Available online at www.sciencedirect.com

ScienceDirect

Behavior Therapy 50 (2019) 489–503

Behavior Therapy

www.elsevier.com/locate/bt

Individuals Intolerant of Uncertainty: The Maintenance of Worry and Distress Despite Reduced Uncertainty

Rachel M. Ranney
University of Illinois at Chicago

Evelyn Behar
Hunter College–City University of New York

Gregory Bartoszek
University of Illinois at Chicago

The intolerance of uncertainty model of worry posits that individuals worry as a means to cope with the discomfort they feel when outcomes are uncertain, but few experimental studies have investigated the causal relationships between intolerance of uncertainty, situational uncertainty, and state worry. Furthermore, existing studies have failed to control for the likelihood of future negative events occurring, introducing an important rival hypothesis to explain past findings. In the present study, we examined how individuals with high and low trait intolerance of uncertainty differ in their behavioral, cognitive, and emotional reactions to situational uncertainty about an upcoming negative event (watching emotionally upsetting film clips), holding constant the likelihood of that negative event taking place. We found that although individuals high in trait prospective intolerance of uncertainty reported a higher degree of belief that being provided with detailed information about the upcoming stressor would make them feel more at ease, they did not experience an actual decrease in distress or state worry upon being provided with more information, during anticipation of the film clips, or during the film clips themselves. Our results suggest that heightened distress regarding negative events may be more central than intolerance of uncertainty to the maintenance of worry.

Address correspondence to Rachel M. Ranney, Department of Psychology, University of Illinois at Chicago, Chicago, IL 60607; e-mail: rranne2@uic.edu.

Keywords: intolerance of uncertainty; generalized anxiety disorder; worry

The intolerance of uncertainty model (IUM) of generalized anxiety disorder (GAD) is one of the most prominent theoretical conceptualizations of worry (e.g., Dugas, Buhr, & Ladouceur, 2004). Intolerance of uncertainty (IU) is an individual differences variable depicting an individual's appraisal of uncertain or ambiguous situations as threatening. Individuals high in IU report that they respond negatively to uncertain situations on emotional, cognitive, and behavioral levels (Buhr & Dugas, 2002; Dugas et al., 2004). The IUM posits that individuals worry as a means to cope with the discomfort they feel when outcomes are uncertain (e.g., Dugas et al., 2004). IU is a transdiagnostic construct, predicting symptoms of GAD (e.g., Gentes & Ruscio, 2011), obsessive-compulsive disorder (OCD; Steketee, Frost, & Cohen, 1998), social anxiety disorder (Boelen & Reijntjes, 2009), depression (de Jong-Meyer, Beck, & Riede, 2009), panic disorder, and agoraphobia (McEvoy & Mahoney, 2011). IU is also strongly associated with worry (e.g., Dugas, Freeston, & Ladouceur, 1997).

IU has traditionally been viewed as a trait-like feature (Mahoney & McEvoy, 2012), but has also been manipulated experimentally (Ladouceur, Gosselin, & Dugas, 2000; Rosen & Knäuper, 2009) and decreases in response to psychotherapy for GAD that seeks to reduce IU (Boswell, Thompson-

Hollands, Farchione, & Barlow, 2013; Dugas & Ladouceur, 2000). Among individuals with GAD, IU has been found to partially account for the cross-sectional relationship between neuroticism and worry (McEvoy & Mahoney, 2013). These findings add to growing evidence that IU might play a causal role in maintaining worry. According to the IUM, high trait IU and high situational uncertainty interact to produce especially high, disruptive levels of worry. However, the vast majority of research on IU as it relates to GAD utilizes correlational rather than experimental designs, and thus causal relationships and mechanisms involving both IU and situational uncertainty have remained largely untested.

Woody and Rachman (1994) offer a perspective on GAD that might enrich our understanding of the role that IU plays in the maintenance of worry. They assert that GAD stems from a search for safety signals, and that this search is ultimately unsuccessful due to worriers' bias toward perceiving and interpreting threat (e.g., Butler & Mathews, 1983, 1987). Because uncertainty is perceived as threatening, individuals with GAD may search for information in order to reduce uncertainty. Relative to nonanxious controls, individuals with GAD are more likely to seek reassurance from others (arguably a form of safety information; Beesdo-Baum et al., 2012; Cougle et al., 2012). Woody and Rachman (1994) theorize that these attempts to find safety only offer temporary relief from anxiety; eventually, the safety signal's effects wear off, and the individual's attention and thoughts are drawn toward other potentially threatening stimuli and/or subject matter.

Information-seeking behavior as a consequence of high IU has thus far only been examined in the health literature. Rosen and Knäuper (2009) investigated the effects of both IU and situational uncertainty on information seeking using a task in which participants read a medical description of a fictitious sexually transmitted infection (STI). They randomly assigned participants to perceive themselves as having either high or low IU through false feedback about their trait level of IU. Participants also read a description that led them to be either certain they did not have the STI (situational certainty) or uncertain about whether they might have the STI (situational uncertainty). Participants assigned to experience both high perceived trait IU *and* situational uncertainty sought more information about the fictitious health risk and reported higher levels of state worry compared with those in the other three groups. Importantly, however, this study did not rule out the important rival hypothesis (identified by Oglesby & Schmidt, 2017) that the mere anticipation of a negative event (i.e., having an STI) might have led to these effects. Because the situational uncertainty condition induced both uncertainty *and* the anticipation of a negative event, it is impossible to isolate the effects of situational uncertainty. Additionally, this task may not have been personally relevant for those with GAD, as health concerns are not among the main topics of worry for this population (Hoyer, Becker, & Roth, 2001).

In another experimental study, Ladouceur et al. (2000) manipulated situational uncertainty using a gambling task. Participants were told that either a specific charitable organization would not receive money if they did not succeed in the game (situational uncertainty) or that the charity would receive money regardless of their success in the game (situational certainty). Participants in the situational uncertainty condition reported higher IU and higher levels of state worry during the gambling task than did participants in the situational certainty condition. Although these results suggest a causal relationship between situational uncertainty and state worry, this study likewise did not rule out the rival hypothesis that the anticipation of a negative event (i.e., a charitable organization not receiving money) might have led to increased state worry during the gambling task. As in Rosen and Knäuper (2009), the situational uncertainty condition induced both uncertainty *and* anticipation of a negative event, precluding isolation of the effects of uncertainty. In addition, this investigation did not measure information seeking, which may play a role in maintaining anxiety (Woody & Rachman, 1994).

Noting that the anticipation of a threat was a potential confound in existing experimental research on IU, Oglesby and Schmidt (2017) sought to control for this variable. They randomly assigned participants to be told either that they would give a speech (low situational uncertainty) or that a coin toss would determine whether they would give a speech (high situational uncertainty), allowing them to hold the threat constant across conditions. Participants higher in trait IU evidenced higher anticipatory state anxiety than did participants lower in trait IU, regardless of level of situational uncertainty. Thus, individuals with higher trait IU *subjectively* reported that uncertainty caused them more distress than did those lower in trait IU, but they did not *actually* evidence higher state anxiety when faced with uncertainty (vs. certainty) about a future threat. Importantly, although Oglesby and Schmidt attempted to hold constant the presence of threat, the *likelihood* of that threat occurring varied systematically with situational uncertainty. Therefore, it remains unclear whether individuals with high trait IU react differently to high versus

low situational uncertainty when the likelihood of a future event occurring is held constant. In addition, this investigation did not include a measure of information seeking.

Taken together, these three investigations offer support for the IUM by demonstrating that both high trait IU and high situational uncertainty are associated with an increase in anxiety-relevant behaviors/experiences (i.e., information seeking, state worry, anxiety). However, the most recent of these studies (Oglesby & Schmidt, 2017) suggests that the effects of situational uncertainty might simply be due to the anticipation of a negative event and not to situational uncertainty per se. Furthermore, these three investigations were limited in (a) the systematic varying of situational uncertainty with the likelihood of a negative event and (b) the lack of consistent assessment of information seeking as a dependent variable. Another potential limitation of these investigations lies in (c) their definition of trait IU. All three of these studies utilized the full-scale score from the Intolerance of Uncertainty Scale (IUS; Buhr & Dugas, 2002) to identify high versus low trait IU. The shortened 12-item version of the IUS consists of two subscales. Prospective anxiety (hereafter referred to as prospective IU) measures anxiety regarding the anticipation of uncertainty (e.g., reacting aversively to unforeseen or surprising events), and is uniquely associated with GAD and OCD. In contrast, inhibitory anxiety measures the inhibition of action or experience in response to uncertainty (e.g., feeling paralyzed in the face of doubt or uncertainty), and is uniquely associated with panic disorder, agoraphobia, depression, and social anxiety disorder (Carleton et al., 2012; McEvoy & Mahoney, 2011). Because prospective IU reflects discomfort with anticipating uncertainty as well as the desire for more certainty/information, this subscale is particularly well positioned to predict information-seeking behavior. Furthermore, prospective IU (but not inhibitory IU) predicts greater brain activity in response to errors (measured with an electroencephalogram [EEG]) and stronger startle eye-blink response to unpredictable threat (Jackson, Nelson, & Hajcak, 2016; Nelson, Liu, Sarapas, & Shankman, 2016). Thus, selecting participants on the basis of their prospective IU scores may facilitate isolation of theoretically relevant effects of uncertainty.

