



Worrying But Not Acting: The Role of Intolerance of Uncertainty in Explaining the Discrepancy in COVID-19-Related Responses

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Abstract

Research indicates that Intolerance of Uncertainty (IU) is associated with COVID-19 emotional responses, but not necessarily with engaging in COVID-19 preventative behaviors. The current study was designed to further evaluate this discrepancy. Participants (N=454) completed self-report forms about COVID-19 emotional responses (i.e., fear, worry, sensitivity to symptoms) and COVID-19 behavioral interference/responses (i.e., interference in daily activities, interference due to worry, and engagement in preventative behaviors). IU was positively associated with COVID-19-related emotional responses as well as two of the COVID-19-related behavioral interference/responses (i.e., interference in daily activities and interference due to worry), but negatively predicted engagement in COVID-19 preventative behaviors. Exploratory analyses revealed a significant indirect effect of IU on lower engagement in preventative behaviors through lower belief in the effectiveness of such behaviors. Thus, we further document the role of IU in statistically predicting higher distress but lower levels of adaptive health behaviors. Furthermore, we provide preliminary support for the hypothesis that these relationships may be explained by associations between IU and lower belief in the efficacy of health behaviors. Because some current analyses indicate small effect sizes, future studies should investigate IU alongside other potentially important markers.

Keywords Intolerance of uncertainty · COVID-19 · Health behaviors

Introduction

The transdiagnostic mechanism of Intolerance of Uncertainty (IU) is “a dispositional characteristic that results from a set of negative beliefs about uncertainty and its implications and involves the tendency to react negatively on an emotional, cognitive, and behavioral level to uncertain situations and events” (p. 216; Buhr & Dugas 2009). Because the COVID-19 pandemic has brought about uncertainty for most people in multiple domains – including health, work, and everyday living – IU represents an important mechanism to investigate in relation to COVID-19-related responses, including emotional and behavioral responses during the pandemic.

Indeed, in recent research, IU has been found to predict a broad range of fear-based emotional responses to COVID-19. Specifically, IU predicts concerns about COVID-19 spreading (Wheaton et al., 2021), viral contamination fear and social distancing fear (Fedorenko et al., 2021), and level of worry surrounding contracting COVID-19 (Tull et al.,

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2020). IU is also related to overall COVID-19-related stress (Paluszek et al., 2021) and body vigilance (Fedorenko et al., 2021) and is associated with fear of COVID-19 (Akbari et al., 2021; Bakioglu et al., 2020; Deniz, 2021; Mertens et al., 2020; Millroth & Frey, 2021; Paluszek et al., 2021; Satici et al., 2020; Voitsidis et al., 2020; but see Sauer et al., 2020 for a dissenting finding).

Despite the robust connections between IU and emotional responses to COVID-19, few studies have investigated the relationship between IU and engaging in preventative behaviors against COVID-19 (e.g., wearing a mask), and those completed have yielded mixed results. One previous study found only a weak positive relationship between IU and adhering to preventative measures for an older adult sample but no significant relationship for a general population sample, despite finding IU to be associated with COVID-19-related threat perception and general anxiety (Bavolar et al., 2021). Further, no relationship between IU and safety/preventative behaviors was reported in separate studies of adults in the United States (Millroth & Frey, 2021), Brazil (Farias & Pilati, 2021), and Germany (Sauer et al., 2020). Further, Mertens and colleagues (2020) reported that IU was not significantly associated with perceived control surrounding contracting COVID-19 by doing things such as limiting social contact.

