INCREASING TOLERANCE OF UNCERTAINTY

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ABSTRACT

Intolerance of uncertainty is a far-reaching – yet not widely examined – construct with both clinical (e.g., PTSD) and nonclinical (e.g., political intolerance) associations. Much of the existing research has demonstrated methods that increase intolerance of uncertainty, but far fewer methods that have been able to increase its opposite, tolerance of uncertainty, which would likely have beneficial effects. The current study attempted to address this lack by implementing a brief intervention designed to increase tolerance of uncertainty. The intervention consisted of reading a short parable and subsequently reflecting on an instance in one’s life that was uncertain at the time but ultimately turned out well. The experimental condition \( n = 50 \) was compared to an active control condition \( n = 50 \). Results demonstrated the opposite of the primary hypothesis: the intervention significantly increased intolerance of uncertainty (vs. increased tolerance of uncertainty), and also marginally significantly increased political intolerance. Results confirmed a secondary hypothesis, that those higher in mindfulness were higher in tolerance of uncertainty. These findings suggest unexpected factors that might contribute to intolerance of uncertainty, as well as potential directions for future research. The study indicates that investigations of longer-term interventions, especially those that include training in mindfulness, might be particularly warranted.
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As Voltaire put forward three centuries ago, tolerating uncertainty is an often uncomfortable – yet ubiquitous – experience. Uncertainty can encompass a variety of aspects: a lack of information, an inability to predict the future, a need to hold multiple possibilities at once, the psychological responses to these facets, and so on (Hillen, Gutheil, Strout, Smets, & Han, 2017). Multiple theories have been posited as to why uncertainty can be aversive, from the motivation for effective action to the drive to achieve predictive accuracy (Haas & Cunningham, 2014; Harmon-Jones, Amodio, & Harmon-Jones, 2009). The aversiveness of uncertainty might be so central a motivating force that some characterize predictive planning – in order to reduce uncertainty – as a fundamental function of cognitive processing (Carhart-Harris et al., 2014). Others place reactions to uncertainty, namely those characterized by grasping for certainty where none may exist, in the broader context of meaning-making or fairness (Heine, Proulx, & Vohs, 2006; van den Bos & Lind, 2002).

Investigations of reactions to uncertainty in the research literature have primarily been focused on intolerance of uncertainty (Hillen et al., 2017). Intolerance of uncertainty has been defined as “an individual's dispositional incapacity to endure the aversive response triggered by the perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty” (Carleton, 2016, p. 31). People can have higher or lower tolerance of uncertainty, and these differences in tolerance have been demonstrated in both clinical and nonclinical populations (Banducci, Bujarski, Bonn-Miller, Patel, & Connolly, 2016; Carleton, 2016).
Differences in tolerance of uncertainty may also exist between geographic cultures (Choi & Choi, 2002; Kogan, Sasaki, Zou, Kim, & Cheng, 2013; Phillips & Wright, 1977).

How one approaches uncertainty appears to have consequences in other areas, including clinically relevant ones. Intolerance of uncertainty has been posited as a transdiagnostic factor that affects a variety of clinical domains, especially those involving threat generalization and negative thinking (Carleton, 2016; McEvoy & Erceg-Hurn, 2016; Morriss et al., 2016). Intolerance of uncertainty appears to facilitate an increased tendency to interpret ambiguous situations as threatening, such that uncertainty about outcome is a cause for fear or distress (Sexton, Norton, Walker, & Norton, 2003). Specifically, higher tolerance of uncertainty is associated with a stronger ability to discriminate between threat and safety cues, while higher intolerance of uncertainty is associated with generalized responding to threat and safety cues and delayed discrimination between them (Morriss et al., 2016).

This relationship between intolerance of uncertainty and threat generalization has particular relevance for post-traumatic stress disorder (PTSD) and post-traumatic stress symptoms (PTSS), given the central role of sensitivity to perceived threat in these presentations. Higher intolerance of uncertainty has been repeatedly found to be associated with increased symptomatology of PTSD and PTSS (Banducci et al., 2016; Oglesby, Boffa, Short, Raines, & Schmidt, 2016; Oglesby, Gibby, Mathes, Short, & Schmidt, 2017). The role of intolerance of uncertainty regarding sensitivity to perceived threat is distinct from that of worry; changes in intolerance of uncertainty are associated with subsequent changes in worry, while the reverse is not true (Buhr & Dugas, 2002; Dugas & Ladouceur, 2000). In addition, studies have shown that
the relationship between worry and intolerance of uncertainty is not solely due to shared variance with anxiety and depression (Dugas, Freeston, & Ladouceur, 1997; Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994).

Intolerance of uncertainty has also been linked with anxiety disorders. Increased tolerance of uncertainty has been shown to be associated with symptom relief – specifically reduced repetitive negative thinking – in those with anxiety disorders, including GAD (McEvoy & Erceg-Hurn, 2016). Other studies corroborate the link between intolerance of uncertainty and GAD symptomatology (Dugas & Ladouceur, 2000; Holaway, Heimberg, & Coles, 2006; Ladouceur, Blais, Freeston, & Dugas, 1998). Considering the above two transdiagnostic factors related with attitude toward uncertainty, threat generalization and repetitive negative thinking, it makes sense that higher intolerance of uncertainty has also been associated with panic disorder (Carleton et al., 2012; Kim, Lee, Kim, Choi, & Lee, 2016; Mahoney & McEvoy, 2012).

Potential nonclinical associations with intolerance of uncertainty also exist. Higher intolerance of uncertainty has been characterized as fearful reactions to the unknown (Mosca, Lauriola, & Carleton, 2016). One way to achieve a sense of “certainty” and decrease fear of the unknown is to remain closed to perspectives different than one’s own. This narrowing of openness to other possibilities could prevent constructive dialogue in the face of disagreement, such as political difference: “Our tendency to dig in on our certainties prevents us from appreciating the merit of opinions different from our own” (Schaefer, 2018). Indeed, intolerance of uncertainty – combined with threat – has been associated with decreased political tolerance (Haas & Cunningham, 2014).

Thus, it appears that it could be of benefit to be able to increase one’s tolerance of uncertainty. However, most studies to date have shown only the ability to decrease tolerance of
uncertainty. Some have done this via didactic measures, such as watching a powerpoint lecture that presented information about either the negative or positive effects of uncertainty on problem-solving (Deschenes, Dugas, Radomsky, & Buhr, 2010). Others incorporated personalized elements: Two studies had participants reflect on a possible future negative life event and consequences of that potential event, then read statements either affirming the difficulty of uncertainty regarding the potential negative event or affirming the ease of tolerating the uncertainty (Grenier & Ladouceur, 2004; Mosca et al., 2016). Several studies used a less-involved personalized approach in which participants reflected on the emotions and physical sensations that arise when they are uncertain (Fergus & Rowat, 2015; van den Bos, Poortvliet, Maas, Miedema, & van den Ham, 2005).

In contrast to the above studies showing decreased tolerance, increased tolerance of uncertainty has been demonstrated by only two studies. One study used an 8-week course of Mindfulness-Based Cognitive Therapy (MBCT) in a clinical population with panic disorder (Kim et al., 2016). MBCT is an adaptation of Mindfulness-Based Stress Reduction (MBSR) that integrates principles of cognitive behavioral therapy and psychoeducation with meditation (Segal, Williams, & Teasdale, 2002). The 8-week intervention is a weekly group course incorporating didactic teachings, discussion, mindfulness practices, and a daylong meditation retreat. MBCT trains the ability to recognize and attend to ineffective habitual patterns, including difficult emotional reactions and cycles of negative thinking, and to bring a curious and nonjudgmental stance toward them. The second study demonstrating increased tolerance of uncertainty utilized a 16-week cognitive-behavioral therapy intervention consisting of weekly one-hour individual therapy sessions in a clinical population with GAD (Ladouceur, Dugas, Freeston, Leger, Gagnon, & Thibodeau, 2000). The cognitive-behavioral intervention addressed
uncertainty in several ways, including correcting inaccurate beliefs that result in attempting to control uncertain outcomes through worry, as opposed to learning to accept the inevitability of uncertainty. This intervention also addressed problem orientation, i.e., differentiating between uncertain situations when problem-solving is useful and those when it is not, in addition to cognitive avoidance (Ladouceur et al., 2000).

The researchers utilizing MBCT theorized that the combination of mindfulness education and cognitive-behavioral intervention trains more effective handling of uncertainty via increased awareness of thoughts and sensations as well as improved ability to observe these without getting caught in them (Kim et al., 2016). For example, mindfulness skills facilitate noticing reactions in uncertain situations or uncertain physical sensations (e.g., a racing heart) and the ability to be aware of possible catastrophizing or misinterpretations. It is of note that mindfulness has also been related with tolerance of uncertainty and similar concepts in other studies: mindfulness was shown to be positively associated with tolerance of ambiguity, which has been viewed as a less-specific construct produced by tolerance of uncertainty but composed of a broader range of facets (Hillen et al., 2017; Ie, Haller, Langer, & Courvoisier, 2012), and intolerance of uncertainty was demonstrated to mediate the relationship between mindfulness and health anxiety (Kraemer, O’Bryan, & McLeish, 2016). It could be useful to examine which specific components of mindfulness might be most closely associated with tolerance of uncertainty. One aspect of mindfulness that could be associated with tolerance of uncertainty is the theoretical orientation of “beginner’s mind” or “don’t know mind” that is often incorporated into teachings on mindfulness. These approaches have the goal of experiencing the present moment as free from preconceived expectations as possible, such that there is increased awareness of actual present moment experience instead of experience filtered through expectations. This orientation
could facilitate ease with a state of not knowing, generating increased acceptance of uncertainty as a ubiquitous (i.e., unavoidable) and tolerable state.