In the present study, we examined (a) whether individuals high in trait prospective IU would (behaviorally) seek more information about an uncertain threat, and (cognitively) report increased positive beliefs about the effects of receiving information; and (b) whether individuals high in trait prospective IU would react more negatively (with respect to state worry and subjective distress) to situational uncertainty. To improve upon past limitations and better isolate the causal role of situational uncertainty, we selected participants on the basis of their trait prospective IU scores, and we manipulated situational uncertainty holding constant the likelihood and occurrence of an upcoming stressor. Participants were informed that they would be exposed to two emotionally upsetting film clips and asked to write a list of questions about the upcoming clips. The number of questions asked and the amount of time participants spent generating these questions served as *behavioral measures* of information seeking. We also asked participants how much more at ease they believed they would feel if they were to have their questions answered and if they were to be provided with detailed summaries of the film clips; these served as *cognitive measures* of reactions to situational uncertainty. Participants were randomly assigned to have their questions fully answered and receive detailed information about the upcoming film clips (situational certainty), or to not have their questions answered and not receive information about the film clips (situational uncertainty). All participants were then instructed to think about the upcoming film clips during a 5-minute anticipation period, during which they provided *state worry* and *subjective distress* ratings (with the measurement of state worry during this anticipation period serving as a test of the IUM's central tenet that individuals high in trait IU worry in anticipation of uncertain events). Finally, all participants viewed the two film clips and provided subjective distress and negative affect ratings, which served as *emotional measures* of between-groups reactions to the film clips.

First, based on Woody and Rachman's (1994) proposal that anxious individuals seek safety signals, as well as the IUM's proposal that individuals high in trait IU find uncertainty threatening, we predicted that upon being informed about the film clips (before the manipulation of situational uncertainty), participants high in trait prospective IU (relative to those low in trait prospective IU) would seek more information and that they would be more likely to perceive having this information as beneficial. Second, we predicted a three-way interaction among our main variables of interest (trait prospective IU and situational uncertainty) and time during the anticipation period. We expected that relative to individuals high in trait prospective IU, those low in trait prospective IU would evidence consistently lower levels of state worry and distress across the anticipation period regardless of the situational uncertainty condition. In contrast, we predicted that among individuals high in trait prospective IU, those who

Table 1
Sample Characteristics and Baseline Measures

	Low prospective IU		High prospective IU	
	Situational certainty (n = 24)	Situational uncertainty (n = 23)	Situational certainty (n = 28)	Situational uncertainty (n = 28)
Age *M* (*SD*)	19.04 (1.15)	19.05 (1.13)	19.54 (2.19)	19.46 (1.58)
Females (n)	16	15	19	17
Race/ethnicity (n)				
Caucasian	6	4	5	4
African American	2	5	2	0
Hispanic	10	7	8	9
Asian/Pacific Islander	1	5	11	13
Middle Eastern	1	1	0	0
Other	0	0	1	0
Multiracial	4	0	1	1
Variables (observed range)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
PSWQ (18–79)	40.79 (12.33)	43.22 (11.60)	61.96 (11.11)	62.96 (11.70)
BDI-II (0–55)	5.83 (5.35)	5.74 (5.99)	17.29 (13.44)	18.64 (13.07)
State Worry (0–70)	10.00 (11.80)	4.35 (7.88)	17.50 (20.30)	22.14(22.17)
SUDS (Distress) (0–80)	12.08 (11.12)	12.17 (12.42)	21.54 (19.53)	25.19 (21.73)
Negative Affect (10–37)	12.92 (3.20)	11.22 (1.54)	14.79 (5.72)	15.39 (5.17)

Note. Untransformed *M*s and *SD*s are provided for ease of interpretation. IU = intolerance of certainty; PSWQ = Penn State Worry Questionnaire; BDI-II = Beck Depression Inventory–II; SUDS = Subjective Units of Distress Scale.

experienced situational uncertainty would maintain a consistently higher level of state worry and distress while anticipating the upcoming film clips, whereas those who experienced situational certainty would initially report lower levels of state worry and distress (having received the "safety signal" of information), which would increase as their attention would be drawn toward other potential threats (Woody & Rachman, 1994). Using an exploratory approach, we also examined participants' (a) subjective distress when they were initially told about the clips (before manipulating uncertainty) and (b) emotional reactivity to the clips. Although these additional analyses do not directly test the IUM or Woody and Rachman's theory, they provide knowledge about the potential emotional consequences of IU and situational uncertainty during a subsequent negative event.

Method

DESIGN

We utilized a 2 (trait prospective IU: high, low) × 2 (condition: situational certainty, situational uncertainty) between-subjects design. We also included time as a repeated measures variable reflecting multiple measurements of state worry, distress, and emotional reactivity.

PARTICIPANTS

We selected undergraduate students both low and high in trait prospective IU from the participant pool at a large, public, urban university. Potential participants (N = 2,932) completed the Intolerance of Uncertainty Scale–12 (IUS-12; Carleton, Norton, & Asmundson, 2007) during a departmental screening procedure each semester. We invited students to participate if their score on the prospective IU subscale was at least 1 standard deviation above ($\geq$25) or below ($\leq$12) the pool mean (M = 18.68, SD = 6.29). A total of 169 individuals meeting inclusion criteria agreed to participate. On the day of the laboratory visit, we readministered the IUS-12 to all 169 participants; 66 participants still did not meet this inclusion criterion and were therefore excluded from primary analyses.[1] The final sample (N = 103) was young (mean age = 19.29, SD = 1.61), predominantly female (65.05%), and racially/ethnically diverse (see Table 1).

MEASURES

Intolerance of Uncertainty Scale–12 (IUS-12)

This version of the original IUS (Carleton et al., 2007) contains 12 items measuring two subscales: prospective anxiety (prospective IU), which measures fear and anxiety regarding the anticipation of uncertainty and is uniquely associated with GAD and OCD; and inhibitory anxiety (inhibitory IU), which measures the inhibition of action or experience in response to uncertainty and is uniquely associated with panic

[1] We collected data from these 66 participants, plus an additional 30 participants with prospective IU scores falling within 1 *SD* of the mean, for later examination of dimensional prospective IU scores. These 96 individuals' data were not included in primary analyses.

disorder, agoraphobia, depression, and social anxiety disorder (Carleton et al., 2012; McEvoy & Mahoney, 2011). The IUS-12 evidences good retest reliability (Khawaja & Yu, 2010) and adequate convergent and discriminant validity (Carleton et al., 2007; McEvoy & Mahoney, 2011). Potential participants' prospective IU scores (M = 18.67, SD = 6.29) were similar to values reported elsewhere (e.g., Carleton, Collimore, & Asmundson's, 2010, community [M = 19.45, SD = 6.58] and student [M = 16.68, SD = 6.00] samples). Clinical samples of patients with anxiety disorders evidence higher levels of prospective IU (e.g., McEvoy & Mahoney, 2011 [M = 21.81, SD = 6.92]), and patients with GAD evidence the highest scores on this subscale (e.g., Talkovsky & Norton, 2016 [M = 23.40, SD = 7.33]). Internal consistency of this subscale in the current sample was excellent (α = .96), and its retest reliability (from the screening to the experimental session) was imperfect but acceptable (r = .75).

Penn State Worry Questionnaire (PSWQ)
The PSWQ (Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item self-report measure designed to assess the frequency and intensity of worry. It has good retest reliability both immediately (r = .92) and at 4 weeks from initial assessment (r = .74). Correlations between the PSWQ and measures of anxiety, depression, and emotional control support the PSWQ's convergent and discriminant validity (Brown, Antony, & Barlow, 1992). We administered the PSWQ to ensure that trait levels of worry were equivalent across randomly assigned conditions, given that state worry was one of our dependent variables of interest. Internal consistency of the PSWQ in the current sample was excellent (α = .94).

Beck Depression Inventory–II (BDI-II)
The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report measure that assesses features of depression over the past 2 weeks. The BDI-II has excellent retest reliability over durations varying from 1 to 12 days after initial assessment in a university sample (r = .82–1.00; Sprinkle et al., 2002). The convergent and discriminant validity of the BDI-II are good (Arnarson, Ólason, Smári, & Sigurðsson, 2008). We administered the BDI-II to ensure that depression was equivalent across randomly assigned conditions, given the positive relationship between depression and IU (de Jong-Meyer et al., 2009). Internal consistency of the BDI-II in the current sample was excellent (α = .95).