Thus, work to date indicates that IU is far more relevant for predicting emotional responses to the pandemic (e.g., self-reported COVID-19-related stress and fear) than behavioral responses (e.g., engaging in COVID-19-related preventative behaviors). The purpose of the current study was to further examine this predictive disparity, by evaluating both emotional and behavioral interference/responses to COVID-19 in one large sample, with particular attention to the associations between these two domains of responses. We chose to conduct this study through Amazon's Mechanical Turk (MTurk), an online crowdsourcing recruitment tool, as MTurk allows for the recruitment of large and diverse samples (e.g., McCredie & Morey, 2021). Accordingly, in a large nationwide sample of adults living in the United States, we examined the predictive influence of IU on three COVID-19-related emotional responses: (1) fear of COVID-19, (2) worry related to COVID-19, and (3) sensitivity to COVID-19 health symptoms. We also evaluated the predictive influence of IU on three COVID-19-related behavioral interference/responses: (1) interference in daily activities during the COVID-19 pandemic, (2) interference in functioning specifically caused by COVID-19-related worries, and (3) engagement in preventative behaviors due to the COVID-19 pandemic. Lastly, due to the existing discrepant literature between COVID-19-related emotional responses and engaging in preventative behaviors, we conducted exploratory analyses to better understand the

resulting relationships between COVID-19-related emotional and behavioral interference/responses.

For the three COVID-19-related emotional responses examined, we hypothesized that increased IU would predict greater levels of each outcome based on the existing research. We also hypothesized that increased IU would predict greater levels of the first two COVID-19-related behavioral interference/responses we examined – interference in daily activities and functional interference due to COVID-19-related worry. Lastly, consistent with the current literature, we anticipate there will be a disparity in prediction for IU between COVID-19 emotional responses and preventative behaviors such as mask wearing, and exploratory analyses will evaluate: (1) if IU moderates this relationship, and (2) if belief in effectiveness of preventative behaviors is linked to the discrepancy between emotional responses and adaptive health behaviors.

Method

Participants

A total of 628 participants consented and completed at least 75% of the survey. Participants were ages 18 years and older, residing in the U.S., and recruited through MTurk between April 30th, 2020 and May 28th, 2020. Of these, 454 provided adequate data (i.e., did not fail quality assurance evaluations, see below) and were included in study analyses. Mean age of these 454 individuals was 35.2 years ($SD = 11.95$, range = 18–76); and 57.0% ($n = 259$) identified as male, 42.5% ($n = 193$) as female, 0.2% ($n = 1$) as gender non-conforming, and 0.2% ($n = 1$) preferred not to report their gender. Regarding race, 67.8% ($n = 308$) identified as White, 15.0% ($n = 68$) Asian, 11% ($n = 50$) Black/African American, 2.4% ($n = 11$) Alaska Native/American Indian, 1.8% ($n = 8$) more than one race, 0.9% ($n = 4$) other, 0.4% ($n = 2$) Native Hawaiian/Other Pacific Islander, and 0.7% ($n = 3$) declined to state. Additionally, 75.8% ($n = 344$) identified as non-Spanish/Hispanic/Latinx and 23.1% ($n = 105$) identified as Spanish/Hispanic/Latinx, while 1.1% ($n = 5$) declined to answer.

Procedures

After consenting to study procedures, participants completed a battery of online self-report questionnaires relating to mental health and responses to COVID-19, which took approximately 30 minutes to complete. Eligible participants were compensated for survey completion. Overall, a total of 628 individuals consented and completed at least 75% of the study. In order to ensure good quality of data for

Table 1 Descriptives of Included Measures

Category	Measure	N ²	Mean	SD
Predictor Variable	IU	453	38.34	9.45
Emotional Responses	Fear	446	21.64	6.87
	Worry	453	59.31	20.05
	Sensitivity	452	27.02	15.53
Behavioral Interference/ Responses	Daily Act.	454	10.78	6.39
	Worry Int.	453	55.72	22.78
	Prev. Beh.	453	9.13	4.33
Exploratory Variable	Eff. Prev.	396	7.26	3.09