The current study adapted two primes for use in the experimental condition. The first prime originated in an area of research related to tolerance of uncertainty: tolerance of contradiction. Tolerance of contradiction has been investigated in the broader context of naïve dialecticism, which encompasses expectation of change (vs. continuity) and ability to hold two contradicting ideas at once (e.g., dialectical thinking) (Peng & Nisbett, 1999; Spencer-Rodgers, Williams, & Peng, 2010). Tolerance of contradiction – or rather, intolerance of it – has also been theorized as a contributing factor to the phenomenon of cognitive dissonance, given that intolerance of contradiction would motivate the drive for resolution of any contradiction in beliefs, values, or behaviors (Spencer-Rodgers, Williams, & Peng, 2010). Tolerance of contradiction has been able to be significantly affected by priming, specifically by a prime in which participants are asked to reflect on an uncertain time in life (Cheng, 2009; Spencer-Rodgers, Peng, Wang, & Hou, 2004). That prime has thus been adapted for the current study given the related construct. A second prime – involving reading a parable – was also adapted for use in the current study based on prior work. Given the evidence showing that some types of brief explicit messaging have not been able to affect tolerance of uncertainty (see above), the current study used a parable to implicitly convey tolerance of uncertainty in the experimental intervention. Recent findings suggested that priming participants with a short fable significantly affected their moral judgments of a subsequent scenario (Moon, Wright, Broadbent, & Robinson, 2017). This finding provides evidence for the ability of brief stories to effectively convey implicit messages and provides a basis for the use of parable in the current study. It should be noted that the didactic methods used in prior studies that have not been shown to be effective
have not been systematically investigated: perhaps dosage would impact the effectiveness of didactic methods, as might possible moderators.

The aforementioned studies using longer-term clinical interventions imply that tolerance of uncertainty *can* be increased. Other literature cited above suggests nonclinical methods that – though their counterparts in the same studies were successful for increasing intolerance of uncertainty – were not successful in increasing tolerance of uncertainty: purely didactic information about the positive effects of uncertainty (e.g., on problem-solving; Deschenes et al., 2010) and reading statements that explicitly affirm the benefits of uncertainty (Mosca et al., 2016). Thus, the current study attempted to use the personalized element that a clinical intervention incorporates – here, reflecting on an uncertain time in one’s life – along with an implied, instead of explicit, communication of the possible benefits of uncertainty: here, a parable. This two-pronged approach attempted to harness diverse methodology from two types of manipulations that have shown prior significant results in similar constructs as the current study.

Possible findings from the current study were hypothesized to have several implications. If this research demonstrated that tolerance of uncertainty is able to be increased via a brief intervention, there would be reason to conceive of tolerance of uncertainty as a malleable construct that does not require 8- to 16-week clinical interventions to change. In terms of time and resources required to see beneficial results, shorter interventions would be more feasible and economical to implement. If tolerance of uncertainty were shown to be associated with a measure of political tolerance, it would replicate the findings of one existing study and provide information about real-world analogues of tolerance of uncertainty and what other constructs tolerance of uncertainty might affect (Haas & Cunningham, 2014). If it were shown to be
malleable as well as associated with a measure of political tolerance, shifting tolerance of uncertainty might be a route through which political tolerance could be affected. If tolerance of uncertainty were associated with mindfulness, it would provide evidence that further research into the link between the two might be fruitful. In sum, the proposed research attempted to identify practical methods of catalyzing change in a construct that might have a variety of effects across domains.

Especially given the dearth of work examining the ability to increase tolerance of uncertainty, the proposed research examined whether tolerance of uncertainty could be increased via a nonclinical, shorter method than the 8-week and 16-week clinical interventions previously found to demonstrate significant results (Kim et al., 2016; Ladouceur et al., 2000). Participants were randomly assigned to either an increasing tolerance condition or a control condition and completed a measure of mindfulness. In the increasing tolerance condition, participants read a brief parable that implicitly conveyed the benefit of uncertainty, then were instructed to reflect on an instance from their own lives when they felt uncertain about a decision or event that turned out well in the long-term. In the control condition, participants read a brief article about a neutral topic, then were instructed to reflect on the topic and think about possible outcomes of the topic, in the same format as the experimental condition. Participants then completed two measures of tolerance of uncertainty, one a self-report scale and one a behavioral measure, as well as a measure of political tolerance that represented a real-world analogue of tolerance of uncertainty. They also completed two exploratory self-report measures. It was hypothesized that those participants who were assigned to the increasing tolerance condition would show higher tolerance of uncertainty than those assigned to the control condition. Given the earlier discussion
of how mindfulness might be associated with tolerance of uncertainty, a secondary hypothesis was that those with higher mindfulness would also demonstrate higher tolerance of uncertainty.
CHAPTER 2

METHOD

Participants

Participants were 100 students (87 female, $M_{age} = 19.31$, $SD = 1.22$) at a private mid-Atlantic American university who were 18 years of age or older. Data was collected from 105 participants prior to the exclusion of five participants’ data, detailed below, leaving 100 participants. The number of total participants was determined to be 100 through a power analysis based on a similar study’s effect size (Choi, Connor, Wason, & Kahan, 2016). Participants received partial course research credit for their participation. There was also the chance for one participant to win a $50 Amazon gift card, contingent on performance in the JTC Beads Task. Fifty-seven percent of participants identified as White / Caucasian, 13% as Hispanic / Latinx, 10% as Asian / Pacific Islander, 7% as Black / African American, 9% as Multi-Racial / Multi-Cultural, and 4% as Middle Eastern.

Prior to any analysis, those participants who were not native speakers of English and began learning English at 10 years old or older were excluded due to concerns about lack of reading comprehension of the intervention. Participants who were not native speakers of English but began learning English before 10 years old were included in analysis. Five participants were excluded based on these criteria, leaving 100 participants. The inclusion limit of 10 years old was determined from the linguistics literature on eventual English fluency based on learning age (Hartshorne, Tenenbaum, & Pinker, 2018).
Measures (in temporal order)

Pre-Intervention

*Five Facet Mindfulness Questionnaire* (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The Five Facet Mindfulness Questionnaire measures five facets of the construct of mindfulness: observing, describing, acting with awareness, nonjudging, and nonreacting. The 39-item measure presents items and participants rate how true these items are of them on a five-point Likert-type scale. Sample items, with the facet assessed by that item in parentheses, include “I notice the smells and aromas of things” (observing), “I am good at finding words to describe my feelings” (describing), “I find myself doing things without paying attention” [reverse scored] (acting with awareness), “I tend to evaluate whether my perceptions are right or wrong” [reverse scored] (nonjudging of experience), and “I perceive my feelings and emotions without having to react to them” (nonreactivity to inner experience). The three facets included in this study are Acting with Awareness, Nonreactivity, and Nonjudging, due to their hypothesized stronger relationship with tolerance of uncertainty: increased present moment awareness of reactions to uncertainty, decreased reactivity to uncertain situations, and less judgment when there is a lack of certainty. The Observe facet has been omitted, given its lack of hypothesized relationship with tolerance of uncertainty as well as its lack of validity in non-meditating samples (Baer et al., 2008; de Bruin, Topper, Muskens, Bogels, & Kamphuis, 2012; Lilja, Lundh, Josefsson, & Falkenstrom, 2013; Williams, Dalgleish, Karl, & Kuyken, 2014). The Describe facet has also been omitted, given the absence of hypothesized relationship between ability to put experience into words and tolerance of uncertainty, as well as theoretical criticism of the Describe facet as being “conceptually distant” from common definitions of mindfulness (Grossman, 2008; Truijens, Nyklicek, van Son, & Pop, 2016). This three-factor version of the FFMQ has been used
in prior studies due to similar theoretical considerations in non-meditating populations (Duncan & Bardacke, 2010; Truijens et al., 2016). The original FFMQ has demonstrated satisfactory to good internal consistencies (0.72 to 0.92) for all facets and good construct validity, other than the lack of validity of the Observe facet in non-meditating samples (Baer et al., 2006; Baer et al., 2008). In the current study, the internal consistency of the three-factor version, as measured by Cronbach’s α, was 0.86; for each of the three subscales independently, Cronbach’s α was 0.86 for Acting with Awareness, 0.83 for Nonjudging, and 0.74 for Nonreactivity. It was hypothesized that the experimental condition would demonstrate higher mindfulness, represented by higher scores on the FFMQ, than the control condition.

Post-Intervention

Intolerance of Uncertainty Scale – Short Form (IUS; Carleton, Norton, & Asmundson, 2007; Buhr & Dugas, 2002). The Intolerance of Uncertainty Scale (Buhr & Dugas, 2002; Freeston et al., 1994) measures how one approaches the concept of uncertainty. Factor analysis indicated that four factors are present: beliefs that uncertainty is stressful and upsetting, uncertainty prevents action, uncertain events are negative and should be avoided, and being uncertain about the future is unfair. The 27-item measure presents items such as “Uncertainty makes me uneasy, anxious, or stressed” and “My mind can’t be relaxed if I don’t know what will happen tomorrow,” and participants rate how characteristic these items are of them on a five-point Likert-type scale. The internal consistency of the scale, as measured by Cronbach’s α, was 0.94, and its test-retest reliability over a five-week period demonstrated $r = 0.74$ (Buhr & Dugas, 2002). The scale has criterion-related validity in a non-clinical sample, convergent validity with measures of worry, and divergent validity from measures of anxiety and depression (Buhr & Dugas, 2002; Freeston et al., 1994). The short-form version of the IUS is a 12-item measure that
consists of two factors, as determined by factor analysis (Carleton et al., 2007; Hale et al., 2016). Factor analysis also demonstrated that the two-factor, 12-item version provides better fit to the data than the long-form version and is gender invariant (Roma & Hope, 2017). The internal consistency of the short-form version, as measured by Cronbach’s $\alpha$, was .91 (.88 in the current study); both the first factor, assessing unacceptability and avoidance of uncertainty, and the second factor, measuring frustration related to uncertainty, had $\alpha$’s of .85. The first factor includes items such as “Unforeseen events upset me greatly,” while the second factor includes items such as “When it’s time to act, uncertainty paralyzes me.” Given the evidence showing increased goodness of fit in the short-form version, along with the fact that it focuses more on present-moment assessment of uncertainty, the short-form version was used in the current study. It was hypothesized that the experimental condition would have lower intolerance of uncertainty, and thus lower scores on the IUS, than the control condition.

