance factor for GAD.

While the primary disorder to which intolerance of uncertainty has been linked is GAD, there is research to suggest that it may also play a role in obsessive compulsive disorder (OCD), and social anxiety disorder (Einstein, 2014). As it has been investigated in relation to several disorders, there has also been research suggesting that it be considered a transdiagnostic concept (Einstein et al. 2014). One common feature in OCD is severe doubt, which often leads to compulsive behaviors. As such, it has been theorized that intolerance of uncertainty may contribute to this doubt component of OCD (Tolin et. al, 2003). Research suggests that individuals who suffer from OCD and engage in checking behaviors are more likely to have high intolerance of uncertainty than are individuals without OCD or individuals with OCD who do not engage in checking behaviors (Tolin et. al, 2003). These checking rituals, or anxiety reducing behaviors, may therefore be conceptualized as attempts to reduce the discomfort produced by uncertainty.

One major component of social anxiety disorder is that the individual fears negative evaluation from others (American Psychiatric Association, 2013). However, some research suggests that this may not sufficiently explain the individuals' thought processes. Further research suggests that intolerance of uncertainty may also be a key component of social anxiety disorder (Carleton et al., 2009). Studies have identified fear of negative evaluation and intolerance of uncertainty as predictors for social anxiety and found that not only did intolerance of uncertainty predict social anxiety outcomes, but that it also accounted for a similar amount of the variance as did fear of negative evaluation (Carleton et al., 2009). Therefore, this suggests that intolerance of uncertainty, while robustly shown to be related to worry, may be serving additional functions within other diagnoses.

Uncertainty and COVID-19

Recently, due to the COVID-19 pandemic and the uncertainty that has resulted from it, there has been an increased interest in intolerance of uncertainty, particularly in how it relates to reactions to the pandemic. In fact, it may be considered a gross oversight to attempt to conduct research on uncertainty in this time and not examine how COVID-19 may be impacting the results. The pandemic has led to an increase in anxiety and stress responses from individuals throughout the world, as has been true for other public health crises in history (Garfin et al., 2020). Additionally, research has indicated that during the initial lockdown stage in the United Kingdom, individuals had increased generalized anxiety, depression, and uncertainty (Rettie & Daniels, 2020). As anxiety and worry have increased, it is important to understand how factors related to these concepts may also be changing.

Recent research on this topic has examined how intolerance of uncertainty may be related to mental wellbeing during the COVID-19 pandemic; specifically how these variables interact with rumination and fear of COVID-19 (Satici et al., 2020). Studies have found that the relationship between an individual's intolerance of uncertainty and mental wellbeing was mediated by the amount of rumination they engaged in, as well as their fear of COVID-19 (Satici et al., 2020). Rumination is also a factor in worry and GAD, however, this study indicates that a mechanism behind that currently may be a fear of the pandemic (Satici et al., 2020). This suggests that there are additional contextual factors that are currently playing important roles in the relationship between intolerance of uncertainty and other variables.

Measuring Intolerance of Uncertainty

Intolerance of uncertainty has been examined in several ways. Primarily, it is examined through surveys. The most common measure that is used in this area of research is the Intolerance of Uncertainty Scale (Freeston et al., 1994). However, there are also brief versions of this measure that have become widely accepted (Carleton et al., 2007). These scales ask participants how much statements such as, "uncertainty makes life intolerable", "I can't stand being taken by surprise", and "I should be able to organize everything in advance" are reflective of their experience. By measuring the concept in this way, it allows researchers to examine how intolerance of uncertainty may be related to a variety of other constructs, like the ones discussed previously. However, this does not lend itself well to experimental manipulation.