Note. IU=Intolerance of Uncertainty Scale – Short Version; Fear=Fear of the Coronavirus-19 Scale; Worry=COVID-19 Worry Index; Sensitivity=Sensitivity to COVID-19 Health Symptoms Scale; Daily Act. = Daily Activities Survey; Worry Int. = COVID-19 Worry Index – Interference Subscale; Prev. Beh. = COVID-19-related preventative behaviors; Eff. Prev. = Belief in effectiveness of COVID-19-related preventative behaviors; SD=Standard Deviation

² Of the 454 participants included in study analyses, final sample sizes for each individual measure varied between 396 and 454 due to missing values or exclusions due to patterned and/or careless responses for each measure.

analyses (e.g., Aguinis et al., 2021; Chmielewski & Kucker 2020), we completed a thorough assessment of data quality, resulting in the removal of 174 participants due to quality item failures (e.g., incorrect response to one or more quality assurance questions, insufficient time spent taking the survey). This resulted in a total of 454 participants available for study analyses. Further, final sample sizes subjected to analysis varied between 396 and 454 (see Table 1) due to missing values or exclusions due to patterned and/or careless responses for individual measures (e.g., selecting one extreme response for an entire measure despite reverse coded items). In regard to missing values, if at least 80% of a measure was completed by a participant, the mean value for missing items was imputed in order to include that participant's data for that measure in analyses.¹ The study protocol was approved by the Institutional Review Board at Boston University.

Measures

Intolerance of Uncertainty. To assess IU, the 12-item short version of the Intolerance of Uncertainty Scale was used (IUS-12; Carleton et al., 2007), which asks participants to rate how characteristic several statements are of them (e.g., “I can't stand being taken by surprise”). Resulting higher scores indicate greater intolerance of uncertainty. In the current sample, the IUS-12 demonstrated good internal consistency (Cronbach's $\alpha=0.89$).

¹ Notably, results for data including these imputed values and results obtained when individuals with missing data were excluded resulted in similar patterns of significance.

COVID-19-Related Emotional Responses. Fear of COVID-19 severity was assessed using the seven-item Fear of the Coronavirus-19 Scale (Ahorsu et al., 2020), which asks participants to rate their level of agreement with various statements (e.g., “I am most afraid of coronavirus-19”) with higher total scores indicating more COVID-19 fear. Internal consistency for this measure in the current sample was good (Cronbach's $\alpha=0.88$). The 15-item COVID-19 Worry Index (Rogers et al., 2021) was used to assess COVID-19-specific worries by asking participants to rate how worried they feel about various statements (e.g., “I worry that I am going to become seriously ill due to COVID-19” and “If I hear others speak about symptoms on the news, media outlets, or through conversation, I find myself worrying that I may contract COVID-19”) with higher scores indicating more COVID-19-related worry. In the current sample, internal consistency was excellent (Cronbach's $\alpha=0.93$). We also employed the 14-item Sensitivity to COVID-19 Health Symptoms Scale (SCHSS; Mayorga et al., 2021), which was used to measure sensitivity to symptoms related to COVID-19. Specifically, participants were asked to rate how anxious/uncomfortable they would feel if they experienced various situations in light of the COVID-19 pandemic (e.g., “Having labored or rapid breathing” and “Feeling phlegm in your throat”). Resulting higher scores indicated greater sensitivity. This measure also yielded excellent internal consistency in the current sample (Cronbach's $\alpha=0.96$).

COVID-19-Related Behavioral Interference/Responses. To assess COVID-19-related interference of usual daily activities, we used the eight-item Daily Activities Survey (Garey et al., 2021). The Daily Activities Survey assesses changes in behavior due to the COVID-19 pandemic by asking participants if they are experiencing disruption to their daily hygiene, sleep, social contact, eating habits, motivation to work, ability to exercise, energy levels, and maintenance of a routine. Specifically, participants read statements about each of these topics and rated the degree to which each one applied to them (e.g., “I am having more trouble keeping up with daily hygiene,” “I am eating more unhealthily,” and “I am having trouble keeping a daily ‘routine’”). Higher scores indicate greater difficulty/interference in completing routine daily tasks during COVID-19. In the current sample, this measure yielded good internal consistency (Cronbach's $\alpha=0.89$). The COVID-19 Worry Index, described above, also asks participants to rate the degree to which each worry interferes with their daily life functioning. This results in an adjacent interference score with higher scores indicating greater interference in daily life functioning caused by COVID-19-related worries. Excellent internal consistency was observed for this measure in the current sample (Cronbach's $\alpha=0.95$). Finally, for the purposes of this study, we created a questionnaire