State Worry Rating
We asked participants to report their state worry ("How worried are you at this moment?") on a 0- to 100-point scale (0 = *not at all worried*, 100 = *extremely worried*) six times: once at baseline, and five times throughout the anticipation period.

Subjective Units of Distress Scale (SUDS)
Using the SUDS (Wolpe, 1958), at various points in the experiment we asked participants to report their subjective distress on a 0- to 100-point scale (0 = *totally relaxed*, 100 = *highest distress/fear/anxiety/discomfort that you have ever felt*). Participants rated their distress six times: at baseline, after being initially informed about the film clips, after the manipulation of uncertainty, after the anticipation period, after viewing the first film clip, and after viewing the second film clip.

Positive and Negative Affect Schedule—Moment Version (PANAS)
The PANAS (Watson, Clark, & Tellegen, 1988) is a 20-item self-report measure consisting of 10 positively valenced and 10 negatively valenced adjectives that assess positive affect (PA) and negative affect (NA), respectively. In the current study, we calculated only the NA subscale. The PANAS demonstrates moderate retest reliability for the NA subscale (α = .45) for momentary assessment of affect. The PANAS demonstrates good convergent (Bagozzi, 1993) and discriminant (Bleidorn & Peters, 2011; Watson et al., 1988) validity. Internal consistency of the NA subscales in the current sample was good at all three time points assessed (α = .81–.87). Participants completed the PANAS three times: at baseline, before both film clips, and after both film clips.

PROCEDURE

Upon arrival, participants were seated at a desk containing a computer monitor, keyboard, and a box of tissues. They were asked to complete state worry, baseline distress, and NA ratings, and then to complete the IUS-12 (to ensure continued eligibility for the study), the PSWQ, and the BDI-II. See Figure 1 for an outline of all study procedures (including when dependent measures were administered).

Informing Participants About Stimuli
The experimenter informed participants that study staff had conducted a thorough search for film clips that are effective at eliciting strong emotions, and that they would be watching "emotionally upsetting film clips" as part of the study. The experimenter also told participants that they would be provided with mental health resources at the end of the session, as these film clips "could bring up emotions that they would like to discuss with a professional." Finally, the experimenter reminded participants that they could stop watching the film

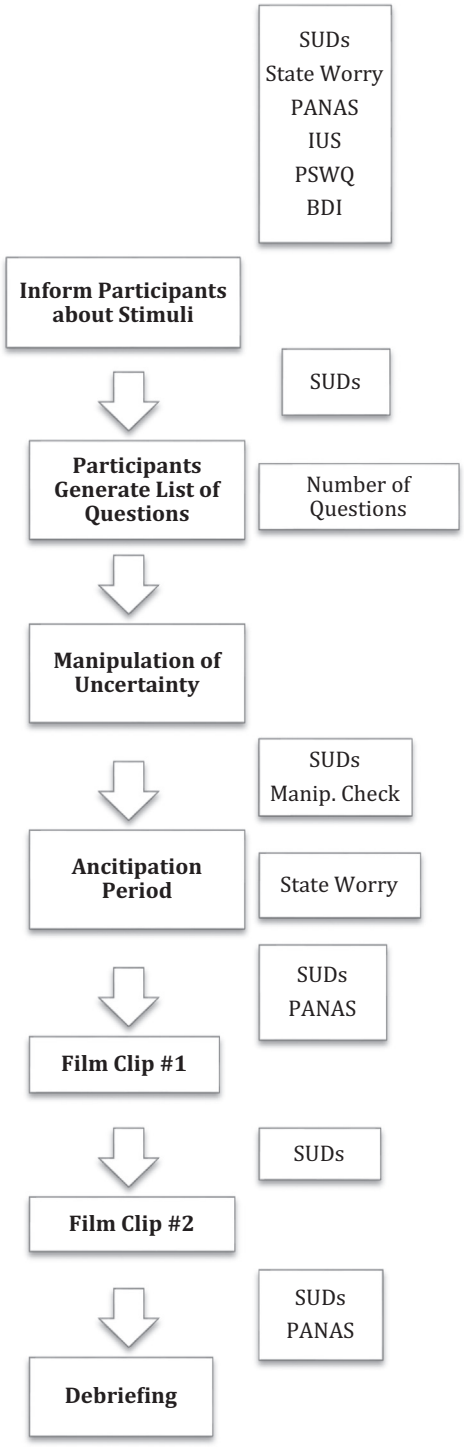

FIGURE 1 Diagram outlining study procedure flow. Stages of the study appear on the left; dependent variables appear on the right, indicating at which point they were obtained. *Note.* SUDS = Subjective Units of Distress Scale; PANAS = Positive and Negative Affect Schedule; IUS = Intolerance of Uncertainty Scale; PSWQ = Penn State Worry Questionnaire; BDI = Beck Depression Inventory.

clips at any point. This information (in combination with the visible box of tissues) was meant to highlight the potential emotional effects of the film clips and to create the anticipation of negative emotional reactions. Participants then completed another distress rating.

Generating Questions About Film Clips

The experimenter told participants that they could write down questions to which they would like answers about the upcoming film clips, and provided them with an unlimited amount of time to generate those questions. The number of questions generated and the amount of time taken to complete the task served as behavioral measures of information seeking. Additionally, participants were asked, "How much more at ease would you feel if you could have these questions answered?" as well as "How much more at ease would you feel if you could be provided with a summary about what happens in the films?" (1 = *not at all*, 5 = *a lot*). These questions served as cognitive measures of the belief that being provided with information about a future threat would ease their distress.

Manipulation of Situational Uncertainty

Participants were randomly assigned to experience situational certainty or uncertainty regarding the upcoming film clips. The experimenter provided participants in the *situational certainty* condition with a detailed summary of the two film clips and then answered each of their questions accurately and thoroughly. In contrast, the experimenter did not provide participants in the *situational uncertainty* condition with a summary of the film clips, and did not answer their questions. To control for the passage of time during this portion of the experiment, each participant in the uncertainty condition was yoked to a participant in the certainty condition (based on their order of participation) by asking each participant in the uncertainty condition to wait in the room for the amount of time his or her yoked participant in the certainty condition had taken to receive the information. Participants then completed another distress rating. To examine whether our uncertainty manipulation was successful, we then asked participants, "How uncertain are you about what the film clips will be like?" (1 = *extremely certain*, 5 = *extremely uncertain*).

Anticipation Period

Participants remained seated quietly for 5 minutes, during which the experimenter asked them to think about what it would be like to watch the upcoming film clips. The experimenter interrupted participants every 40 seconds and asked them how worried they were at that moment on a scale from 0 to 100 (0 = *not worried at all* to 100 = *extremely worried*), which served as a measure of state worry during the anticipation period. At the end of this

period, participants completed another distress and NA rating.

Film Viewing

Participants then viewed the two film clips in counterbalanced order. The fearful clip (216 seconds long) was from the film *Silence of the Lambs* and depicted a female FBI agent tracking a serial killer in his house; the sad clip (158 seconds long) was from the film *The Champ* and depicted a young boy grieving over his dying father. Both clips have been shown to elicit these intended emotions (Gross & Levenson, 1995). Participants completed a distress rating immediately after watching each clip, and an NA rating after having watched both clips; these served as measures of emotional reactivity to the film clips. Finally, participants were debriefed and provided with mental health service resources.

Results

PRELIMINARY ANALYSES

We tested all dependent variables for normality by examining skew (with a cutoff of >–2 and <2) and kurtosis (with a cutoff of >–7 and <7; West, Finch, & Curran, 1995). The baseline measure of NA was the only measure that required transformation, displaying a substantial positive skew with leptokurtic kurtosis. After an inverse transformation, baseline NA then met the skew and kurtosis criteria for normality. Untransformed means and standard deviations are provided in all analyses for ease of interpretation.

We also examined correlations among baseline measures, which demonstrated that most measures were significantly correlated (*p*s < .05) but not redundant. Trait prospective IU was associated with trait worry (PSWQ; r = .69), depression (BDI-II; r = .55), baseline state worry (r = .33), baseline distress (SUDS; r = .37), and baseline NA (PANAS; r = .38). Trait worry was associated with depression (r = .62), baseline state worry (r = .30), baseline distress (r = .37), and baseline NA (r = .48). Depression was associated with baseline state worry (r = .35), baseline distress (r = .43), and baseline NA (r = .47). Finally, baseline NA was associated with baseline state worry (r = .67), and baseline distress (r = .58). Baseline state worry and distress shared the strongest relationship (r = .82).