As such, there are some methods that have attempted to experimentally manipulate uncertainty. However, there are very few paradigms that do so and there is little research in this area (Faleer et al., 2017). One of the most common paradigms is a gambling paradigm. In this paradigm, participants are asked to play a computerized roulette game. Participants begin with \$20 and, regardless of participant input, the computer program is designed such that everyone ends with \$14 (Ladouceur et al., 2000). The experimenter explains to all participants that if they end with more than \$20, \$100 would be donated to a fictional foundation. Individuals in the uncertainty condition are also given information throughout the study that indicates either good or poor chances of winning (Ladouceur et al., 2000). The results suggested that individuals who were in the increased intolerance group, those told that their chances of winning were poor, scored significantly higher on a measure of worry than did those in the decreased intolerance group (Ladouceur et al., 2000).

This paradigm appears to be the dominant one for the limited research in this area (Faleer et al., 2017; Ladouceur et al., 2000). Unfortunately, it may be currently limited in its utility due to its high time and material cost. In order to use this paradigm, a lab would need to have access to the gambling program. Additionally, only one participant could be tested at a time, and it requires the researcher to verbally deliver the manipulation. As such, it was not practical for application during the COVID-19 pandemic and was not used for this study.

An alternative method that is used involves a vignette-based task. This task asks individuals to read one of two sets of vignettes that would be common situations for college students. In one set of vignettes, the outcome is implicitly uncertain, and in another it is explicitly stated that the outcome is uncertain (Reuman et al., 2015). These vignettes are further broken into high and low threat conditions. Research suggests that, even when controlling for previous levels of stress and anxiety, individuals in the explicit uncertainty condition endorse more anxiety-reducing behaviors than those in the implicit uncertainty condition (Reuman et al., 2015). This vignette-based task allows for manipulation of uncertainty in a way that is more efficient and versatile than the gambling paradigm, however, there is little research employing these methods to date. As such, the vignette method is ideal under the conditions in which time, resources, and face-to-face contact is limited.

The Present Study

As such, the current study aimed to examine how manipulation of uncertainty can alter an individual's level of worry about external or unrelated events. There exists little research in which uncertainty is manipulated, despite its theoretical implications. If an individual's tolerance of uncertainty is related to a variety of clinical outcomes, then understanding the mechanisms and ways to intervene on uncertainty would be beneficial to developing treatments that may target uncertainty specifically. Therefore, this study aimed to examine whether vignette based experimental manipulation of uncertainty could alter an individual's global worry, as well as worry about specific but unrelated topics such as COVID-19. Additionally, this study sought to replicate previous findings that intolerance of uncertainty is related to higher worry and GAD symptoms. The following hypotheses were examined:

H1: Higher levels of intolerance of uncertainty would predict a higher level of GAD symptoms and global and COVID-19 specific worry in participants.

H2: Individuals who were presented with the explicit uncertainty vignettes would be more likely to report increased global and COVID-19 specific worry than would individuals who are presented with the implicit uncertainty vignettes.

H3: The difference in global and COVID-19 specific worry based on the uncertainty in the vignettes would be moderated by an individual's intolerance of uncertainty, such that individuals with a higher intolerance of uncertainty would demonstrate a stronger association.

Method

Participants & Procedure

Participants in this study included undergraduate students enrolled in an introductory psychology course ($n = 83$, mean age = 19.45 years, female = 67, Caucasian = 68). These participants were recruited through an online portal where they also participated in the study. This study was approved by the university institutional review board. Students completed studies for course credit, however, there were also alternative methods available to them to earn this credit. Participants were recruited through SONA, an online participant management system, and completed the study online. Participants were randomized within the system to one condition each. Participants were first presented with a consent document that they were instructed to review prior to beginning the study. Participants were presented with one of two versions of the questionnaire. The surveys were identical across all measures with the exception of a set of vignettes that were presented partway through the questionnaires. This set of vignettes served as the experimental manipulation. Half of the participants ($n = 43$) were presented with the explicit uncertainty vignettes and half ($n = 40$) were presented with the implicit uncertainty vignettes. The measures that were employed are listed and detailed below.

Measures

Demographic Information

Participants were first presented with various questions regarding demographic information. These questions included asking about their gender, race/ ethnicity, and year in school.