to measure engagement in COVID-19-related preventative behaviors (see Supplementary Materials). This questionnaire asked participants to rate if they have engaged (yes or no) in 15 various behaviors (e.g., wearing a mask, avoiding public transportation). We developed this measure by adapting similar measures used in other studies (i.e., Brug et al., 2004; Lau et al., 2003) and by referencing the Centers for Disease Control and Prevention (CDC)'s recommendations at the time. Total scores were computed by summing how many of these behaviors participants reported engaging in, potentially ranging from 0 to 15. Internal consistency in the current sample was good (Cronbach's $\alpha=0.89$). This questionnaire also asked participants to evaluate how effective they believed each of these COVID-19 preventative behaviors to be by categorizing them into "very effective," "slightly effective," "not effective," or "unsure." Because of the highly skewed distribution in resulting responses, ratings were recoded to indicate high belief in effectiveness (1; "very effective") versus low to no belief in effectiveness (0; "slightly effective", "not effective", "unsure") for analysis. In the current sample, this question yielded adequate internal consistency (Cronbach's $\alpha=0.71$).

Analyses

We first computed descriptive statistics (means, SDs) for all variables. To evaluate our proposed hypotheses, we conducted individual linear regressions in which the predictor, IU, was the independent variable and the various outcomes were the dependent variables. The three COVID-19-related emotional response outcomes included: (1) fear of COVID-19, (2) worry related to COVID-19, and (3) sensitivity to COVID-19 health symptoms. The three COVID-19-related behavior outcomes included: (1) daily activity interference caused by the COVID-19 pandemic, (2) interference from COVID-19-related worry, and (3) engagement in COVID-19-related preventative behaviors. We also calculated Cohen f^2 effect sizes for each regression effect. Lastly, because we ran several regression models, a Bonferroni correction was applied to correct for Type 1 error associated with multiple analyses. Specifically, for the three COVID-19-related emotional response outcomes, the adjusted p -value threshold of 0.017 (0.05/3) was used. Similarly, for the three COVID-19-related behavior outcomes, an adjusted p -value threshold of 0.017 (0.05/3) was used. Subsequent exploratory analyses are also described below.

Results

The means and standard deviations of all study measures can be found in Table 1. All variables were found to be normally distributed (skew < |0.68|; kurtosis < |1.14|).

COVID-19-Related Emotional Response Outcomes

IU significantly predicted fear of COVID-19 ($\beta=0.414$; $t(443)=9.58$, $p<.001$; $f^2=0.208$), worry related to COVID-19 ($\beta=0.360$; $t(450)=8.18$, $p<.001$; $f^2=0.148$), and sensitivity to COVID-19-related symptoms ($\beta=0.350$; $t(449)=7.92$, $p<.001$; $f^2=0.140$). Across all of these relationships, a positive relationship was found between IU and COVID-19-related emotional responses.

COVID-19-Related Behavioral Interference and Responses.

IU significantly and positively predicted daily activity interference caused by the COVID-19 pandemic ($\beta=0.510$; $t(451)=12.58$, $p<.001$; $f^2=0.351$) and interference from COVID-19-related worry ($\beta=0.399$; $t(450)=9.23$, $p<.001$; $f^2=0.189$). Higher IU was associated with higher interference. Notably, IU significantly predicted *lower* engagement in COVID-19-related preventative behaviors ($\beta = -0.126$; $t(450) = -2.70$, $p = .007$; $f^2 = 0.016$).