*Jumping to Conclusions Beads Task* (JTC; Huq, Garety, & Hemsley, 1988; Phillips & Edwards, 1966). The Beads Task is a probabilistic inference task. Though not originally designed as a measure of intolerance of uncertainty, per se, it has been used as a behavioral measure of it (Deschenes et al., 2010; Jacoby, Abramowitz, Buck, & Fabricant, 2014; Ladouceur, Talbot, & Dugas, 1997; Sternheim, Startup, & Schmidt, 2011). In the computerized version of the Beads Task, there is a jar of 100 beads comprised of two colors in a certain ratio (e.g., 60:40 purple to green). Participants are informed of the ratio (e.g., “The bead colors are in a 60:40 ratio”), then draw beads from the jar one by one until they feel confident in their decision about which color is predominant in the jar. The dependent variables of this measure are the number of beads drawn by the participant before a decision is made (DTD, or draws to decision), as well as the reaction time elapsed before making a decision (RT). Motivation for performance,
including the balance of accuracy and price of accuracy, was provided by entries into a drawing to win a $50 Amazon gift card if the participant answered correctly. However, for each additional bead drawn to make the decision – up to a maximum number of 20 draws – the participant was instructed that he or she would receive one fewer entry into the drawing. Three trials of the task were presented. Prior studies have shown that participants with higher intolerance of uncertainty had higher DTD (Jacoby et al., 2014; Ladouceur et al., 1997). It was hypothesized that the experimental condition would have lower intolerance of uncertainty than the control condition, but it was unknown how that would behaviorally manifest in the JTC Beads Task in terms of lower vs. higher DTD and RT.

Political Tolerance Scale (PTS; Haas & Cunningham, 2014). This measure of political tolerance assesses the degree to which those who hold opposing political views (vs. the participant’s) should be stifled or blocked from having their views heard (Haas & Cunningham, 2014). The 9-item measure presents items such as “When you have the right position on some issue, you should keep those with the wrong opinion from being heard” and “We need to actively oppose those who disagree with us,” and participants rate how characteristic these items are of them on a six-point Likert-type scale. The internal consistency of the scale in a past study, as measured by Cronbach’s α, was .75 (.74 in the current study). As a possible analogue to intolerance of uncertainty, it was hypothesized that the experimental condition would have higher political tolerance, represented by lower scores on the PTS, than the control condition.

Dialectical Self Scale (DSS; Spencer-Rodgers et al., 2015). The DSS is a 32-item self-report tool intended to measure dialectical thinking in the domain of self-perception (vs. social perception or interpersonal relations, for example; Spencer-Rodgers et al., 2015). In this context, dialectical thinking is conceived of as the degree to which one holds that opposites can both be
true or that one’s beliefs and behaviors change depending on circumstances. Factor analysis has indicated the presence of three factors: contradiction, cognitive change, and behavioral change. Items such as “When I hear two sides of an argument, I often agree with both” and “I can never know for certain that any one thing is true” assess dialectical thinking, with participants rating how characteristic these items are of them on a seven-point Likert scale. The internal consistency of the scale in the current study, as measured by Cronbach’s α, was .78. The DSS was included as an exploratory measure.

*Analysis-Holism Scale* (AHS; Choi, Koo, & Choi, 2007). The AHS is a 24-item self-report tool used to measure cognitive style. Statements such as “Future events are predictable based on present situations” and “The whole, rather than its parts, should be considered in order to understand a phenomenon” are presented and participants indicate their agreement with each statement using a seven-point Likert scale on a scale from 1 (“strongly disagree”) to 7 (“strongly agree”). Confirmatory factor analysis was done to assess factor loadings, and there are four distinct factors: causality, attitude toward contradictions, perception of change, and locus of attention. The internal consistency of the scale, as measured by Cronbach’s α, was .74 (.74 in the current study), though the scale authors note that the reliability of the AHS is not as much of a psychometric threat as with other measures given the range of factors that it aims to assess (Choi et al., 2007). Choi, Koo, and Choi also showed the scale to have predictive validity with measures assessing cognitive style that examine attributions (the Attributonal Complexity Scale; Fletcher, Danilvics, Fernandez, Peterson, & Reeder, 1986), thinking style (the Sternberg-Wagner Self-Assessment Inventory on the Global Style; Sternberg & Wagner, 1991), and approach to conflict (the Rahim Organization Conflict Inventory-II; Rahim, 1983). They also demonstrated the scale to have divergent validity from a scale assessing individualism and collectivism (the
Individualism-Collectivism Scale; Triandis, 1996) and from a scale assessing self-construal (the Self-Construal Scale; Singelis, 1994). A higher score indicates a more holistic cognitive style. The AHS was included as an exploratory measure.

*Follow-up questions and demographics questionnaire.* Follow-up questions were composed of several brief items. For the experimental group, one question assessed whether or not the participant had either read a version of the story before and another question assessed the importance of the past decision reflected upon. For the control group, a question assessed whether or not the participant had spent time thinking in depth before about the topic of the control passage. Both groups received an open-format question assessing any reactions to the reading the passage. The demographics questionnaire included questions about gender, age, race, religion, political orientation, and whether or not English was a native language and at what age it was learned.

*Intervention*

See Appendix A for details. Participants were presented with a passage and instructions to read it carefully, as questions would follow. Qualtrics enforced a minimum amount of time of 45 seconds spent reading the passage before being able to advance to the next page. Participants were informed at the beginning of the experiment, “If you reach the end of the passage and are not able to click forward onto the next page, keep reading for a bit and you will soon be able to.” After reading the passage, participants wrote a paragraph in response to prompt questions. Qualtrics enforced a minimum of 500 characters written before being able to advance to the next page.
In the experimental condition, participants read a short fable about a Chinese farmer’s reactions to events in his life. His reactions, judging the events as neither positive nor negative, are contrasted to those of his neighbors. The neighbors immediately judge each event as either positive or negative, but each event soon proves to have unexpected consequences or benefits that are opposite to their initial judgment. The passage illustrates the fundamentally uncertain nature of life and contrasting ways of reacting to it. Participants were then instructed to reflect on an instance from their own lives when they felt uncertain about a decision or event that turned out well in the long-term. In the control condition, participants read a brief article about a neutral topic (the national economic effects of hosting the Olympics), then were instructed to reflect on the topic and think about possible outcomes of the topic, writing a paragraph response in the same format as the experimental condition.

Procedures

After giving informed consent, participants were run individually. They arrived at the study having been told that it is a study about how people think, and that the session would be comprised of questionnaires and tasks completed on the computer. After completing the FFMQ to assess pre-existing characteristics, half of the participants were given the increasing tolerance intervention and half were given the control intervention based on prior randomization. The experimenter was blind to condition until the participant sat down at the computer to begin the intervention and measures. Participants then completed the tasks in the order that they are presented in the materials list above. Following the intervention, the IUS was given, followed by the PTS and the Beads Task. The exploratory measures of the AHS and DSS followed. Lastly, follow-up questions and a demographics questionnaire were given. The current study was
approved by the university’s Institutional Review Board and complied with current APA ethical
guidelines.
CHAPTER 3

RESULTS

Preliminary Analysis

All measures, excluding demographics, were assessed for normality via SPSS 25, examining skew, kurtosis, and Shapiro-Wilk values regarding distribution. The only measures that demonstrated significant skew and kurtosis were reaction times for the JTC Beads Task, both total reaction time (RT) and mean reaction time per bead draw (Mean RT). RT had skewness of 2.74 (SE = .241) and kurtosis of 11.47 (SE = .478) while Mean RT had skewness of 3.41 (SE = .241) and kurtosis of 13.21 (SE = .478). Due to the skew and kurtosis, reaction times were log transformed to achieve a more symmetrical distribution, following a prior study that also found skew and kurtosis in reaction time for the JTC Beads Task (Jacoby, Abramowitz, Reuman, & Blakey, 2016). In addition, draws to decision (DTD) in the JTC Beads Task was non-normally distributed, with a Shapiro-Wilk value of .790, \( p < .001 \). Draws to decision showed an overall positive skew with an additional minor uptick in scores at the higher end of the scale. Internal consistency in the JTC Beads Task was assessed via correlations across trials for both DTD and RT, i.e., the correlation between Trial 1 and Trial 2, between Trial 2 and Trial 3, and between Trial 1 and Trial 3. Internal consistency was demonstrated for both DTD and RT, with all correlation \( p \)'s < .001 and \( r \)'s for DTD ranging from .776 to .859 while \( r \)'s for RT ranged from .304 to .490.

See Table 1 for overall means, standard deviations, and correlations for the dependent measures, exploratory measures, and possible moderators. Differences in measures due to demographic factors of gender, race, religion, and political orientation, and native vs. non-native English status were assessed on all dependent measures by including those demographic
categories as factors in one-way ANOVAs. When there were fewer than 10 participants in a category, that category was excluded from analysis due to insufficient cell size. When there were more than two groups in the demographic category, Bonferroni post-hoc tests were conducted to assess specific between-group differences. Differences due to demographic factors were assessed in order to ascertain how main analysis results might be influenced by factors other than the experimental intervention. There were differences in intolerance of uncertainty based on gender such that females \((n = 84, M = 37.45, SD = 9.10)\) had higher scores on the IUS – i.e., were more intolerant of uncertainty – than males \((n = 16, M = 32.13, SD = 10.07)\), \(t(98) = -2.11, p < .05\). There were also differences in political tolerance based on political orientation, excluding the three categories of Libertarian, Conservative, and Strongly Conservative due to each category having fewer than 10 participants. Participants who identified as Strongly Liberal \((n = 13, M = 40.62, SD = 5.50)\) had higher scores on the PTS – i.e., were more politically intolerant – than those who identified as Liberal \((n = 62, M = 32.06, SD = 7.46)\), \(t(73) = 3.91, p < .001\) or Other \((n = 14, M = 29.50, SD = 9.04)\), \(t(25) = 3.82, p < .001\). Lastly, those participants who were native speakers of English \((n = 87, M = 18.87, SD = 17.65)\) had more draws to decision (DTD) on the JTC Beads Task than those who were not native speakers of English \((n = 13, M = 7.00, SD = 7.31)\), \(U = 269, p < .05\), via a Mann-Whitney U test. Participants who were native speakers \((n = 87, M = 9.40\text{sec}, SD = .79)\) also had faster mean reaction times per bead draw (log of Mean RT) on the JTC Beads Task than those who were not native speakers \((n = 13, M = 10.24\text{sec}, SD = .95)\), \(t(98) = -3.48, p < .001\). While not related to the hypotheses of the current study, these differences might be of interest to future lines of research.