Intolerance of Uncertainty Scale (IUS)

Participants were then asked to fill out the Intolerance of Uncertainty Scale-12 (Carelton et al., 2006; $\alpha = .86$). This questionnaire included 12 items that asked individuals to rate how much they feel each statement applies to them on a 1-5 Likert scale, with 1 being "not at all characteristic of me" and 5 being "entirely characteristic of me." Each item asked about the individual's ability to deal with uncertain events, for example: "I always want to know what the future has in store for me." (Carelton et al., 2006). This measure has been shown to have good validity, as the results demonstrated convergent validity with the original 27 item intolerance of uncertainty scale (Carelton et al., 2006). Means, standard deviations, and calculated reliability of variables of interest can be found in Table 1.

Table 1
Descriptive Statistics of Variables of Interest

	Mean	Observed Range	Standard Deviation	Chronbach's α
Intolerance of Uncertainty	34.07	16-50	7.89	.86
Depression Anxiety and Stress Scale	22.17	2-60	12.50	.93
Generalized Anxiety Disorder Scale	9.69	0-21	5.15	.87
Penn State Worry Questionnaire	57.32	23-79	13.47	.92
COVID-19 Worry	12.65	5-22	4.28	.77

Depression, Anxiety, and Stress Scale 21 (DASS-21)

Participants then completed a 21-item survey that asked about a variety of clinical symptoms related to depression, anxiety, and stress (Henry, & Crawford, 2005; $\alpha = .93$). Participants were asked to rate how much a statement applies to them on a 0-3 scale, with 0 indicating “did not apply to me at all” and 3 indicating “applied to me very much or most of the time” (Henry, & Crawford, 2005). An example item from this scale would be “I found it difficult to work up the initiative to do things.” The DASS-21 has cutoff scores for mild, moderate, severe, and extremely severe for the depression, anxiety, and stress subscales (Henry & Crawford, 2005). The DASS-21 has been demonstrated to have strong convergent validity with other measures of stress in non-clinical samples (Henry & Crawford, 2005).

Generalized Anxiety Disorder (GAD-7)

The next section of the survey had participants fill out the GAD-7, which asked about symptoms of generalized anxiety disorder (Spitzer et al., 2006; $\alpha = .87$). This measure includes 7 items that asked the participant to rate how often has happened to them a list of symptoms in the last two weeks on a 0-3 scale, with 0 representing “not at all” and 3 representing “nearly every day” (Spitzer et al., 2006). An example item would be, “worrying too much about different things.” Additionally, participants were asked if they indicated any instances of the previous symptoms, how much those symptoms interfere with their daily lives (Spitzer et al., 2006). Total scores of 5, 10, and 15 are indicative of mild, moderate, and severe anxiety symptoms (Spitzer et al., 2006). The GAD-7 has been shown to have strong criterion validity as the results correlate with independent diagnoses of GAD by mental health professionals (Spitzer et al., 2006).

Vignettes and Norming Questions

Following this, participants were asked to read 11 vignettes. Participants were then given one of two sets of vignettes that include second person descriptions of events that are typical for college students (Reuman et al., 2015). The first set, the implicit uncertainty condition, included just a description of the situation. For example, “You decide to send an email to the teaching assistant (TA) for one of your classes to ask for clarification about an assignment. Your TA seems like a laid back graduate student who enjoys interacting with your class. You carefully type and send your email.” The second set, the explicit uncertainty condition, included the same description of the situation, but also included an additional sentence that described the uncertainty felt about the situation. For example, “After hitting the “send” button, you start to wonder if your email was unnecessary. You don’t know whether or not your email will bother the TA.” After reading the vignette, participants were asked to rate how

threatening the situation was, how anxious the situation made them feel, how uncertain it made them feel, how relevant it was to them, and how likely they would be to engage in a specific anxiety-reduction behavior (Reuman et al., 2015).