Exploratory Analyses.

Because we found the anticipated discrepancy between IU's significantly positive associations with COVID-19-related emotional responses and behavioral interference, but negative association with engagement in COVID-19-related preventative behaviors, we conducted two sets of exploratory analyses to better understand this discrepancy. First, we considered whether IU moderated the relationship between COVID-19 fear or COVID-19-related worry and engaging in COVID-19 preventative behaviors, such that this relationship differed between individuals high and low in IU. Separate moderation models were evaluated for COVID-19 fear and COVID-19 worry and all variables were mean centered. Results indicated that IU did not significantly moderate the relation between COVID-19 fear and engagement in protective behaviors (Interaction: $b = -0.003$; $t(440) = -1.02$, $p = .309$) or COVID-19 worry and engagement in protective behaviors (Interaction: $b = -0.001$; $t(447) = -0.96$, $p = .338$).

Second, we sought to investigate if IU also predicted belief in the effectiveness of COVID-19 preventative behaviors and if belief in effectiveness predicted engagement in those preventative behaviors. A linear regression demonstrated that IU significantly negatively predicted belief in effectiveness ($\beta = -0.165$; $t(395) = -3.31$, $p < .001$; $f^2 = 0.027$), and belief in effectiveness significantly, positively predicted engagement in COVID-19 preventative behaviors ($\beta = 0.463$; $t(395) = 10.37$, $p < .001$; $f^2 = 0.272$). Further, there was a significant indirect effect of IU on engagement in preventative behaviors through belief in

the effectiveness of preventative behaviors ($\beta = -0.075$; 95% bootstrapped CI [-0.126, -0.025]). This indirect effect accounts for 57.1% of the total effect.

Discussion

For the current study we sought to better understand the predictive power of IU for COVID-19-related emotional and behavioral interference/responses, and how such responses relate to each other. As hypothesized, IU predicted all three COVID-19-related emotional response variables – fear of COVID-19, COVID-19-related worry, and sensitivity to COVID-19-related symptoms, reflecting medium-to-large, medium, and small-to-medium effect sizes respectively. Such findings parallel research showing IU to relate to health anxiety (e.g., Deacon & Abramowitz 2008; Boelen & Carleton, 2012; Gerolimatos & Edelstein, 2012), and suggests that this relationship extends to COVID-19 emotional responses. Further, as expected, IU significantly predicted two of three COVID-19-related behavioral interference/responses – daily activity interference caused by the COVID-19 pandemic and interference from COVID-19-related worry, reflecting large and medium-to-large effect sizes. For all these relationships, higher IU predicted higher values of the corresponding COVID-19-related outcome variable. Thus, as hypothesized, the more intolerant one feels of uncertain situations, the greater emotional reactivity and behavioral interference one has while living through the pandemic. IU may therefore be an important marker for identifying individuals most in need of therapeutic services during the pandemic, as these individuals may benefit greatly from learning skills to alleviate elevated anxiety and remedy behavioral interference.

Based on current research, we anticipated that the positive association between IU and emotional responses would not extend to engagement in preventative behaviors. For example, Horenstein and colleagues (2019) found that the interactions of health anxiety and IU did not predict general medicine utilization, specialist care utilization, or emergency care utilization, and further, increased IU predicted decreased likelihood of utilizing emergency care (Horenstein et al., 2019). In interpreting their finding, Horenstein and associates posited that “some individuals with high IU may experience behavioral paralysis in the face of potentially emergent medical concerns ... [and] although ‘uncertainty paralysis’ is associated with a *higher* degree of anxiety and solitary information-seeking, it may actually be associated with a *lower* likelihood that an individual will proactively seek emergency care” (p. 62; Horenstein et al., 2019). Our findings suggest that such inaction, in the face of a health threat, extends to COVID-19. Specifically,