The randomization of demographic variables between the control and experimental groups was successful, with no significant differences between groups on any demographic
variables. As a result, demographic variables were not controlled for. In addition, five participants responded affirmatively that they had heard the parable at some point before.

Table 1. Overall Means, Standard Deviations, and Bivariate Correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
<th>8</th>
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<tbody>
<tr>
<td>Mean</td>
<td>36.60</td>
<td>32.48</td>
<td>17.33</td>
<td>10.70</td>
<td>9.51</td>
<td>126.74</td>
<td>121.06</td>
<td>69.08</td>
<td>24.80</td>
<td>23.36</td>
<td>20.92</td>
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<tr>
<td>SD</td>
<td>9.41</td>
<td>8.38</td>
<td>17.12</td>
<td>.63</td>
<td>.86</td>
<td>18.08</td>
<td>12.72</td>
<td>11.54</td>
<td>5.79</td>
<td>6.10</td>
<td>4.29</td>
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</tbody>
</table>

1. IUS
2. PTS   .261**
3. JTC DTD -.118 .002
4. JTC RT  -.126 -.019 .498**
5. JTC Mean RT .154 -.059 -.702** .143
6. DSS     .051 -.277** -.001 .085 .135
7. AHS     -.019 -.277** -.100 .005 .094 .419**
8. FFMQ – Overall -.374** -.066 .060 .256* .054 -.220* -.115
9. FFMQ – Acting with Awareness -.155 -.045 .039 .055 -.001 -.174 -.202* .730*
10. FFMQ – Nonjudging -.273** .064 .077 .336** .068 -.163 -.044 .778* .306**
11. FFMQ – Nonreactivity -.408** -.208* .000 .134 .048 -.126 .025 .597* .177 .257**

Table 2. Means, Standard Deviations, and Bivariate Correlations – Control Condition

<table>
<thead>
<tr>
<th>Variable</th>
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<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Mean</td>
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<td>31.10</td>
<td>17.30</td>
<td>10.72</td>
<td>9.52</td>
<td>126.42</td>
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<td>70.52</td>
<td>24.92</td>
<td>24.36</td>
<td>21.24</td>
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<tr>
<td>SD</td>
<td>8.63</td>
<td>8.80</td>
<td>16.86</td>
<td>.66</td>
<td>.90</td>
<td>18.84</td>
<td>12.98</td>
<td>10.54</td>
<td>5.26</td>
<td>6.31</td>
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</tr>
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</table>

1. IUS
2. PTS   .497**
3. JTC DTD -.083 .052
4. JTC RT  -.039 .051 .418**
5. JTC Mean RT .128 -.045 -.710** .231
6. DSS     -.198 -.357* .089 .208 .159
7. AHS     -.225 -.463** -.133 .133 .186 .512**
8. FFMQ – Overall -.293* .015 .094 .291* .063 -.097 .077
9. FFMQ – Acting with Awareness -.104 -.059 -.014 -.067 .011 -.109 -.119 .697**
10. FFMQ – Nonjudging -.140 .250 .244 .413** -.055 -.162 .076 .778** .290*
11. FFMQ – Nonreactivity -.401** -.269 -.117 .195 .229 .136 .231 .476** .062 .087
Table 3. Means, Standard Deviations, and Bivariate Correlations – Experimental Condition

<table>
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<th>Variable</th>
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<tr>
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<td>.83</td>
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<tr>
<td>3. JTC DTD</td>
<td>-1.55</td>
<td>-0.54</td>
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<td>4. JTC RT</td>
<td>-2.02</td>
<td>-0.94</td>
<td>.587**</td>
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<tr>
<td>5. JTC Mean RT</td>
<td>.191</td>
<td>-0.76</td>
<td>-0.697**</td>
<td>.037</td>
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<tr>
<td>6. DSS</td>
<td>.284*</td>
<td>-1.95</td>
<td>-0.95</td>
<td>-0.60</td>
<td>.107</td>
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<tr>
<td>7. AHS</td>
<td>.096</td>
<td>-1.35</td>
<td>-0.71</td>
<td>-1.31</td>
<td>-0.09</td>
<td>.320*</td>
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<tr>
<td>8. FFMQ – Overall</td>
<td>-0.46**</td>
<td>-1.06</td>
<td>-0.34</td>
<td>.222</td>
<td>.045</td>
<td>-0.335*</td>
<td>-0.254</td>
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<tr>
<td>9. FFMQ – Acting with Awareness</td>
<td>-1.92</td>
<td>-0.27</td>
<td>.081</td>
<td>.167</td>
<td>-.012</td>
<td>-0.234</td>
<td>-0.278</td>
<td>.759**</td>
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<tr>
<td>10. FFMQ – Nonjudging</td>
<td>-0.350*</td>
<td>-0.99</td>
<td>-0.96</td>
<td>.241</td>
<td>.214</td>
<td>-0.162</td>
<td>-0.122</td>
<td>.783**</td>
<td>.328*</td>
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<tr>
<td>11. FFMQ – Nonreactivity</td>
<td>-0.404**</td>
<td>-1.27</td>
<td>.104</td>
<td>.068</td>
<td>-1.35</td>
<td>-0.388**</td>
<td>-1.153</td>
<td>.688**</td>
<td>.265</td>
<td>.415**</td>
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</tr>
</tbody>
</table>

Note: IUS = Intolerance of Uncertainty Scale; PTS = Political Tolerance Scale; JTC = Jumping to Conclusions Beads Task (DTD = Draws to Decision; RT = Reaction Time); DSS = Dialectical Self Scale; AHS = Analysis-Holism Scale; FFMQ = Five Facet Mindfulness Questionnaire. IUS items were measured on a scale ranging from 1 (not at all characteristic of me) to 5 (entirely characteristic of me), where a higher total score represents more intolerance of uncertainty. PTS items were measured on a scale ranging from 1 (strongly disagree) to 7 (strongly agree), where a higher total score represents more political intolerance. DSS items were measured on a scale ranging from 1 (strongly disagree) to 7 (strongly agree), where a higher total score represents more dialectical thinking. AHS items were measured on a scale ranging from 1 (strongly disagree) to 7 (strongly agree), where a higher total score represents more of a holistic cognitive style. FFMQ items were measured on a scale ranging from 1 (never or very rarely true) to 5 (very often or always true), where a higher total score represents more mindfulness.

* p < .05  ** p < .01.

Effect of the Intervention

The first analysis assessed the hypothesis that the experimental intervention would lead to higher tolerance of uncertainty, as measured by the Intolerance of Uncertainty Scale (IUS), the Jumping to Conclusions Beads Task (JTC), and the related Political Intolerance Scale (PTS). Independent samples t-tests were conducted; the means, standard deviations, and t-test results detailed below are presented in Table 2. The experimental group had higher intolerance of
uncertainty, measured by the IUS, than the control group, $t(98) = -2.28, p < .05$, Cohen’s $d = .46$.

For the JTC Beads Task, there were no significant differences between the experimental group and the control group in draws to decision (DTD), $t(98) = -0.02, p = .986$, the log of reaction time (RT), $t(98) = .36, p = .719$, or the log of mean reaction time (Mean RT), $t(98) = .06, p = .951$.

The experimental group also had marginally significant higher political intolerance, measured by the PTS, than the control group, $t(98) = -1.66, p = .100$, Cohen’s $d = .33$. Thus, results were in the opposite direction of the hypothesis in the IUS and – marginally – in the PTS, while results were not significant in the JTC Beads Task.

Table 4. Means, Standard Deviations, and Independent Samples T-Test Results

<table>
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<tr>
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<th></th>
<th>Experimental</th>
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<th>t-statistic</th>
<th>p-value</th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IUS</td>
<td>34.50</td>
<td>8.63</td>
<td>38.70</td>
<td>9.78</td>
<td>-2.28</td>
<td>0.025</td>
</tr>
<tr>
<td>PTS</td>
<td>31.10</td>
<td>8.80</td>
<td>33.86</td>
<td>7.78</td>
<td>-1.67</td>
<td>0.100</td>
</tr>
<tr>
<td>JTC DTD</td>
<td>17.30</td>
<td>16.86</td>
<td>17.36</td>
<td>17.56</td>
<td>-0.02</td>
<td>0.986</td>
</tr>
<tr>
<td>JTC Log RT</td>
<td>10.72</td>
<td>0.66</td>
<td>10.68</td>
<td>0.60</td>
<td>0.36</td>
<td>0.719</td>
</tr>
<tr>
<td>JTC Log Mean RT</td>
<td>9.52</td>
<td>0.90</td>
<td>9.51</td>
<td>0.83</td>
<td>0.06</td>
<td>0.951</td>
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<tr>
<td>DSS</td>
<td>126.42</td>
<td>18.84</td>
<td>127.06</td>
<td>17.48</td>
<td>-0.18</td>
<td>0.861</td>
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<tr>
<td>AHS</td>
<td>118.88</td>
<td>12.98</td>
<td>123.24</td>
<td>12.19</td>
<td>-1.73</td>
<td>0.087</td>
</tr>
</tbody>
</table>

Follow-Up Analysis: Mediation of Political Intolerance (PTS) by Intolerance of Uncertainty (IUS)

The indirect effect of the intervention on political intolerance via intolerance of uncertainty was tested using bootstrapping procedures via the SPSS Process Macro (Hayes, 2017). In mediation analyses with 10,000 bootstrap resamples, the 95% confidence interval was computed. The bootstrapped indirect effect of the intervention on political intolerance via intolerance of uncertainty was .88, and the 95% confidence interval ranged from .051 to 2.088. Thus, zero was not within the confidence interval and the effect of the intervention on political
intolerance was mediated by intolerance of uncertainty. The reverse mediation of the indirect effect of the intervention on intolerance of uncertainty via political tolerance was also tested to confirm the unidirectionality of the mediation, since a significant reverse mediation would raise questions about the validity of the original mediation. The reverse mediation was not significant, with a bootstrapped indirect effect of the intervention on intolerance of uncertainty via political intolerance of .71, with a 95% confidence interval of -0.133 to 1.895.