The Penn State Worry Questionnaire

Finally, participants were asked to respond to 16 questions about their worry behaviors (Meyer et al., 1990; $\alpha = .92$). These questions asked individuals to rate how typical a behavior is to them on a scale of 1-5, with 1 indicating “not at all typical of me” and 5 indicating “very typical of me.” An example item would be “I know I should not worry about things, but I just cannot help it.” (Meyer et al., 1990). This measure has been shown to be able to significantly discriminate between college students who meet some or all criteria for generalized anxiety disorder and those who do not (Meyer et al., 1990).

COVID-19 Worry Questions

Additionally, participants were asked several questions created for this study derived from the Penn State Worry Questionnaire about the COVID-19 pandemic ($\alpha = .76$; See Appendix A). An example of this would be “I am preoccupied by the COVID-19 pandemic” or “I worry about my academic performance,” which was asked on a 1-5 Likert scale with 1 indicating “not at all typical of me” and 5 indicating “very typical of me.”

Results

Intolerance of Uncertainty, Worry, and GAD

In order to examine the hypothesis that higher intolerance of uncertainty was associated with higher levels of GAD and worry, correlation analyses were conducted (See Table 2). A correlation analysis was conducted to determine whether intolerance of uncertainty was associated with reported GAD symptoms. Correlation results indicate that intolerance of uncertainty was significantly correlated with GAD symptoms ($r = .592, p < .001$). Additional correlation results indicate that intolerance of uncertainty was significantly correlated with overall worry ($r = .546, p < .001$). Correlation analyses were also conducted to determine whether intolerance of uncertainty was associated with COVID-19 specific worry. Results indicate that intolerance of uncertainty were not significantly correlated with COVID-19 specific worry ($r = .203, p = .065$).

Table 2
Correlation Matrix for Variables of Interest

	1	2	3	4	5	6
1. Vignette	----					
2. Generalized Anxiety Disorder Scale	.097	----				
3. Intolerance of Uncertainty	.037	.529*	----			
4. Depression Anxiety and Stress Scale	.063	.757*	.440*	----		
5. Penn State Worry Questionnaire	.113	.629*	.546*	.419*	----	
6. COVID-19 Worry	-.079	.195*	.203	.214	.278*	----

*Significant at the $p < .05$ level.

Explicit vs. Implicit Uncertainty and Worry

Prior to running this analysis, the average DASS-21 scores were compared between the explicit and implicit uncertainty condition to determine whether the participants' overall level of distress significantly differed between groups prior to the manipulation. The results of a two-tailed independent samples t-test indicated that the DASS-21 scores between individuals who were presented with the explicit uncertainty vignettes ($n = 40$, $M = 21.42$, $SD = 12.65$) and individuals presented with the implicit uncertainty vignettes ($n = 43$, $M = 22.98$, $SD = 12.46$) were not significantly different [$t(81) = -.56$, $p = .574$].

In order to examine whether individuals who are presented with explicit uncertainty will be more likely to report increased overall worry, a one-tailed independent samples t-test was conducted. Levene's test for equality of variance was not significant, indicating that there was equal variance between the samples. The results indicate that there was not a significant difference between individuals who were presented with explicit uncertainty vignettes ($M = 55.86$, $SD = 12.22$) and those who were presented with implicit uncertainty vignettes ($M = 58.90$, $SD = 14.69$) on overall worry [$t(81) = -1.03$, $p = .154$].

In order to examine whether individuals who are presented with explicit uncertainty will be more likely to report increased COVID-19 specific worry, a one-tailed independent samples t-test was conducted. The results indicate that there was not a significant difference between individuals who were presented with explicit uncertainty vignettes ($M = 13.00$, $SD = 4.48$) and those who were presented with implicit uncertainty vignettes ($M = 12.30$, $SD = 4.10$) on COVID-19 specific worry [$t(81) = .72$, $p = .762$].