Data Reduction

To reduce our analyses and increase ease of interpretation, we first examined the correlations between various dependent variables, and combined variables and/or conducted multivariate analyses where appropriate. Results indicated moderate correlations (*r*s = .23–.61) between (a) number of questions asked about the upcoming film clips, (b) time taken to generate questions, (c) ratings of how much more at ease participants would feel if they could receive the answers to their questions, and (d) ratings of how much more at ease participants would feel if they could receive a summary of the film clips. We conducted a MANOVA on these four dependent variables given Maxwell's (2001) guidelines stating that dependent measures should be correlated at $.30 < r < .70$ to be entered in a MANOVA.

We also examined the correlations between distress and NA ratings before and after the film clips. Distress and NA ratings were strongly correlated at baseline (r = .58), before (r = .72) the film clips, and after (r = .72) the clips—thus, we standardized and combined these ratings to form a single variable representing self-reported *negative reactivity* at each of these three time points. Because NA was not measured at any other times during the experiment (i.e., after participants were initially told about the film clips or during the anticipation period), we examined distress independently (as opposed to combined with NA to form a negative reactivity variable) for these other analyses.

To reduce the risk of Type I error in our exploratory analyses, we set the p value for all exploratory analyses to .005 based on Benjamin et al.'s (2018) recommendations to employ this more conservative standard for significance in detecting new, exploratory findings. The new standard was chosen by attaining a p value that corresponded with Bayes factors that conventionally indicate "substantial" to "strong" evidence. The new standard was found to reduce the false positive rate from 33% (with a p value of .05 and prior odds of 1:10) to 5% (with a p value of .005 and prior odds of 1:10). Benjamin et al. recommend that p values that fall between .05 and .005 be termed "suggestive" rather than "significant," and that these findings may be further explained with this more forthcoming labeling.

Baseline Differences

We examined trait prospective IU group differences on baseline measures (see Table 1). Relative to participants with low trait prospective IU, those with high trait prospective IU reported higher levels of trait worry, $F(1, 101) = 79.82$, $p < .001$, $d = 1.76$; trait depression, $F(1, 101) = 34.89$, $p < .001$, $d = 1.20$; baseline distress, $F(1, 98) = 10.98$, $p = .001$, $d = 0.67$; baseline state worry, $F(1, 101) = 13.80$, $p < .001$, $d = 0.75$; and baseline NA, $F(1, 101) = 14.20$, $p < .001$, $d = 0.75$.

We also sought to ensure that the two randomly assigned conditions yielded equivalent levels of

baseline measures. Participants in the situational uncertainty and situational certainty conditions did not differ from each other on trait worry, trait depression, baseline distress, baseline state worry, or baseline NA ($ps \geq .54$, $ds \leq .12$).

Manipulation Check

As intended by our manipulation, participants in the uncertainty condition indicated less certainty about what the upcoming film clips would be like ($M = 2.61$, $SD = 1.13$) than did participants

Table 2
Primary Analytic Models

1. Effects of Trait Prospective IU on Distress From Before to After Being Informed of Film Clips (ANOVA)

Source	*df*	*F*	*p*	Partial η^2
Prospective IU	1	19.46	<.001*	.17
Time	1	2.17	.14	.02
Prospective IU × Time	1	5.56	.02	.05
Error	98			

2. Effects of Trait Prospective IU on Information-Seeking Variables (MANOVA)

Source	*df*	*F*	*p*	Partial η^2
Prospective IU multivariate effect	4	4.02	.005*	.15
Number of questions asked	1	1.96	.17	.02
Time taken to generate questions	1	0.02	.88	<.001
Ratings of "at ease" if provided answers	1	8.85	.004*	.09
Ratings of "at ease" if provided summary	1	12.04	.001*	.11
Multivariate error	92			
Univariate error	95			

3. Effects of Trait Prospective IU and Situational Uncertainty on Distress During Anticipation of Film Clips (ANCOVA)

Source	*df*	*F*	*p*	Partial η^2
Prospective IU	1	12.96	.001*	.12
Condition	1	0.33	.57	.003
Time (before, after)	1	2.19	.14	.02
Prospective IU × Condition × Time	1	0.63	.43	.01
Baseline distress (covariate)	1	102.50	<.001*	.52
Error	95			

4. Effects of Trait Prospective IU and Situational Uncertainty on State Worry During Anticipation of Film Clips (ANCOVA)

Source	*df*	*F*	*p*	Partial η^2
Prospective IU	1	25.61	<.001*	.22
Condition	1	0.57	.45	.01
Time (interruption 1, 2, 3, 4, 5)	2.82	0.15	.92	.002
Prospective IU × Condition × Time	2.82	0.34	.79	.004
Baseline state worry (covariate)	1	10.73	.001*	.10
Error (within subjects)	258.99			
Error (between subjects)	92			

5. Effects of Trait Prospective IU and Situational Uncertainty on Negative Reactivity During Film Clips (ANCOVA)

Source	*df*	*F*	*p*	Partial η^2
Prospective IU (high, low)	1	10.78	.001*	.10
Condition (certainty, uncertainty)	1	0.001	.98	<.001
Time (before, after)	1	0.08	.78	.001
Prospective IU × Condition × Time	1	0.77	.38	.01
Baseline negative reactivity (covariate)	1	59.76	<.001*	.39
Error	93			

Note. IU = intolerance of certainty.

in the certainty condition (M = 5.67, SD = 1.10), F (1, 101) = 194.53, $p < .001$, d = 2.74.

EFFECTS OF TRAIT PROSPECTIVE IU UPON BEING INFORMED ABOUT A DISTRESSING EVENT

We examined the effects of trait prospective IU on individuals' information-seeking behavior, beliefs, and subjective distress upon being informed that they would be exposed to an emotionally upsetting event. All results appear in Table 2. For information-seeking behavior and beliefs, we conducted a one-way (prospective IU: low, high) between-subjects MANOVA on (a) the number of questions asked about the upcoming film clips, (b) the time taken to generate questions, (c) ratings of how much more at ease participants would feel if they could receive the answers to their questions, and (d) ratings of how much more at ease participants would feel if they could receive a summary of the film clips. Results indicated a multivariate main effect of trait prospective IU, $F(4, 92) = 4.02$, $p = .005$, $\eta^2_p = .15$. Follow-up univariate tests revealed that participants high in trait prospective IU believed that they would be more at ease if they could receive the answers to their questions (M = 2.67, SD = 1.29) than did those low in trait prospective IU (M = 1.96, SD = 1.04), $F(1, 95)$ = 8.85, p = .004, d = 0.60. Furthermore, participants high in trait prospective IU reported that they would be more at ease if they could receive a summary of the films (M = 3.40, SD = 1.19) than did those low in trait prospective IU (M = 2.51, SD = 1.34), $F(1, 95)$ = 12.04, p = .001, d = 0.70. However, participants with high and low trait prospective IU did not differ in how long they took to generate their questions, $F(1, 95) = 0.02$, $p = .88$, $d = 0.03$, or in how many questions they asked, $F(1, 95) = 1.96$ $p = .17$, $d = 0.29$.[2]

For subjective distress, we conducted an exploratory 2 (prospective IU: low, high) × 2 (time: baseline, after being informed) mixed-model ANOVA on subjective distress ratings provided immediately after being initially informed about the film clips. Results indicated a main effect of trait prospective IU, such that participants high in trait prospective IU reported greater distress (M = 24.64, SD = 18.87) than did those low in trait prospective IU (M = 11.65, SD = 10.69), $F(1, 98) = 19.46$, $p < .001$, $d = 0.85$. This was qualified by a suggestive Prospective IU × Time interaction, $F(1, 98) = 5.56$, $p = .02$, $\eta^2_p = 0.05$ (Benjamin et al., 2018). Follow-up analyses of this suggestive interaction revealed that participants high in trait prospective IU experienced an increase in distress from baseline to after being informed of the upcoming film clips, $F(1, 52) = 7.80$, $p = .01$; $d = 0.21$, whereas those low in trait prospective IU did not, $F(1, 46) = 0.37$, $p = .55$; $d = 0.09$[3] (see Figure 2).

EFFECTS OF TRAIT PROSPECTIVE IU AND SITUATIONAL UNCERTAINTY DURING ANTICIPATION

We also examined the effects of both trait prospective IU and situational uncertainty on individuals' state worry and subjective distress while anticipating a distressing event (see Table 2). For state worry, we conducted a 2 (prospective IU: high, low) × 2 (condition: certainty, uncertainty) × 5 (time: interruption 1, 2, 3, 4, 5) mixed-model ANCOVA on state worry ratings, controlling for baseline state worry. Results indicated a main effect of trait prospective IU, such that participants high in trait prospective IU reported greater state worry throughout the anticipation period (M = 25.59, SD = 20.10) than did those low in trait prospective IU (M = 6.80, SD = 10.70), $F(1, 92) = 25.61$, $p < .001$, $d = 1.17$. No other significant effects emerged. In particular, the hypothesized Prospective IU × Condition × Time interaction was not significant, $F(2.82, 258.99) = 0.34$, $p = .79$, $\eta^2_p = 0.004$.