Relation of Mindfulness to Intolerance of Uncertainty

The second hypothesis was that higher mindfulness would be associated with higher tolerance of uncertainty. Total score on the Five Facet Mindfulness Questionnaire (FFMQ) was used to assess this hypothesis. Further exploratory analysis examined whether different aspects of the broader construct of mindfulness might have different relationships with tolerance of uncertainty. As described earlier, three facets of mindfulness, as measured by three subscales of the FFMQ, were included in the current study: Acting with Awareness, Nonreactivity, and Nonjudging. These three subscales were used in the exploratory analysis. For the following analyses, all variables were centered (Aiken & West, 1991).

A regression was conducted to assess the hypothesis that higher mindfulness would be associated with higher tolerance of uncertainty as measured by the IUS. The regression was conducted across groups (i.e., on all participants together), controlling for condition. Condition was entered as the first step in the regression, total FFMQ score was entered as the second step, and the interaction of condition and total FFMQ score was entered as the third step. Controlling for condition, total FFMQ score significantly negatively predicted intolerance of uncertainty as measured by the IUS, $F(1, 97) = 14.23, p < .001$, explaining 17.2% of the variance in intolerance of uncertainty, $R^2 = .172$. The interaction of total FFMQ score and condition was not significant,
Regressions of the three FFMQ subscales on dependent measures were conducted across 
groups (i.e., on all participants together), controlling for condition, to assess how different 
aspects of mindfulness might account for variance in the dependent measures. Condition was 
entered as the first step in the regression, the three FFMQ subscales were entered as the second 
step, and the three interactions of condition by each FFMQ subscale were entered as the third 
step. Controlling for condition, FFMQ Nonreactivity contributed unique variance in the model, 
in a negative direction, \( F(1,95) = 13.94, p < .001, \beta = -.351 \). This negative relationship suggests 
that higher nonreactivity – i.e., being less reactive – is associated with higher tolerance of 
uncertainty. FFMQ Nonjudging did not contribute unique variance, \( F(1,95) = 2.02, p = .158 \), nor 
did FFMQ Acting with Awareness, \( F(1,95) = .24, p = .625 \).

The above procedures were repeated to examine the relationship between mindfulness 
and intolerance of uncertainty, as measured by the JTC Beads Task. The same regressions were 
run as previously described, however this time predicting performance on the JTC Beads Task, 
not score on the IUS, while continuing to control for condition. Regarding the relationship 
between mindfulness and intolerance of uncertainty as measured by the JTC Beads Task, total 
score on the FFMQ significantly positively predicted reaction time (RT) on the JTC Beads Task, 
\( F(1,97) = 5.50, p < .05, \beta = .233 \). This relationship suggests that higher overall mindfulness is 
associated with taking longer to draw each additional bead in the task. Regressions of the three 
FFMQ subscales showed that FFMQ Nonjudging was the only aspect of mindfulness that 
contributed unique variance in the model, which was in a positive direction, \( F(1,95) = 8.35, p < 
.01, \beta = .307 \). This relationship suggests that being less judgmental is associated with taking
longer to draw each additional bead in the task. FFMQ Nonreactivity did not contribute unique variance, $F(1,95) = .46, p = .499$, nor did FFMQ Acting with Awareness, $F(1,95) = .34, p = .562$. Total score on the FFMQ did not significantly predict mean reaction time per draw (Mean RT), $F(1,97) = .13, p = .718$, and none of the FFMQ subscales contributed unique variance: FFMQ Nonreactivity, $F(1,95) = .33, p = .567$; FFMQ Nonjudging, $F(1,95) = 2.54, p = .114$; FFMQ Acting with Awareness, $F(1,95) = .61, p = .435$. Total score on the FFMQ also did not significantly predict draws to decision (DTD), $F(1,97) = .36, p = .550$, and again none of the FFMQ subscales contributed unique variance: FFMQ Nonreactivity, $F(1,95) = .05, p = .828$; FFMQ Nonjudging, $F(1,95) = .51, p = .479$; FFMQ Acting with Awareness, $F(1,95) = .03, p = .858$.

Lastly, the same types of regressions as previously described were run to assess the relationship between mindfulness and political intolerance, controlling for condition. Total score on the FFMQ did not significantly predict political intolerance as measured by the PTS, $F(1,97) = .21, p = .650$. Regarding the relationship between the three aspects of mindfulness and political intolerance, FFMQ Nonreactivity was the only aspect that contributed unique variance in the model, which was in a negative direction, $F(1,97) = 5.02, p < .05, \beta = -.228$. This relationship suggests that being higher in nonreactivity – being less reactive – is associated with more political tolerance. FFMQ Nonjudging did not contribute unique variance, $F(1,97) = 2.48, p = .119$, nor did FFMQ Acting with Awareness, $F(1,97) = .26, p = .615$.

Thus, FFMQ Nonreactivity was the only aspect of mindfulness to contribute unique variance to intolerance of uncertainty as measured by the IUS, but FFMQ Nonjudging was the only aspect to contribute unique variance to intolerance of uncertainty as measured by the JTC Beads Task (and only significantly affected RT in that task, not Mean RT or DTD). However,
FFMQ Nonjudging did contribute marginally significant variance to intolerance of uncertainty as measured by the IUS. In contrast, FFMQ Nonreactivity was the only aspect of mindfulness to contribute unique variance to political intolerance. FFMQ Acting with Awareness was the only subscale that did not contribute unique variance to any of the measures of intolerance of uncertainty or political intolerance. In addition, it did not correlate with any main variables. It appears that different aspects of mindfulness might indeed have different relationships with intolerance of uncertainty and related constructs, but further research would be needed to clarify these differential relationships.

**Exploratory Analyses**

*Comparing Correlation Coefficients*

Given that the IUS and PTS appeared to have contrasting patterns of significant correlations with secondary variables, these correlations were compared with each other to assess whether differences between them were significant. Thus, correlations of the IUS with the DSS, AHS, FFMQ Overall, FFMQ Acting with Awareness, FFMQ Nonjudging, and FFMQ Nonreactivity were compared against the correlations of PTS with those same secondary variables. The correlations were significantly different between the IUS and PTS for the DSS, $z = 2.71, p < .01$, the AHS, $z = 2.14, p < .05$, FFMQ Overall, $z = -2.61, p < .01$, and FFMQ Nonjudging, $z = -2.78, p < .01$. The correlations were marginally significantly different from each other for FFMQ Nonreactivity, $z = -1.74, p = .08$, and were not significantly different for FFMQ Acting with Awareness, $z = -0.90, p = .37$ (the only subscale that was not significantly correlated with either the IUS or the PTS).
**Quadratic Relationship between IUS and JTC Beads Task**

There is little discussion in the literature about the variety of ways in which intolerance of uncertainty could behaviorally manifest. For instance, in the behavioral measure of the JTC Beads Task, intolerance of uncertainty could manifest in a more avoidant manner (e.g., making a decision quickly to avoid prolonged time spent in a state of uncertainty) or a more perseverative manner (e.g., taking a long time or needing a large amount of information in order to make a more “certain” decision). Given the lack of discussion in the literature about this issue, the question of how intolerance of uncertainty might behaviorally manifest was examined in the current study. The relationship between the self-report measure of intolerance of uncertainty, the IUS, and the behavioral measure of intolerance of uncertainty, the JTC Beads Task, was explored to determine what the behavioral tendencies were of those who self-reported as higher versus lower in intolerance of uncertainty.

Given the lack of significant correlations between the IUS and all aspects of the JTC Beads Task, the plots were examined to see if there were any non-linear patterns. The plot of the relationship between self-reported intolerance of uncertainty (IUS) and draws to decision on the JTC Beads Task (DTD) appeared to be an inverse-U curve (see Figure 1), and thus a quadratic regression was conducted. To do so, a linear regression was run with both the IUS and the squared IUS as predictors and DTD as the outcome. There was a marginally significant quadratic relationship between IUS and DTD, $t(97) = -1.92, p = .058$. The same phenomenon occurred with reaction time (RT) on the JTC Beads Task: there was a significant quadratic relationship between IUS and RT, $t(97) = -2.04, p < .05$. Thus, low DTD (fewer bead draws before making a decision) and low RT (faster decision-making) could be representative of either low or high intolerance of uncertainty. This quadratic relationship indicates that higher self-reported
intolerance of uncertainty is generally associated with the behaviors of fewer draws to decision and faster reaction times in the JTC Beads Task, while medium levels of intolerance of uncertainty are associated with a wider range of draws to decision and slower reaction times. Lower self-reported intolerance of uncertainty has a less clear relationship with draws to decision and reaction time.

Figure 1. Quadratic relationship between IUS and DTD on the JTC Beads Task.