Intolerance of Uncertainty as a Moderator

Although the results suggest that the amount of worry participants reported did not differ based on which vignette they were presented with, a moderated regression was conducted to test the third hypothesis that intolerance of uncertainty moderates this relationship. This is because it may have been the case that this relationship was only present for individuals with a high intolerance of uncertainty, which would not be shown in the t-test. A moderated regression analysis was conducted to test the hypothesis that the relationship between vignette uncertainty and overall worry is moderated by intolerance of uncertainty. Intolerance of uncertainty and condition were both centered prior to entering them into the analyses and the interaction term was based on that centered score. Regression rating on vignette uncertainty and overall worry resulted in an r^2 of .013, which was not significant, $p = .307$. The introduction of the interaction term did not account for a significant additional proportion of the variance in worry, $\Delta R^2 = .015$, $p = .270$. As such, hypothesis three was not supported.

Vignette Norming

In order to replicate previous norming data on the vignettes, multiple one-tailed independent samples t-tests were conducted to examine where the perception of threat, anxiety, uncertainty, and likelihood of engaging in a safety behavior differed between the implicit and explicit uncertainty vignette conditions. Levene's test for equality of variance was not significant, indicating that there was equal variance between the samples. The results indicate that there was a significant difference between individuals who were presented with explicit uncertainty vignettes ($M = 422.67$, $SD = 209.48$) and those who were presented with implicit uncertainty vignettes ($M = 244.03$, $SD = 191.58$) on the total perceived threat level of the situations presented [$t(79) = 4.00$, $p < .001$], with the explicit vignettes perceived as more threatening.

The results also indicate that there was a significant difference between the explicit ($M = 482.64$, $SD = 209.14$) and the implicit ($M = 328.13$, $SD = 205.89$) uncertainty vignettes on the amount of anxiety participants reported in reaction to the situation [$t(79) = 3.35$, $p < .001$], with the explicit vignettes perceived as more anxiety inducing. Additionally, results suggest that there was a significant difference between the explicit ($M = 446.24$, $SD = 216.29$) and the implicit ($M = 305.77$, $SD = 221.78$) uncertainty vignettes on the amount of uncertainty participants reported in reaction to the situation [$t(79) = 2.89$, $p = .003$], with the explicit perceived as more uncertain.

There was also a significant difference between the explicit ($M = 590.21$, $SD = 209.23$) and the implicit ($M = 496.026$, $SD = 216.00$) uncertainty vignettes on the likelihood participants would perform a safety behavior [$t(79) = 1.99$, $p = .025$], with the participants receiving the explicit uncertainty vignettes more likely to endorse a desire to engage in safety behaviors. Finally, there was not a significant difference between the explicit ($M = 544.79$, $SD = 254.95$) and implicit ($M = 564.85$, $SD = 256.60$) uncertainty vignettes on how relevant the participants viewed the situation [$t(79) = -.035$, $p = .64$].

Discussion

The results of this study suggest that intolerance of uncertainty does predict higher levels of worry, which is consistent with previous literature that suggests that intolerance of uncertainty may be a driving factor in worrying (Freeston et al., 1994). This association between worry and intolerance of uncertainty has been seen before in both clinical and non-clinical samples (Dugas et al., 2001). Additionally, the results of this study suggest that intolerance of uncertainty predicts higher levels of GAD symptoms which is consistent with previous literature (Buhr & Dugas, 2012). Although the current study recruited from a non-clinical sample, it should be noted that more than half of the participants reported moderate to severe levels of generalized anxiety disorder symptoms. (Buhr & Dugas, 2012).

Surprisingly, this study demonstrated that presenting people with explicitly uncertain vignettes does not increase their overall worry, nor their worry about the COVID-19 pandemic. This is inconsistent with research that finds that vignette-based uncertainty interventions are able to increase worrying behaviors in participants, which suggests that individuals presented with explicitly uncertain vignettes should demonstrate an increase in global worry (Reuman et al., 2015). Finally, this study did not support the hypothesis that intolerance of uncertainty moderated the relationship between vignette uncertainty and worry. Previous research on the topic would suggest that the level of uncertainty one could tolerate would affect the amount of worry that they displayed, as it significantly impacts worrying behaviors and interpretations of events (Ladouceur et al., 2000).