For subjective distress, we conducted a 2 (prospective IU: low, high) × 2 (condition: certainty, uncertainty) × 2 (time: beginning of anticipation period, end of anticipation period) mixed-model ANCOVA on distress ratings, controlling for baseline distress. Results indicated a main effect of trait prospective IU, such that participants high in trait prospective IU were more distressed while anticipating the upcoming stressor (M = 27.23, SD = 18.44) than were those low in trait prospective IU (M = 12.03, SD = 10.55), $F(1, 95) = 12.96$, $p = .001$, d = 1.01. No other significant effects emerged. In particular, the hypothesized Prospective IU × Condition × Time interaction was not significant, $F(1, 95) = 0.63$, $p = .43$, $\eta^2_p = 0.01$.[4]

[2] We also investigated the relationship between (a) dimensional prospective IU and (b) dimensional trait worry and these four information-seeking variables. Higher trait prospective IU predicted higher ratings of being at ease if provided with answers (p = .005) and if provided with a summary of the clips (p = .001), but not the other two variables. Similarly, higher trait worry predicted higher ratings of being at ease if provided with answers (p = .003) and if provided with a summary of the clips ($p < .001$), but not the other two variables. Analyses available from R.M.R. upon request.

[3] To examine whether a proxy measure of neuroticism might offer an alternative explanation, we conducted a 2 (trait prospective IU) × 2 (time: baseline, after being informed) ANOVA on person-centered distress scores. Within-subjects distress did not account for our suggestive interaction. Analyses available from R.M.R. upon request.

[4] We also examined state worry and distress across the anticipation period (a) without controlling for baseline levels, (b) by examining the *Dimensional* Prospective IU × Situational Uncertainty interaction, and (c) by examining the *Dimensional* Trait Worry × Situational Uncertainty interaction. Additionally, for distress across the anticipation period, we conducted these analyses (d) using person-centered distress scores. These approaches did not alter the pattern of results. Analyses available from R.M.R. upon request.

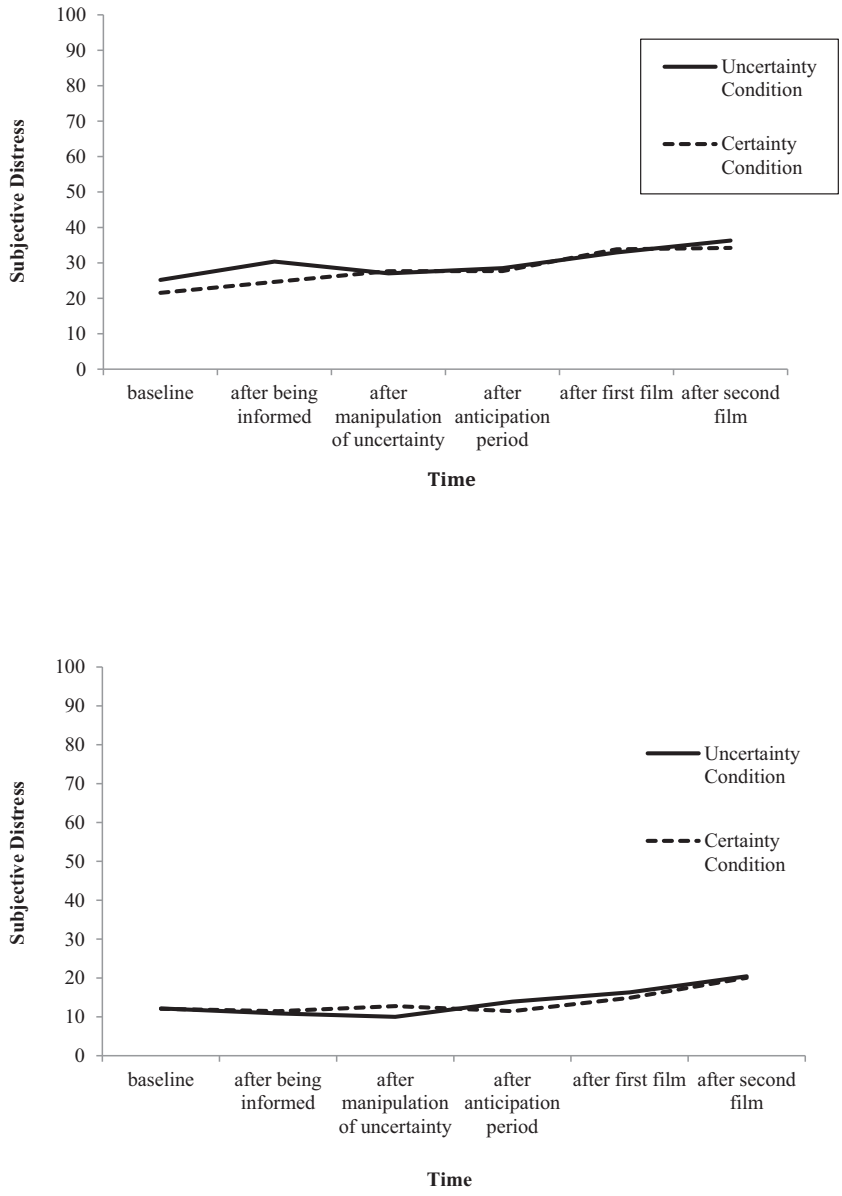

FIGURE 2 Subjective distress over time for participants high in trait prospective IU (top) and low in trait prospective IU (bottom). *Note.* IU = intolerance of uncertainty.

EFFECTS OF TRAIT PROSPECTIVE IU AND SITUATIONAL UNCERTAINTY DURING A DISTRESSING EVENT

We examined the effects of both trait prospective IU and situational uncertainty on individuals' self-reported negative reactivity while they viewed the film clips (see Table 2). We conducted an exploratory 2 (prospective IU: low, high) × 2 (condition: certainty, uncertainty) × 2 (time: before film clips, after film clips) mixed-model ANCOVA on our combined negative reactivity variable, controlling for baseline negative reactivity. Results indicated a main effect of trait prospective IU, such that participants high in trait prospective IU (M = 0.74, SD = 1.86) reported higher negative reactivity than did those low in trait prospective IU (M = –0.89, SD = 0.99), $F(1, 93) = 10.78$, $p = .001$, $d = 1.09$. No other significant effects emerged. In particular, the Prospective IU × Condition × Time interaction was not significant, $F(1, 93) = 0.77$, $p = .38$, $\eta^2_p = 0.01$.[5]

Discussion

We aimed to examine how individuals with high and low trait prospective IU differ in their behavioral, cognitive, and emotional reactions to situational certainty and uncertainty about an upcoming

[5] We conducted this analysis (a) without controlling for baseline levels, (b) by examining the *Dimensional* Prospective IU × Situational Uncertainty interaction, and (c) by examining the *Dimensional* Trait Worry × Situational Uncertainty interaction. These approaches did not alter the pattern of results. Analyses available from R.M.R. upon request.

negative event. The IUM (Dugas et al., 2004) posits that GAD is developed and maintained largely due to high trait IU, which leads to pathological levels of state worry when outcomes are uncertain. This theory, coupled with Woody and Rachman's (1994) theory that anxious individuals are motivated to seek safety signals when they detect a threat, led us to expect that participants high in trait prospective IU would seek more information about an upcoming stressor than would those low in trait prospective IU. However, we found that when participants were initially informed about an upcoming stressor (watching emotionally upsetting film clips), those high in trait prospective IU did *not* ask more questions about that upcoming event than did individuals low in trait prospective IU. This result is surprising considering Rosen and Knäuper's (2009) finding that trait IU predicts information-seeking behavior when outcomes are uncertain. However, Rosen and Knäuper examined a *composite index* of information seeking, which included two behavioral measures (requesting additional information and taking an informational sheet) and one self-report measure (a subjective assessment of information-seeking intentions). In contrast, we examined behavioral and subjective indices separately and found that although individuals high in trait prospective IU *subjectively* reported that they would feel more at ease if they could receive information about a stressor (with a large magnitude of effects), they did not *behaviorally* seek more information. Thus, individuals high in trait prospective IU hold beliefs about the utility of gathering information for reducing anxiety and distress, but they may not behaviorally seek more information to reduce that uncertainty.

Woody and Rachman (1994) argue that attempts to find safety only lead to temporary decreases in distress for anxious individuals, as their tendency to attend to threatening stimuli in the environment persists beyond the initial comfort that safety signals provide. Our results did not support this temporary relief hypothesis: When we reduced uncertainty by providing extensive information about the upcoming films, individuals high in trait prospective IU did *not* evidence a reduction in anxiety, and they did *not* react to this reduced uncertainty differently from those low in trait prospective IU. Rather, those high (vs. low) in trait prospective IU maintained greater state worry and distress while anticipating what it would be like to watch the upcoming film clips. Past research indicates that relative to nonworriers, worriers report greater distress when anticipating stressful events (Hoyer et al., 2001)—our results further suggest that uncertainty alone may not cause increased distress during anticipation of a stressful event. Taken together, our findings suggest that individuals high in trait prospective IU *expect* a decrease in distress as a consequence of being provided with information about an impending stressor, but when they are provided with this information, they do *not* experience this decrease in distress.