we found that despite a positive relationship with COVID-19-related distress, IU statistically predicted lower engagement in COVID-19 health behaviors. Further, our findings provide preliminary support that this negative association may be explained by lower belief in the effectiveness of such behaviors: i.e., the indirect effect of belief in effectiveness accounted for 57.1% of the predictive effect of IU on engagement in preventative behaviors. Accordingly, our findings replicate those found for health behaviors in other domains (e.g., seeking emergency care; Horenstein et al., 2019), and extends these findings to suggest a potential mechanistic pathway for these effects: through low confidence in the efficacy of the identified health behavior. Stated another way, an individual with higher IU may be less likely to believe that wearing a mask will be effective in preventing them from contracting COVID-19, and thus may choose not to wear a mask.

Overall, our findings indicate that IU may be important for understanding a certain profile of responses to disease threat: one of higher distress but lower adaptive health behaviors. This may be particularly relevant for understanding behavioral health responses to situations that are inherently uncertain. COVID-19 is an evolving and ever-changing situation. When this data were collected in April and May of 2020, whereas the preventative behaviors assessed in the current study (e.g., wearing a mask) were being recommended by experts, a counternarrative doubting the efficacy of mask wearing has continued to have a prominent voice in the media and on social media (e.g., Keller et al., 2021; Pascual-Ferra et al., 2021). Individuals with higher IU characteristically crave certainty, and our findings appear to illustrate what happens when certainty cannot be reached. Indeed, IU has been shown to relate to increased avoidance responses in laboratory-based learning tasks (Flores et al., 2018; Hunt et al., 2019) as well as avoidance of clinically-related phenomenon, such as avoidance of places due to fear of panic attacks (Carleton et al., 2013). Further, IU has been associated with poor behavioral performance (e.g., Thibodeau et al., 2013) and ineffective problem-solving in lab-based protocols (e.g., Jacoby et al., 2014). Accordingly, IU may be an important target of assessment and perhaps intervention for such individuals. This conclusion is tempered by the magnitude of IU associations (i.e., effect sizes in predicting both engaging in preventative behaviors and belief in efficacy of them were both small); as such, future studies should seek to elucidate the relative importance of IU with other mechanisms that may also affect health information processing and engaging in related behaviors (e.g., anxiety sensitivity, political beliefs).

The current study is not without limitations. Specifically, the COVID-19 pandemic continues to evolve and this cross-sectional study captured individuals at only one

specific point of the pandemic; it is important to understand how the relationships discussed here may present at other points of the pandemic. Further, prediction of health-related distress and health behavior responses over time in longitudinal studies would lend support to the role of IU as potentially causal in helping explain these responses. For example, it may be the case that IU is most important to consider in understanding COVID-19 related responses at times of increased uncertainty (e.g., when a new virus variant is emerging, when laws around mask wearing may be changing). Additionally, as is inherent with online studies, our sample consisted of self-selecting individuals. We also created a questionnaire to assess engagement in COVID-19 preventative behaviors for the purposes of the current study and it is not yet validated beyond adequate internal validity. This measure asked participants to rate engagement in each preventative behavior with either “yes” or “no,” and findings may have been different if they had been able to select among a range of choices for each behavior (e.g., “I sometimes/often/always wear a mask”). Lastly, we noted that previous work found a weak but significant relationship between IU and engaging in preventative behaviors for an older adult sample (Bavolar et al., 2021); we did not have the age range to evaluate that association in that study and recommend that future work seek to evaluate whether age moderates our findings.

The current study further documented and helped clarify the discrepancy in associations between IU and COVID-19 emotional responses vs. COVID-19 related health behaviors. Our data supported the hypothesis that these opposite relationships may be explained by associations between IU and lower belief in the efficacy of health behaviors. Overall, IU may prove to be an important variable for understanding negative associations between health anxiety and adaptive health behaviors.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10608-022-10321-0>.

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