The results of the current study could indicate a failure in the vignettes between conditions to evoke differing levels of uncertainty. While the overall participant-rated uncertainty between the sets of vignettes differed, further analyses suggest that only four of the eleven individual vignettes significantly differed in levels of participant-rated uncertainty. It could be that although the total uncertainty differed between the explicit and implicit vignettes, these differences were potentially driven by these four vignettes. While the vignettes have previously been normed (Reuman et al., 2015), the majority of the vignettes did not differ in participant-rated uncertainty in this study. As such, the intervention may not have worked as intended. It may be that this manipulation would have been successful had the participants viewed the situations as differing in uncertainty. Further research could replicate this study, using the specific vignettes that were perceived as more uncertain by participants.

Though this study importantly replicated previous research that suggested that intolerance of uncertainty would be related to GAD and worry, there are still limitations that should be addressed. First, a vignette-based task may be less likely to evoke feelings of uncertainty than the “gambling” paradigm that is considered the gold standard (Faleer et al., 2017). It could be that participants did not feel as invested in the vignettes as they might a gambling task, therefore making the vignettes less effective. Additionally, there appeared to be a non-normal distribution of both global worry and worry about the COVID-19 pandemic. Global worry exhibited a ceiling effect, with most participants reporting a worry score above 57. As such, it may have been difficult to detect any changes that may have occurred in their global worry as a result of the vignettes. The lack of significant change in COVID-19 specific worry could be attributed to the timeframe data was collected in. This study was conducted in the Spring 2021 semester, so opinions on the pandemic may have been difficult to manipulate at that point. Therefore, state-based uncertainty would be unlikely to easily affect them. Future research on this topic may benefit from using a worry measure that is more sensitive to higher levels of worry. This would allow for changes at the more extreme levels of worry to be detected.

Finally, while not the main focus of this study, future research should examine the high levels of generalized anxiety symptoms found in this sample. The average anxiety scores among our sample would indicate mild to moderate levels of generalized anxiety. This is a significant and startling level of GAD symptomology for a typical college sample. It could be the case that COVID-19 is contributing to high levels of anxiety overall in the sample as shown in other studies, however the high levels of generalized anxiety warrant further explanation (Rettie & Daniels, 2020).

Conclusion

Although this study has several limitations, this study adds to the limited body of work on experimental manipulations to invoke uncertainty. The norming data collected here could be used in the development of future studies using similar methodologies, or in developing other interventions. The results shown here add to the body of literature that details the role that intolerance of uncertainty plays in worry and anxiety behaviors. Additionally, this demonstrates how robust the role of intolerance of uncertainty is. This study demonstrates that this relationship

holds in a young, rural sample. More importantly, it shows that the role of uncertainty is still powerful even during the COVID-19 pandemic, which is an incredibly uncertain time. Overall, intolerance of uncertainty appears to impact a variety of anxiety-related outcomes and should be considered as a possible target of intervention when working with individuals who have difficulties with anxiety.

Appendix A. COVID-19 Specific Worry Questions

Instructions: Rate each of the following statements on a scale of 1 (“not at all typical of me”) to 5 (“very typical of me”). Please do not leave any items blank.

1. I am preoccupied by the COVID-19 pandemic. 1 2 3 4 5
2. My worries about the COVID-19 pandemic overwhelm me. 1 2 3 4 5
3. I find it easy to dismiss worrisome thoughts about the COVID-19 pandemic. 1 2 3 4 5
4. The COVID-19 pandemic situation makes me worried. 1 2 3 4 5
5. I never worry about the COVID-19 pandemic. 1 2 3 4 5

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