This inaccurate expectancy regarding the utility of gathering information about an upcoming stressor may function similarly to a host of other inaccurate expectancies held by anxious individuals. For example, compared to healthy control participants, anxious individuals may be less accurate in predicting their emotional experiences. The emerging field of affective forecasting has shown that individuals have difficulty accurately anticipating emotional reactions (e.g., Wilson & Gilbert, 2003). Furthermore, individuals high in neuroticism show even more difficulty accurately predicting their emotional reactions given their negative biases. Hoerger and Quirk (2010) found that neurotic individuals anticipate more severe negative emotional reactions to future events as compared to their actual experienced reactions of that event. Thus, individuals high in trait worry (which is strongly correlated with neuroticism; McEvoy & Mahoney, 2013), as well as individuals high in trait prospective IU, may be especially poor predictors of their emotional experiences. These findings align with previous research showing that individuals with GAD (a condition uniquely associated with high levels of trait prospective IU; Carleton et al., 2012) may have difficulty predicting their emotional reactions to future negative events. For instance, individuals with GAD tend to overestimate the likelihood and severity of negative events and to underestimate their ability to cope with those events (Borkovec, Hazlett-Stevens, & Diaz, 1999; Ladouceur, Blais, Freeston, & Dugas, 1998; MacLeod, Byrne, & Valentine, 1996). Individuals with GAD also hold *positive* biases about the utility of worry in that they are more likely to report that worry can help them cope with negative emotions (e.g., Penney, Mazmanian, & Rudanycz, 2013)—an inaccurate positive expectancy given evidence that worrisome states are associated with distress and impairment (Gentes & Ruscio, 2014; Kessler & Wittchen, 2002) and lower perceived coping ability (Hirsch, Perman, Hayes, Eagleson, & Mathews, 2015).

This finding also aligns with other models of worry and GAD that converge to suggest that individuals with GAD experience difficulties with their emotions. For instance, the emotion dysregulation model (Mennin, Heimberg, Turk, & Fresco, 2005; Mennin, Holaway, Fresco, Moore, & Heimberg, 2007) posits that individuals with GAD have difficulty identifying and understanding their emotions, hold negative

beliefs about emotions (e.g., that emotions are threatening), and engage in maladaptive emotional management strategies (e.g., emotional suppression). If understanding one's *present* emotions provides a foundation for understanding one's *future* emotions, then such emotional deficits in the present may explain worriers' difficulties predicting future emotions. In addition, the contrast avoidance model of GAD (Llera & Newman, 2010, 2014) posits that individuals with GAD are particularly sensitive to increases in negative emotion, and that they employ worry to avoid the experience of a sharp increase in negative emotion. In our study, participants high in trait prospective IU (which is uniquely related to GAD) experienced heightened negative emotion that was maintained consistently throughout the study even when certainty was provided. It is possible that these participants utilized worry to avoid increases in negative emotion, although future research would need to explore such a mechanism more directly. Finally, the avoidance model of worry posits that worry functions to avoid aversive somatic and affective experiences (Borkovec, Alcaine, & Behar, 2004), and draws on research indicating that chronic worriers are likely to believe that worry reduces the likelihood of negative events. Similarly, our results showed that participants high in trait prospective IU had a subjective perception that *certainty* would help to avoid future distress.

Although we were inspired by research on worry and accordingly measured worry-relevant variables, as a transdiagnostic variable, prospective IU also shares a unique relationship with OCD (Carleton et al., 2012; McEvoy & Mahoney, 2011). Similar to individuals with GAD, individuals with OCD have difficulty understanding emotions: They have difficulty recognizing emotions in others (Daros, Zakzanis, & Rector, 2014) and expressing emotions congruent with external stimuli (Valeriani et al., 2015). Thus, research on clinical phenomena that are uniquely related to high prospective IU (i.e., GAD, OCD) consistently points to foundational difficulties in understanding current emotions, whether those emotions are personal, relevant to others, or relevant to external situations. It is likely that such foundational difficulties underlie observed difficulties in predicting future emotions, including those resulting from situations characterized by uncertainty. Future experimental research seeking to examine prospective IU in domains other than worry could manipulate uncertainty regarding OCD-relevant stressors (e.g., potentially contaminated objects) to determine whether providing certainty regarding such stressors alleviates or maintains distress.

The specific mechanisms by which participants high in trait prospective IU maintain higher state worry and distress when uncertainty is alleviated remain unclear. However, several findings from extant research might illuminate these mechanisms. In particular, *uncertainty* surrounding an upcoming stressor might not be the active ingredient that causes distress for these individuals. In the three experimental investigations examining IU and/or situational uncertainty, two studies (Ladouceur et al., 2000; Rosen & Knäuper, 2009) found that high IU led to an increase in state worry when outcomes were uncertain, whereas the third investigation (Oglesby & Schmidt, 2017) failed to find this effect. However, in all three of these investigations, the manipulation of situational uncertainty was confounded with varying likelihood of anticipated threat. We sought to rule out this potential confound, and found that if uncertainty about the negative event is alleviated, but the *likelihood* of that event remains, distress is not alleviated. Individuals high in trait IU have a tendency to be more distressed by thinking about upcoming negative events (Hoyer et al., 2001) and to attend more to threat (Butler & Mathews, 1983, 1987; Dugas et al., 2005). This *negativity* bias, rather than an *uncertainty* bias, may be a more central construct for individuals with high trait IU (e.g., chronic worriers) in certain contexts.

A second potential reason why alleviating uncertainty about the film clips did not lead to a reduction in distress in participants high in trait prospective IU is that although we alleviated participants' uncertainty about the *nature* of the stimulus, we did not alleviate their uncertainty about the *effects* of that stimulus. High trait worriers (who also evidence high prospective IU) not only perceive negative emotions as aversive (Mennin et al., 2005; Salters-Pedneault, Roemer, Tull, Rucker, & Mennin, 2006) but also underestimate their ability to cope with stressors (Borkovec et al., 1999; Ladouceur et al., 1998). Thus, participants' uncertainty about their impending emotional reactions may have led to maintained distress even though they were given information about the nature of the upcoming stressor. In addition to examining the effects of uncertainty about various stimuli, future studies should examine the effects of uncertainty about emotional responses to those stimuli. A third potential reason why alleviating uncertainty about the film clips did not lead to a reduction in distress in participants high in prospective IU is that even participants in the uncertainty condition were provided with *some* certainty that the film clips would be emotionally upsetting, potentially diluting the severity of state uncertainty in this condition. Future investigators may wish to tell all participants that the film clips will be emotionally evocative, without specifying particular emotions, in order to maximize uncertainty.

In addition to assessing emotional responding during the anticipation of an upcoming stressor, we

also explored participants' emotional reactions to the stressor. Results indicated that participants high in trait prospective IU maintained a higher level of negative reactivity both before and after viewing the film clips. However, participants high and low in trait prospective IU did not differ in the degree to which their negative emotions changed from before to after the film clips. These results are not surprising given that individuals high in trait IU evidence heightened anxiety both when anticipating and experiencing stressors (e.g., Ladouceur et al., 2000; Oglesby & Schmidt, 2017). Our findings further support the idea that individuals with high prospective IU evidence a strong *negativity* bias when potential threat is present, and that this bias may be more prominent than situational factors such as uncertainty.

This study had several limitations. First, our reliance on subjective reactions to a stressor may have increased demand characteristics. Anxious individuals (including those with high trait IU) may be especially influenced by demand characteristics (Blowers, Cobb, & Mathews, 1987; Matias & Turner, 1986), and thus may report distress after being told about a negative mood induction to satisfy an experimenter's expectations. Our suggestive finding that participants with high trait IU showed a greater increase in distress after being told about the film clips should be replicated using more objective (e.g., physiological) measures of distress. Second, because we did not select individuals on the basis of clinical symptoms, we cannot generalize our findings to individuals with diagnosable GAD. In addition, we examined prospective IU as a categorical construct. Although our results did not change when we examined it dimensionally, future investigators may wish to examine the full range of IU scores given evidence of IU's dimensional nature (Carleton et al., 2012), as well as given the limitations of an extreme-groups design (e.g., increased likelihood of violating assumptions of normality; Preacher, 2015). Third, our manipulation of situational uncertainty was quite different from how individuals experience uncertainty in their daily lives. We *markedly* decreased uncertainty by informing participants of what would transpire during each moment of the upcoming stressor. This stark elimination of uncertainty may have artificially increased the likelihood that individuals high in trait IU would experience alleviation of state worry and distress (although we did not find such a result in spite of this liberal test). Fourth, given that some populations with high prospective IU (e.g., individuals with GAD) worry most often about interpersonal situations (Hoyer et al., 2001), viewing upsetting film clips may not have been personally meaningful for participants. Although these participants did report higher distress during the anticipation period relative to those low in trait prospective IU, these levels of distress were relatively low (M = 27.86 out of 100). Utilizing personally relevant stressors may increase the likelihood that participants with high trait IU will experience decreased state worry and distress under conditions of reduced uncertainty. In addition, viewing film clips is a passive activity. Future investigators might wish to manipulate certainty using a task in which active performance has an impact on the outcome of the stressor, as this might lead to expected reductions in distress as a result of reduced uncertainty.