Dialectical Self Scale (DSS) & Analysis-Holism Scale (AHS)

Independent samples t-tests were also run for the two exploratory measures, neither of which demonstrated significant differences between the experimental group and the control group (see Table 2).
Reactions to the Passages

Participants had the option to write about reactions they had to the passages read. These written reactions were read by the experimenter and assessed for any patterns or elements that related to the hypotheses being examined. No patterns or elements of interest were found.
The present study investigated whether a brief intervention could increase tolerance of uncertainty. The experimental intervention consisted of reading a brief parable that implicitly conveyed the benefits of tolerance of uncertainty, then subsequently reflecting upon and writing about a time in one’s life when one was uncertain about a decision or event that turned out well in the long-term. In the control condition, participants read a brief article about a neutral topic and subsequently reflected upon and wrote about possible outcomes of the topic. Results demonstrated that the intervention significantly increased intolerance of uncertainty – the opposite of the primary hypothesis – as well as marginally increased political intolerance. It was found that intolerance of uncertainty mediated the intervention’s effect on political intolerance. The secondary hypothesis – that those with higher mindfulness would demonstrate higher tolerance of uncertainty – was confirmed. In addition, among the three subscales of the FFMQ assessing different aspects of mindfulness, the facet of Nonreactivity contributed unique variance to intolerance of uncertainty as measured by the IUS and to political intolerance. In contrast, Nonjudging was the only aspect of mindfulness that contributed unique variance to performance on the JTC Beads Task, doing so only for the aspect of reaction time (RT).

The intervention significantly increased intolerance of uncertainty rather than decreasing it, directly contradicting the primary hypothesis. Thus, it appears that brief exposure to uncertainty – even through a positive lens – activates intolerance of uncertainty. As discussed earlier, there appear to be only two studies that have demonstrated the ability to increase tolerance of uncertainty, one which employed an 8-week Mindfulness-Based Cognitive Therapy
(MBCT) intervention and another which utilized a 16-week cognitive-behavioral therapy intervention (Kim et al., 2016; Ladouceur et al., 2000). The design of the present study was intended to investigate whether briefer interventions are capable of increasing tolerance of uncertainty as well, and perhaps the current findings contribute evidence that interventions must be longer-term to be effective.

However, not only was this brief intervention not effective in increasing tolerance of uncertainty, it significantly increased its opposite: simply being reminded of uncertainty is enough to raise one’s intolerance towards it. This finding could demonstrate a parallel to the process of exposure, in which initial exposure to a feared stimulus causes high levels of distress, which eventually decrease over time through repeated exposures via processes such as habituation (Richard & Lauterbach, 2006). Perhaps longer-term – per the evidence so far, 8-16 week – interventions allow time to repeatedly encounter the experience of uncertainty and to habituate to it, thus decreasing the distress that appears to initially arise when facing an experience or reminder of uncertainty. In addition, the reflection portion of the intervention effectively asked participants to reflect on a time when their expectations had been contradicted (when they were feeling uncertain but the situation turned out positively) whereas the prime the reflection was based on only asked about reflecting on a time that was uncertain. It is possible that the current reflection evoked a feeling of surprise about an unexpected outcome that facilitated intolerance of uncertainty due to feeling a lack of predictive accuracy (Haas & Cunningham, 2014; Harmon-Jones et al., 2009).

It remains that not only are the two studies above both longer-term, but they are also clinical interventions for clinical populations, in contrast to the current nonclinical intervention for a nonclinical population. Perhaps the factors contributing to intolerance of uncertainty are
different for clinical vs. nonclinical populations, and thus the two populations might be differentially responsive to interventions. Alternatively, the factors contributing to intolerance of uncertainty might be the same for both clinical and nonclinical populations, but intolerance of uncertainty might be better addressed through the strategies of clinical interventions that specifically target ineffective patterns of thought and/or behavior as opposed to the current nonclinical intervention’s more general approach.

In the current study, overall mindfulness (as measured by the three subscales of the Five Facet Mindfulness Questionnaire [FFMQ] together) accounted for 17.2% of the total variance in intolerance of uncertainty (as measured by the IUS), controlling for condition. Thus, perhaps interventions that increase overall mindfulness could also have an impact on intolerance of uncertainty. A recent comprehensive meta-analysis demonstrated that mindfulness training interventions are indeed effective in increasing dispositional mindfulness (Quaglia, Braun, Freeman, McDaniel, & Brown, 2016). This efficacy of mindfulness training interventions – in addition to the reasoning below regarding how specific types of mindfulness practices might be likely to have an impact on intolerance of uncertainty in particular – provides further evidence that longer-term mindfulness interventions should be investigated as a means of increasing tolerance of uncertainty.

Across groups, the Nonreactivity subscale of the FFMQ was found to have significant relationships with multiple measures. In a regression of the three subscales of the FFMQ together on intolerance of uncertainty as measured by the IUS, the dimension of Nonreactivity alone contributed unique variance. The same relationship held in a regression of the three subscales of the FFMQ together on political intolerance: only Nonreactivity contributed unique variance among the subscales. There was an inverse relationship between Nonreactivity and both
intolerance of uncertainty and political intolerance, such that the less reactive one is, the more tolerant of uncertainty and the more politically tolerant one is.

As an aspect of mindfulness, nonreactivity has been found to play a role in PTSD. PTSD, as discussed above, has been demonstrated to have a relationship with intolerance of uncertainty such that higher intolerance of uncertainty is associated with increased PTSD symptomatology (Banducci et al., 2016; Oglesby et al., 2016; Oglesby et al., 2017). A recent meta-analysis investigated the effects of mindfulness-based interventions implemented in mental health services within the Department of Veterans Affairs (VA), focusing on whether the programs improved symptoms of PTSD compared to treatment as usual (TAU) (Heffner, Crean, & Kemp, 2016). Data from seven mindfulness-based interventions at the VA showed significant improvement in PTSD symptom severity compared to TAU, as measured by both the Clinician-Administered PTSD Scale (CAPS) and PTSD Checklist-S (PCL-S). Data also indicated that the only subscale of the FFMQ that significantly increased through the mindfulness interventions compared to TAU was Nonreactivity. Two other studies examining the effects of mindfulness-based interventions in veterans with PTSD have also found increases in Nonreactivity, which was associated with decreased PTSD symptoms (Mehling et al., 2017; Stephenson, Simpson, Martinez, & Kearney, 2016). A third study found reductions in symptoms of PTSD along with increases in overall mindfulness (per total FFMQ), but did not specify by FFMQ subscale (Kearney, McDermott, Malte, Martinez, & Simpson, 2012). A fourth study, this one with a non-veteran population, also found an inverse relationship between PTSD symptoms and Nonreactivity (Kalill, Treanor, & Roemer, 2014).

As discussed above, practices that incorporate exposure – whether clinical interventions that formally use exposure therapy, mindfulness practices that implicitly incorporate exposure to
whatever arises during practice, or other means – might facilitate increased nonreactivity over time due to the process of refraining from experiential avoidance and training one’s system to be able to tolerate aversive emotional experience (Barlow, Allen, & Choate, 2004). Indeed, one study found that increases in nonreactivity mediated the improvements seen in anxiety after exposure-based cognitive behavioral therapy (CBT) (Hedman, Hesser, Andersson, Axelsson, & Ljótsson, 2017). Kalill, Trenor, and Roemer theorize that increased nonreactivity may play a prominent role in reduced PTSD symptomatology due to the ability “to tolerate aversive experiences without engaging in rigid avoidance” (2014, p. 319). Given that nonreactivity to inner experience has been conceptualized as “allowing thoughts and feelings to come and go, without getting caught up in or carried away by them” (Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011, p. 311), the ability to tolerate distressing experience without avoiding it – exposure – may be important. Thus, increasing tolerance of uncertainty, as well as the possible benefits that might be associated with that, could perhaps be facilitated by increasing nonreactivity.

In the broader context of mindfulness, nonreactivity has been theorized to be related to the concept of equanimity (Desbordes et al., 2015; Siegel, 2007). Equanimity has been defined as “an even-minded mental state or dispositional tendency toward all experience or objects, regardless of their affective valence (pleasant, unpleasant, or neutral)… such that one can experience unpleasant thoughts or emotions without repressing, denying, judging, or having aversion for them” (Desbordes et al., 2015, p. 357–358). “Nonreactivity” has been used as a term in the mindfulness research literature since its inception as a facet of mindfulness in the FFMQ, while the term "equanimity” has its conceptual roots in traditional Buddhist scholastic texts from the 3rd century B.C.E. onwards (e.g., the Abhidhamma; Desbordes et al., 2015). Increased
equanimity in the face of uncertainty could resemble the ability to tolerate the experience of uncertainty, whether manifesting in everyday life or clinically as anxiety or as threat generalization in PTSD. In this way, uncertainty could evolve over time from an experience that one avoids to an experience with which one is able to be present.

The intervention was also found to marginally increase political intolerance. In addition, political intolerance and intolerance of uncertainty were significantly positively correlated. The intervention’s effect on political intolerance was significantly mediated by intolerance of uncertainty such that increased intolerance of uncertainty was the mechanism by which political intolerance increased. Thus, brief exposure to uncertainty increases one’s intolerance of uncertainty, which leads one to be more politically intolerant. As discussed earlier, intolerance of uncertainty has been characterized as fearful reactions to the unknown (Mosca et al., 2016). These results demonstrate the possibility that being more fearful of the unknown makes one more intolerant of the opposing political views of others, and that this process can be prompted simply by being reminded of uncertainty.

What might be the impact of these findings outside of the research lab? It would depend on how political intolerance is operationalized. The measure of political intolerance used in the current study includes items that might contribute to one’s openness – or lack thereof – to allowing the perspectives of others to be heard. Thus, the consequences of higher intolerance of uncertainty could include less willingness to constructively dialogue with those with opposing views. Perhaps increased tolerance of uncertainty could even yield benefits at the societal level resulting from increased ability to constructively engage with “the other,” fostering bipartisanship. The one other known study to directly investigate the relationship between uncertainty and political tolerance found a moderating influence of threat such that higher
uncertainty led to higher political intolerance, but only in high-threat situations (Haas & Cunningham, 2014). The mediation model of the current study suggests that there are two points of intervention for influencing political tolerance: removing reminders of uncertainty from life or increasing tolerance of uncertainty. The implausibility of the former – as well as the difficulty in removing the moderating influence of threat – provides a motivating force for the development of reliable methods for the latter. In addition, the marginal effect of the intervention on political intolerance perhaps boosts confidence in the significant effect of the intervention on intolerance of uncertainty.