In conclusion, we sought to examine whether individuals high in trait prospective IU would show more information-seeking behavior and positive beliefs about information seeking, and whether they would react more negatively (with respect to state worry and subjective distress) under conditions of situational uncertainty. Although participants high in trait prospective IU believed that being provided with detailed information about an upcoming stressor would make them feel more at ease, they did not actually experience a decrease in distress when they were provided with that information. Rather, they evidenced heightened negative emotionality throughout the experiment—beginning at baseline, intensifying when they were informed about the emotionally upsetting film clips, and persisting until after they viewed the film clips. These results highlight a lack of concordance between what individuals high in trait prospective IU *believe* about the distress-reducing utility of gathering information about uncertain events and the *actual* distress-reducing utility of that information. Furthermore, our results indicate that high trait prospective IU is associated with more negative emotionality both during anticipation of a stressor and the actual experience of that stressor, regardless of the level of situational uncertainty. Thus, heightened distress regarding anticipated negative events may be a more central construct than IU among individuals reporting high trait IU.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

References

Arnarson, Þ., Ólason, D.Þ., Smári, J., & Sigurðsson, J. F. (2008). The Beck Depression Inventory second edition (BDI-II): Psychometric properties in Icelandic student and patient populations. *Nordic Journal of Psychiatry*, *62*(5), 360–365. https://doi.org/10.1080/08039480801962681

Bagozzi, R. P. (1993). An examination of the psychometric properties of measures of negative affect in the PANAS-X scales. *Journal of Personality and Social Psychology*, *65*(4), 836–851. https://doi.org/10.1037/0022-3514.65.4.836

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory* (2nd ed.). San Antonio, TX: Psychological Corporation.

Beesdo-Baum, K., Jenjahn, E., Höfler, M., Lueken, U., Becker, E. S., & Hoyer, J. (2012). Avoidance, safety behavior, and reassurance seeking in generalized anxiety disorder. *Depression and Anxiety*, *29*(11), 948–957. https://doi.org/10.1002/da.21955

Benjamin, D. J., Berger, J., Johannesson, M., Nosek, B. A., Wagenmakers, E., Berk, R., . . . Johnson, V. (2018). Redefine statistical significance. *Nature Human Behaviour*, *2*, 6–10. https://doi.org/10.1038/s41562-017-0189-z

Bleidorn, W., & Peters, A. (2011). A multilevel multitrait-multimethod analysis of self- and peer-reported daily affective experiences. *European Journal of Personality*, *25*(5), 398–408. https://doi.org/10.1002/per.804

Blowers, C., Cobb, J., & Mathews, A. (1987). Generalised anxiety: A controlled treatment study. *Behaviour Research and Therapy*, *25*(6), 493–502. https://doi.org/10.1016/0005-7967(87)90057-X

Boelen, P. A., & Reijntjes, A. (2009). Intolerance of uncertainty and social anxiety. *Journal of Anxiety Disorders*, *23*(1), 130–135. https://doi.org/10.1016/j.janxdis.2008.04.007

Borkovec, T. D., Alcaine, O. M., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder. In R. G. Heimberg, C. L. Turk, & D. S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice* (pp. 77–108). New York, NY: Guilford Press.

Borkovec, T. D., Hazlett-Stevens, H., & Diaz, M. L. (1999). The role of positive beliefs about worry in generalized anxiety disorder and its treatment. *Clinical Psychology and Psychotherapy*, *6*, 126–138. https://doi.org/10.1002/(SICI)1099-0879(199905)6:2<126::AID-CPP193>3.0.CO;2-M

Boswell, J. F., Thompson-Hollands, J., Farchione, T. J., & Barlow, D. H. (2013). Intolerance of uncertainty: A common factor in the treatment of emotional disorders. *Journal of Clinical Psychology*, *69*(6), 630–645. https://doi.org/10.1002/jclp.21965

Brown, T. A., Antony, M. M., & Barlow, D. H. (1992). Psychometric properties of the Penn State Worry Questionnaire in a clinical anxiety disorders sample. *Behaviour Research and Therapy*, *30*(1), 33–37. https://doi.org/10.1016/0005-7967(92)90093-V

Buhr, K., & Dugas, M. J. (2002). The Intolerance of Uncertainty Scale: Psychometric properties of the English version. *Behaviour Research and Therapy*, *40*(8), 931–946. https://doi.org/10.1016/S0005-7967(01)00092-4

Butler, G., & Mathews, A. (1983). Cognitive processes in anxiety. *Advances in Behaviour Research and Therapy*, *5*(1), 51–62. https://doi.org/10.1016/0146-6402(83)90015-2

Butler, G., & Mathews, A. (1987). Anticipatory anxiety and risk perception. *Cognitive Therapy and Research*, *11*(5), 551–565. https://doi.org/10.1007/BF01183858

Carleton, R. N., Collimore, K. C., & Asmundson, G. J. G. (2010). "It's not just the judgments—It's that I don't know": Intolerance of uncertainty as a predictor of social anxiety. *Journal of Anxiety Disorders*, *24*(2), 189–195. https://doi.org/10.1016/j.janxdis.2009.10.007

Carleton, R. N., Mulvogue, M. K., Thibodeau, M. A., McCabe, R. E., Antony, M. M., & Asmundson, G. J. G. (2012). Increasingly certain about uncertainty: Intolerance of uncertainty across anxiety and depression. *Journal of Anxiety Disorders*, *26*(3), 468–479. https://doi.org/10.1016/j.janxdis.2012.01.011

Carleton, R. N., Norton, M. A. P., & Asmundson, G. J. G. (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. *Journal of Anxiety Disorders*, *21*(1), 105–117. https://doi.org/10.1016/j.janxdis.2006.03.014

Cougle, J. R., Fitch, K. E., Fincham, F. D., Riccardi, C. J., Keough, M. E., & Timpano, K. R. (2012). Excessive reassurance seeking and anxiety pathology: Tests of incremental associations and directionality. *Journal of Anxiety Disorders*, *26*(1), 117–125. https://doi.org/10.1016/j.janxdis.2011.10.001

Daros, A. R., Zakzanis, K. K., & Rector, N. A. (2014). A quantitative analysis of facial emotion recognition in obsessive-compulsive disorder. *Psychiatry Research*, *215*(3), 514–521. https://doi.org/10.1016/j.psychres.2013.11.029

de Jong-Meyer, R., Beck, B., & Riede, K. (2009). Relationships between rumination, worry, intolerance of uncertainty and metacognitive beliefs. *Personality and Individual Differences*, *46*(4), 547–551. https://doi.org/10.1016/j.paid.2008.12.010

Dugas, M. J., Buhr, K., & Ladouceur, R. (2004). The role of intolerance of uncertainty in etiology and maintenance. In R. G. Heimberg, C. L. Turk, & D. S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice* (pp. 143–163). New York, NY: Guilford Press.

Dugas, M. J., Freeston, M. H., & Ladouceur, R. (1997). Intolerance of uncertainty and problem orientation in worry. *Cognitive Therapy and Research*, *21*(6), 593–606. https://doi.org/10.1023/A:1021890322153

Dugas, M. J., Hedayati, M., Karavidas, A., Buhr, K., Francis, K., & Phillips, N. A. (2005). Intolerance of uncertainty and information processing: Evidence of biased recall and interpretations. *Cognitive Therapy and Research*, *29*(1), 57–70. https://doi.org/10.1007/s10608-005-1648-9

Dugas, M. J., & Ladouceur, R. (2000). Treatment of GAD: Targeting intolerance of uncertainty in two types of worry. *Behavior Modification*, *24*(5), 635–657. https://doi.org/10.1177/0145445500245002

Gentes, E. L., & Ruscio, A. M. (2011). A meta-analysis of the relation of intolerance of uncertainty to symptoms of generalized anxiety disorder, major depressive disorder, and obsessive-compulsive disorder. *Clinical Psychology Review*, *31*(6), 923–933. https://doi.org/10.1016/j.cpr.2011.05.001

Gentes, E. L., & Ruscio, A. M. (2014). Perceptions of functioning in worry and generalized anxiety disorder. *Cognitive Therapy and Research*, *38*(5), 518–529. https://doi.org/10.1007/s10608-014-9618-8

Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition and Emotion*, *9*(1), 87–108. https://doi.org/10.1080/02699939508408966

Hirsch, C. R., Perman, G., Hayes, S., Eagleson, C., & Mathews, A. (2015). Delineating the role of negative verbal thinking in promoting worry, perceived threat, and anxiety. *Clinical Psychological Science*, *3*(4), 637–647. https://doi.org/10.1177/2167702615577349

Hoerger, M., & Quirk, S. W. (2010). Affective forecasting and the big five. *Personality and Individual Differences*, *49*(8), 972–976. https://doi.org/10.1016/j.paid.2010.08.007

Hoyer, J., Becker, E. S., & Roth, W. T. (2001). Characteristics of worry in GAD patients, social phobics and controls. *Depression and Anxiety*, *13*(2), 89–96. https://doi.org/10.1002/da.1021

Jackson, F., Nelson, B. D., & Hajcak, G. (2016). The uncertainty of errors: Intolerance of uncertainty is associated with error-related brain activity. *Biological Psychology*, *113*, 52–58. https://doi.org/10.1016/j.biopsycho.2015.11.007

Kessler, R. C., & Wittchen, H. (2002). Patterns and correlates of generalized anxiety disorder in community samples. *Journal of Clinical Psychiatry*, *63*, 4–10. https://doi.org/10.4088/JCP.v63n0101

Khawaja, N. G., & Yu, L. N. H. (2010). A comparison of the 27-item and 12-item Intolerance of Uncertainty Scales. *Clinical Psychologist*, *14*(3), 97–106. https://doi.org/10.1080/13284207.2010.502542

Ladouceur, R., Blais, F., Freeston, M. H., & Dugas, M. J. (1998). Problem solving and problem orientation in generalized anxiety disorder. *Journal of Anxiety Disorders*, *12*(2), 139–152. https://doi.org/10.1016/S0887-6185(98)00002-4

Ladouceur, R., Gosselin, P., & Dugas, M. J. (2000). Experimental manipulation of intolerance of uncertainty: A study of a theoretical model of worry. *Behaviour Research and Therapy*, *38*(9), 933–941. https://doi.org/10.1016/S0005-7967(99)00133-3

Llera, S. J., & Newman, M. G. (2010). Effects of worry on physiological and subjective reactivity to emotional stimuli in generalized anxiety disorder and nonanxious control participants. *Emotion*, *10*(5), 640–650. https://doi.org/10.1037/a0019351

Llera, S. J., & Newman, M. G. (2014). Rethinking the role of worry in generalized anxiety disorder: Evidence supporting a model of emotional contrast avoidance. *Behavior Therapy*, *45*(3), 283–299. https://doi.org/10.1016/j.beth.2013.12.011

MacLeod, A. K., Byrne, A., & Valentine, J. D. (1996). Affect, emotional disorder, and future-directed thinking. *Cognition and Emotion*, *10*(1), 69–85. https://doi.org/10.1080/026999396380394

Mahoney, A. E. J., & McEvoy, P. M. (2012). Trait versus situation-specific intolerance of uncertainty in a clinical sample with anxiety and depressive disorders. *Cognitive Behaviour Therapy*, *41*(1), 26–39. https://doi.org/10.1080/16506073.2011.622131

Matias, R., & Turner, S. M. (1986). Concordance and discordance in speech anxiety assessment: The effects of demand characteristics on the tripartite assessment method. *Behaviour Research and Therapy*, *24*(5), 537–545. https://doi.org/10.1016/0005-7967(86)90034-3

Maxwell, S. (2001). When to use MANOVA and significant MANOVAs and insignificant ANOVAs or vice versa. *Journal of Consumer Psychology*, *10*, 29–30.

McEvoy, P. M., & Mahoney, A. E. J. (2011). Achieving certainty about the structure of intolerance of uncertainty in a treatment-seeking sample with anxiety and depression. *Journal of Anxiety Disorders*, *25*(1), 112–122. https://doi.org/10.1016/j.janxdis.2010.08.010

McEvoy, P. M., & Mahoney, A. E. J. (2013). Intolerance of uncertainty and negative metacognitive beliefs as transdiagnostic mediators of repetitive negative thinking in a clinical sample with anxiety disorders. *Journal of Anxiety Disorders*, *27*(2), 216–224. https://doi.org/10.1016/j.janxdis.2013.01.006

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2005). Preliminary evidence for an emotion dysregulation model of generalized anxiety disorder. *Behaviour Research and Therapy*, *43*(10), 1281–1310. https://doi.org/10.1016/j.brat.2004.08.008

Mennin, D. S., Holaway, R. M., Fresco, D. M., Moore, M. T., & Heimberg, R. G. (2007). Delineating components of emotion and its dysregulation in anxiety and mood psychopathology. *Behavior Therapy*, *38*(3), 284–302. https://doi.org/10.1016/j.beth.2006.09.001

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*, *28*(6), 487–495. https://doi.org/10.1016/0005-7967(90)90135-6

Nelson, B., Liu, H., Sarapas, C., & Shankman, S. (2016). Intolerance of uncertainty mediates the relationship between panic and the startle reflex in anticipation of unpredictable threat. *Journal of Experimental Psychopathology*, *7*(2), 172–189. https://doi.org/10.5127/jep.048115

Oglesby, M. E., & Schmidt, N. B. (2017). The role of threat level and intolerance of uncertainty (IU) in anxiety: An experimental test of IU theory. *Behavior Therapy*, *48*(4), 427–434. https://doi.org/10.1016/j.beth.2017.01.005

Penney, A. M., Mazmanian, D., & Rudanycz, C. (2013). Comparing positive and negative beliefs about worry in predicting generalized anxiety disorder symptoms. *Canadian Journal of Behavioural Science*, *45*(1), 34–41. https://doi.org/10.1037/a0027623

Preacher, K. J. (2015). Extreme groups designs. In R. L. Cautin & S.O. Lilienfeld (Eds.), *The encyclopedia of clinical psychology* (pp. 1189–1192). Hoboken, NJ: Wiley. https://doi.org/10.1002/9781118625392.wbecp190

Rosen, N. O., & Knäuper, B. (2009). A little uncertainty goes a long way: State and trait differences in uncertainty interact to increase information seeking but also increase worry. *Health Communication*, *24*(3), 228–238. https://doi.org/10.1080/10410230902804125

Salters-Pedneault, K., Roemer, L., Tull, M. T., Rucker, L., & Mennin, D. S. (2006). Evidence of broad deficits in emotion regulation associated with chronic worry and generalized anxiety disorder. *Cognitive Therapy and Research*, *30*(4), 469–480. https://doi.org/10.1007/s10608-006-9055-4

Sprinkle, S. D., Lurie, D., Insko, S. L., Atkinson, G., Jones, G. L., Logan, A. R., & Bissada, N. N. (2002). Criterion validity, severity cut scores, and test–retest reliability of the Beck Depression Inventory–II in a university counseling center sample. *Journal of Counseling Psychology*, *49*(3), 381–385. https://doi.org/10.1037/0022-0167.49.3.381

Steketee, G., Frost, R. O., & Cohen, I. (1998). Beliefs in obsessive-compulsive disorder. *Journal of Anxiety Disorders*, *12*(6), 525–537. https://doi.org/10.1016/S0887-6185(98)00030-9

Talkovsky, A. M., & Norton, P. J. (2016). Intolerance of uncertainty and transdiagnostic group cognitive behavioral therapy for anxiety. *Journal of Anxiety Disorders*, *41*, 108–114. https://doi.org/10.1016/j.janxdis.2016.05.002

Valeriani, G., Bersani, F. S., Liberati, D., Polli, E., Girolami, M. T., Zullo, D., . . . Bersani, G. (2015). Generalized and specific emotion impairments as potential markers of severity in obsessive-compulsive disorder: A preliminary study using facial action coding system (FACS). *Psychiatria Danubina*, *27*(2), 159–167. https://doi.org/10.2147/NDT.S37174

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 56–75). Thousand Oaks, CA: Sage.

Wilson, T., & Gilbert, D. (2003). Affective forecasting. In M. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 35, pp. 345–411). New York, NY: Elsevier.

Wolpe, J. (1958). *Psychotherapy by reciprocal inhibition*. Stanford, CA: Stanford University Press.

Woody, S., & Rachman, S. (1994). Generalized anxiety disorder (GAD) as an unsuccessful search for safety. *Clinical Psychology Review*, *14*(8), 743–753. https://doi.org/10.1016/0272-7358(94)90040-X

Received: June 27, 2017
Accepted: August 17, 2018
Available online: 23 August 2018