Lastly, there were marginally significant quadratic relationships between intolerance of uncertainty and both draws to decision (DTD) and reaction time (RT) on the JTC Beads Task (see Figure 1). These quadratic relationships were of the inverse-U variety, such that low DTD (fewer bead draws before making a decision) could be representative of either low or high intolerance of uncertainty. It is logical that RT would demonstrate the same relationship as DTD, given that more beads drawn would result in more time spent on the task. Of note, though there was significant internal consistency for both DTD and RT across trials, RT was less consistent across trials than was DTD. Perhaps the difference in internal consistency is due to the broader range of RT or how it could be more affected by distraction or mind-wandering during the task. This analysis was conducted to shed light on what behavioral manifestations of intolerance of uncertainty might be, by examining behavioral measures alongside self-reported intolerance of uncertainty. Of note, the task included incentive to balance risk and accuracy, as described earlier. However, the results could be interpreted a variety of ways. The takeaway might be that the JTC Beads Task is not a reliable behavioral measure of intolerance of uncertainty. In one interpretation, the results suggest experiential avoidance that might occur with higher intolerance
of uncertainty: those participants higher in intolerance of uncertainty generally made their
decision about the which bead color was the majority with much less information (i.e., fewer
bead draws), minimizing the amount of time spent in a state of uncertainty about which decision
to make. In general, those participants high in intolerance of uncertainty drew close to the
minimum number of beads, one per trial over the three trials of the task. Thus, participants who
drew fewer beads could be seen as prioritizing spending less time in a state of uncertainty over
the opportunity to win the gift card. However, participants low in intolerance of uncertainty also
demonstrated the same pattern of fewer draws before making a decision. The behavior of fewer
draws to decision could be interpreted in a variety of ways: being avoidant of uncertainty (as just
discussed), not comprehending that several more draws would likely have an outsized positive
effect on accuracy and one’s chance of winning, being apathetic about the task and/or the chance
of winning, or even being highly tolerant of uncertainty – the uncertainty of whether or not one’s
decision is accurate, which would be highest when one has the least amount of information.

Not only is the finding of a quadratic pattern (for RT; marginal for DTD) open to a wide
variety of interpretations, the findings are in contrast to those of previous studies that found
higher intolerance of uncertainty associated with more perseverative behavior (i.e., higher DTD)
(Jacoby et al., 2014; Ladouceur et al., 1997). It is also notable that participants in the current
study (mean IUS score of 36.60) were much more similar in intolerance of uncertainty to the
2014 study’s cohort of participants with anxiety disorders (mean IUS score of 36.25) than to the
cohort without anxiety disorders (mean IUS score of 19.07). Reasons for these differences are
unclear. Of note, the 2014 study had a more similar percentage of females to the current study
(87%) in its cohort of participants with anxiety disorders (80%) than its cohort of participants
without anxiety disorders (54%), which was a significant difference between the two cohorts.
Given that the current study did find significant differences such that females had higher overall intolerance of uncertainty than males, perhaps gender’s interaction with intolerance of uncertainty and gender differences between the participant cohorts and studies plays a role in the contrast between quadratic findings of the 2014 study and the current study. Accounting for the above contrast to past findings, the current findings should be interpreted cautiously. However, the current study’s lack of a significant linear relationship but presence of a marginally significant quadratic relationship provides evidence that non-linear relationships should be further investigated in the domain of intolerance of uncertainty.

Perhaps the operationalization of the overall construct of intolerance of uncertainty, not only as it relates to the JTC Beads Task, ought to be reexamined. Multiple possible operations were used in the current study – self-reported intolerance of uncertainty as per the IUS, a potential behavioral measure of intolerance of uncertainty as per the JTC Beads Task, and a theoretical real-world analogue of intolerance of uncertainty, political intolerance as measured by the self-report PTS. These three measures did not display consistent relationships with each other or with other variables in the study. E.g., the IUS and PTS were significantly correlated with each other but had correlations that were statistically different from each other for the DSS and AHS, as well as for total score on the FFMQ and for the Nonjudgmentalness facet of the FFMQ (in addition to being marginally different for the Nonreactivity facet of the FFMQ). In addition, neither the IUS or PTS were significantly correlated with any aspects of the JTC Beads Task. These differences suggest that the three measures are likely not representative of an overall concept of “intolerance of uncertainty.” While the IUS assesses how much distress is caused by uncertainty and to what degree uncertainty interferes with acting effectively, the JTC Beads Task might not be an accurate behavioral operationalization of uncertainty. Perhaps it is more a
measure of risk aversity or a measure of avoidant vs. perseverative behavior due to factors other than uncertainty. In addition, it seems likely that the PTS – as a measure of one’s desire to block the political opinions of others from being heard – might not be tapping into intolerance of uncertainty as it manifests in the political context (e.g., that hearing opposing political views might be distressing in part due to the uncertainty then raised about one’s own positions) but instead intolerance of contradiction or conflict. Especially given that there appears to be only the one direct measure of intolerance of uncertainty, the IUS, it could be beneficial to further examine the overall construct of intolerance of uncertainty to determine what exactly it might comprise and what real-world or behavioral analogues might be associated.

Related to operationalization, another important aspect that remains elusive is how to best assess intolerance of uncertainty. To begin with, uncertainty can encompass very distinct elements: being uncertain about whether something is positive or negative, or what the correct action is to take, is quite different from being uncertain whether or not something occurred. In addition, the lack of clear behavioral measures or conceptual analogues leaves self-report measures, which are limited by recall bias and variations in behavior across time and contexts. One method that attempts to mitigate these limitations of self-report measures is ecological momentary assessment (EMA), which uses repeated, real-time sampling of behavior and emotions (Shiffman, Stone, & Hufford, 2008). Thus, EMA lessens the impact of recall bias and variations in behavior across time and contexts on self-report data, and accurate assessment of intolerance of uncertainty could be improved by using EMA in future studies. Assessment could also be informed by the Knowledge-and-Appraisal Personality Architecture (KAPA) model (Cervone, 2004; Cervone & Little, 2019). The KAPA model’s focus on cross-situational coherence – or lack thereof, depending on the personality attribute being examined – suggests
that intolerance of uncertainty could be domain-specific. If this were the case, it could be useful to design methods of assessing intolerance of uncertainty across different types of situations instead of conceptualizing of it as a stable cross-situational construct. Lastly, in assessing intolerance of uncertainty, it might be useful to incorporate assessment of people’s worldviews, as these might have a moderating effect on their perceptions of uncertainty. Terror management theory posits that people’s cultural worldviews “imbue the world with order, meaning, and permanence by providing a set of standards of valued behavior” (Greenberg, Simon, Pyszczynski, Solomon, & Chatel, 1992). It seems likely that the ways in which one’s worldview contributes a sense of permanence and stability would be related to one’s views on uncertainty.

Future research could illuminate what patterns of behavior are associated with higher intolerance of uncertainty, in particular whether it is associated with more avoidant behavior or more perseverative behavior. The differences between the current findings and prior studies’ findings discussed above indicate that this question is far from settled, in addition to being rarely explored. In the clinical domain, anxiety is associated with both avoidant behavior – e.g., behavioral or experiential avoidance of anything that prompts an unwanted emotion – and perseverative behavior, e.g., rumination (Naragon-Gainey, McMahon, & Chacko, 2017; Tull, Gratz, Salters, & Roemer, 2004). Is intolerance of uncertainty associated with one of these patterns more than the other? Findings in this area could shed light on possible consequences of intolerance of uncertainty and how it might interfere with effective functioning, in addition to providing insight into moderators of the relationship or possible points of intervention.

There are limitations to the current study, including its lack of a no-intervention control group. Though the active control intervention was designed to account for any extraneous effects of simply completing a reading and reflection exercise, a no-intervention control group would
have given further information about what accounted for differences between groups following the interventions. For example, there is no way to definitively conclude that the experimental intervention increased intolerance of uncertainty, as opposed to some factor of the active control intervention decreasing intolerance of uncertainty. Another limitation is that the order of reading the passage and subsequently reflecting on the past was not counterbalanced; perhaps having them in the opposite order would have a different effect. For example, reading the passage first might have affected which past occurrence was subsequently recalled or how that memory was interpreted. Relatedly, because the intervention included both the component of the parable and the component of the written reflection, it is impossible to parse apart the differential effects of each. A study with more nuanced experimental groups, e.g., one group that used a parable as its intervention, a second group that used a written reflection as its intervention, a third group that used both, etc., would be able to suggest more basis for effects due to one approach vs. another vs. the interaction of both. More fine-grained experimental approaches might also deepen understanding of the mechanisms of priming-based interventions in general, not only as they relate to intolerance of uncertainty.

It is possible that the written exercise for the experimental condition actually reintroduced uncertainty to those who had resolved their past feelings of uncertainty. In addition, the written reflection asked only about an uncertain time that turned out well; it is the nature of life that uncertain times also do not turn out well. Perhaps future studies could incorporate reflections upon a wider spectrum of times of uncertainty – both positive and negative – to better parallel reality. It is also possible that the written exercise for the control condition might have served as an uncertainty induction of a different unintended sort, given that the topic of economic benefit from hosting the Olympics was presented as a complicated issue with significant pros and cons.
Thus, it might have facilitated feelings of uncertainty about conflicting benefits and drawbacks. Of note, five participants reported having heard the parable used in the experimental condition at a prior point in time. All analyses were redone excluding these five participants and no significance levels changed. Lastly, the experimenter was blind to condition only up until the moment the participant began the measures, which could have led to inadvertent differential treatment of participants. The chances of this occurring were limited, as the experimenter and participant were sitting facing away from each other during the experiment to minimize interaction. However, during the two instances when the experimenter went to the computer to advance the participant to the next task, perhaps the limited interaction could have introduced bias.

There was also no pre-intervention measure of intolerance of uncertainty. A baseline measure of intolerance of uncertainty would also have given the ability to investigate precisely how pre-existing intolerance of uncertainty might moderate the effect of being reminded of uncertainty, or might interact with other factors such as mindfulness to moderate that effect. For example – as discussed above – baseline high (vs. low) intolerance of uncertainty might be heavily contributed to by distorted patterns of thinking, which could be suddenly activated by an intervention that reminds one of uncertainty in any way. In contrast, low intolerance of uncertainty might be driven more by existential concerns and might therefore be less affected by an intervention that sheds a positive light on uncertainty. In this way, pre-existing intolerance of uncertainty would function as a moderator for the effects of the intervention.

In addition, no measures of emotion or personality were given. Measures of emotion could have provided information about how mood or personality factors influence one’s experience of uncertainty. For instance, perhaps being reminded of uncertainty increases one’s
intolerance of it, but only when one’s affect is more negative. Along these lines, a past study found that while higher intolerance of uncertainty did not have behavioral effects across groups during a task, it was associated with increased distress experienced while completing the task for those participants with anxiety disorders (Jacoby et al., 2014). Thus, affect could interact with the intervention such that the intervention has certain effects (or non-effects) when one’s affect is negative vs. positive. Similarly, no dimensions of personality were assessed, such as the Big-Five framework of personality dimensions. It could be possible that some aspect of personality, e.g., neuroticism, accounts for a significant amount of variance in intolerance of uncertainty. Future work would do well to examine what other constructs, such as the above-mentioned personality aspect of neuroticism, the effects of intolerance of uncertainty could also be attributed to.

It also bears noting that the Acting with Awareness subscale of the FFMQ was the only subscale not found to contribute unique variance to any measure of intolerance of uncertainty, nor have a significant correlation with any measure of intolerance of uncertainty or political intolerance. The unique non-effect of the Acting with Awareness subscale raises questions about the nature of the FFMQ subscales. If the subscales are differentially related to outside measures, does that demonstrate how complex the overall construct of mindfulness is? Or does it suggest that this construct of mindfulness, and the various aspects it is hypothesized to comprise, might be worth revisiting in future research? As suggested by a recent comprehensive critique of current practices in mindfulness research (van Dam et al., 2018), mindfulness is such a broad and varied construct that research referring to it requires delineation of which components are considered essential to the construct being assessed and delineation of which criteria are being used to make those decisions. For example, are the three components examined in the current
study – Acting with Awareness, Nonjudging, and Nonreactivity – actually representative of mindfulness? Does a system of ethics need to be included for it to be “mindfulness,” or is a focus on aspects of attention and how one pays attention (e.g., nonjudgmentally and with nonreactivity) sufficient? In addition, different traditions of mindfulness have varying definitions of what the construct entails. Though the critique paper would caution against investigating “mindfulness” as an umbrella concept, the investigation of different facets of mindfulness in the current study is in line with the paper’s recommendations (van Dam et al., 2018). In addition, the current study specifies that the operational definition of mindfulness is based solely on self-report measures and acknowledges their limitations. The critique paper also cautions against viewing mindfulness as a panacea or equating statistically significant differences to clinically significant differences. Thus, the current study attempts to examine the relationship of mindfulness to intolerance of uncertainty without drawing wide-ranging inferences.

The findings indicate several other areas that could be useful for future research. There continues to be a lack of a nonclinical intervention shown to increase tolerance of uncertainty. Given the reasons discussed above about the possible benefits across domains that could arise from such an intervention, this appears to be a high-priority research area. Per the earlier discussion about how the results indicate that successful interventions might need to be longer in duration, research exploring longer-term interventions outside of the clinical context of MBCT or cognitive-behavioral therapies could be useful. One possible approach involves a primary source of uncertainty, one’s mortality. Mortality salience is viewed as a reliable method to increase distress due to the negative reactions we often have when reminded of our impermanence (van de Bos et al., 2005). Responses to uncertainty are theorized to be associated with reactions to mortality salience, and mortality salience is involved in some manipulations
used to temporarily increase intolerance of uncertainty or distress (Tritt, Inzlicht, & Harmon-Jones, 2012; van den Bos et al., 2012). Of note, some traditional mindfulness and meditation practices use longer-term contemplation of mortality in order to increase awareness of the nature of impermanence (Bhikkhu, 2008). Viewing these practices through the theory of exposure, one might expect that repeated exposure over time to a feared stimulus involving uncertainty – death – would eventually decrease distress in response to the stimulus, which could generalize to other sources of uncertainty. A variety of death awareness practices are found across different schools of Buddhism, and they might provide insight into non-clinical methods of increasing tolerance of uncertainty (Bhikkhu, 2008). Given that reminders of death are known to increase intolerance of uncertainty, longer-term exposure to uncertainty through such practices could plausibly lead to decreased distress over time in response to uncertainty. Even without explicit mortality salience, mindfulness practices that incorporate intentional awareness of uncertainty or impermanence – practiced repeatedly over time – could be a viable means of increasing overall tolerance of uncertainty. One means of incorporating these aspects could be an intervention that focuses on the ubiquity of uncertainty in everyday life.

The current study did not identify further methods effective in increasing tolerance of uncertainty, though it illuminated unexpected elements that might facilitate intolerance of uncertainty. Confirming a secondary hypothesis, it found that those higher in mindfulness are also higher in tolerance of uncertainty, which had not yet been explored nor demonstrated by the existing literature. There continues to be a dearth of methods to effectively increase tolerance of uncertainty while there are a number of important related constructs that might benefit from increased tolerance of uncertainty. These findings provide support for future research on ways to increase tolerance of uncertainty, especially longer-term nonclinical interventions and possibly
those that involve training in aspects of mindfulness. A great deal of uncertainty remains, and it would be beneficial to both tolerate the necessary degree of uncertainty as well as explore further.
EXPERIMENTAL AND CONTROL INTERVENTIONS

Experimental Condition

Read the following passage carefully. Pay attention while reading, as questions will follow.

Many years ago, in a poor Chinese village among the mountains, there lived a farmer and his son. His only material possession, apart from the land and a small hut, was a horse he had inherited from his father.

One day, the horse ran away, leaving the man with no animal with which to work the land. His neighbors, who respected him for his honesty and diligence, went to his house to say how much they regretted his bad luck. He said:

"Maybe so, maybe not. We shall see."

A neighbor whispered to a friend: "Perhaps he doesn’t want to face the facts, but let him think what he likes, perhaps it’s better than being sad about it."

A week later, the horse returned to its stable, but it was not alone; it brought with it a beautiful mare for company. The villagers were thrilled when they heard the news, and they went back to the farmer’s house to congratulate him on his luck.

"Instead of one horse, you now have two. What good fortune!" they said.

"Maybe so, maybe not," replied the farmer. "We shall see."

A month later, the farmer’s son decided to tame the mare. However, the animal bucked wildly and threw the boy off; the boy fell awkwardly and broke his leg.

The villagers returned to the farmer’s house, bringing presents for the injured boy and saying what bad luck it was.

The farmer thanked them for their visit and for their kindness, but he said:

"Maybe so, maybe not. We shall see."

These words left the neighbors speechless, since the son’s accident seemed to be a tragedy. As they left the farmer’s house, they said to each other: "His only son could be left permanently injured, and he’s not sure whether the accident was a misfortune or not!"

Several months later, a battalion of soldiers marched towards the village. A war to the north was underway and all young men of fighting age were needed immediately. When the soldiers
reached the village, they recruited all the young men, except the farmer’s son, whose leg had not yet healed.

"How lucky you are!" the neighbors said to the farmer.

The old farmer looked out across his fields at the two horses grazing. He looked at the lovely way the sun caught the tops of the jagged peaks in the distance, and said nothing at all.

- **Guided reflection on past time of uncertainty**

  Think of a past decision you made or a past event in your life that caused you uncertainty at the time, especially about whether it was the right thing to do or a positive thing to have happened, but that turned out well in the long-term.

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  Once you have this past decision or event in mind, reflect for a moment on what it felt like to be uncertain at the time about how things would turn out.

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  Now reflect on what it feels like to be looking back in hindsight and seeing that things turned out well, despite your initial uncertainty. Notice any reactions that arise.

- Please now write about this past decision or event that was uncertain at the time and how things ended up turning out well in the long-term. There are no right or wrong answers: simply describe what you have been reflecting on. Please write at least a long paragraph.
Read the following passage carefully. Pay attention while reading, as questions will follow.

When the Olympic Games were originally held in Ancient Greece, these athletic contests acted as both a religious ritual and an opportunity to celebrate the feats of the human body. In the present day, the latter motivation remains and a new one has been added: much of the rhetoric surrounding the Games involves economic advantages to be gained by the country and city hosting the Games. As recent budgets for hosting the Games have ballooned, so has the insistence that spending money will make money for the host destination.

All of this sounds admirable in theory: what country wouldn’t want to both draw in global prestige and economic profit? The problem is that the reality can be more complex. A 2009 study investigating the impact of hosting did find that countries that hosted the Olympics unequivocally experienced increased international trade in subsequent years. However, in an interesting twist, countries that made bids to host the Olympics but then failed to secure the hosting opportunity experienced the same upsurge in trade. The same studies do show significant increases in national pride when a country hosts the Games.

*Adapted from Danielle Barkley, “International Sporting and the Economics of Enjoyment.”

- Guided reflection on the control paragraph

Think about the above passage and the question as to how hosting the Olympics can be of economic benefit to a country. Think about the points made by the passage.

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Now, develop your ideas about how – specifically – hosting the Olympics can be of economic benefit to a country. How might there be financial benefits in the short-term? In the long-term? In a national context? In an international context? Etc.

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Are there any ways that it might be of short-term benefit but not long-term benefit? Or ways that it might be of long-term benefit but not short-term benefit?
• Please now write about your ideas of how the Olympics can be of economic benefit to a hosting country. There are no right or wrong answers: simply describe ways that you have thought of that hosting the Games can result in financial benefit, either short-term, long-term, or both. Please write at least a long paragraph.
APPENDIX B

DEMOGRAPHIC QUESTIONNAIRE

1. What is your age?

2. What is your gender?

3. What is your race/ethnicity?

4. What is your religious affiliation?

5. What is your average political leaning?

6. Are you a native speaker of English?

   If no, at what age did you learn English?
REFERENCES


