INTOLERANCE OF UNCERTAINTY, ANXIETY AND DEPRESSION IN THE CONTEXT OF COVID-19 IN INDONESIA

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Abstract

This Covid-19 pandemic brings uncertainty and may lead to mental problems. Yet, in this context, no study has examined the relationship between intolerance of uncertainty (IU) and either anxiety or depression during pandemic among Indonesians. This study investigated the pathway between IU, anxiety and depression serially mediated by cognitive appraisals (perceived severity, controllability, and knowledge) and emotional and behavioural responses to COVID-19. Online psychological measures were administered to 406 participants, including the IUS-12, the DASS-21, cognitive appraisal scales, and emotional and behavioural response scale. An indirect pathway was found between IU and depression, and the effect was serially mediated by perceived of severity and emotional and behavioural responses to COVID-19. Perceived knowledge and perceived controllability of COVID-19 did not significantly contribute to the model. A similar pathway was found for IU predicting anxiety. As conclusion, IU represents a risk factor for heightened emotional and behavioural difficulties that eventually, could lead to either anxiety or depression during COVID-19.

Keywords: Indonesia; COVID-19; Intolerance of Uncertainty; Anxiety, Depression; Cognitive Appraisals; Emotional and Behavioural responses

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Introduction

The first cases of SARS-CoV-2 coronavirus (COVID-19) were confirmed in Indonesia on the 2nd of March, 2020. Cases have continued to rise across the country. Government responses to the pandemic have been mixed, with large scale social restrictions being enforced at different times and with varying degrees of rigour. The consequences of the virus itself, as well as the social, psychological and economic ramifications can be observed across the country (Suryahadi et al., 2020). This has been compounded by an inconsistent implementation of preventative measures and a lacking coherent scientific government message. Accordingly, many have sought refuge in unscientific and unsupported information on the virus (I.e. cures, transmission) (Koran Tempo, 2020), leading to a greater sense of uncertainty. It's important, therefore, to understand what factors underlie adverse psychological outcomes for different forms of mental-illness and the role of uncertainty.

Psychological distress seems to be accompanied by an increasing prevalence of disorders such as depression and anxiety. A number of Indonesian studies report a moderate-high prevalence (e.g. Almira, 2020; Mulya et al., 2021; Sunjaya et al., 2021). Although some level of depressive and anxious symptoms are to be expected due to the pandemic's nature, this is troubling, given that depression and anxiety are associated with functional impairments and increased likelihood of suicide (Parker, 2020; Pompili, 2019), which could have lasting effects after the pandemic has subsided.

A mental-health survey conducted online by the Association of Indonesian Mental Medicine Specialists (PDSKJI) found that out of 1,552 participants in the regions of West Java (23.4%), DKI Jakarta (16.9%), Central Java (15.5%), and East Java (12.8%); 66% reported experiences of depression (i.e. sleep disturbance, decreased interest, fatigue, lack of energy, and decreased confidence) and 63% reported symptoms of anxiety (i.e. excessive worry about potential negative outcomes, difficulty relaxing and irritability). Another study using the Beck Depression Inventory-II questionnaire (BDI II) found that among college students, 21% of students experienced mild depression, 17% moderate depression and 34% severe depression (Hasanah et al., 2020).

Social restrictions and disruptions to daily life have led to an increased reliance on technology for tasks such as work, study and communication. Siste et al (2020) examined the effects of the pandemic on a number of variables, including internet addiction, psychopathological symptoms, and sleep quality. They found that internet addiction was significantly higher for participants living in a household with confirmed/suspected COVID-19 cases and it relates to higher psychopathological symptoms and low sleep quality. Importantly, the highest correlation with internet addiction and highest scores in general for participants with actual/potential COVID-19 contact was depression. It's important to note that 66.8% of subjects reported residence in provinces that had not implemented the PSBB (social restrictions),

highlighting the inconsistency between provinces and guidance on how to appropriately manage life during the pandemic.

Finally, this notion is supported by research from other countries. Global evidence indicates that there has been a spike in psychological distress and symptoms of mental illness (Bao et al., 2020), and some researchers have even reported possible collective trauma (Garfin, Silver, & Holman, 2020). Wang et al (2020) recorded immediate psychological responses from 1210 participants from 194 cities in China, 3 weeks after the initial outbreak. Over half of participants (53.8%) had rated the psychological impact as moderate or severe, while moderate to severe symptoms were reported by 16.5% participants for depression and 28.8% for anxiety. In Europe, González-Sanguino et al (2020), with a sample of 3,480 Spanish residents, found that 19% of participants met the threshold for depression, as did 22% for anxiety. Thus, factors that contribute to depression and its relationship with uncertainty need to be examined.

A characteristic of any novel virus outbreak is ambiguity and uncertainty, as the precise cause and severity is at first unknown, and the uncertainty in itself can increase psychosocial morbidity (Desclaux et al., 2017; DiGiovanni et al., 2004). Intolerance of Uncertainty (IU), (Freeston et al., 1994), therefore, the distress caused by not knowing – or having insufficient evidence to know – the outcome or experience of a given event, could heighten distress during COVID-19. IU can result in a range of cognitive, emotional and behavioural responses for the purpose of resolving or avoiding the distressing experience (Carleton, 2016).

Past research on IU and virus pandemics has mainly focused on anxiety. This is understandable as IU initially emerged from and displays strong empirical links with research on Generalized Anxiety Disorder (GAD) and related constructs (such as worry) (Freeston et al., 2020). For example, Taha et al (2014) found that IU increased participants perceptions of threat toward the H1N1 virus, which, alongside emotion-focused coping strategies, correlated with increased health anxiety. However IU later become known as a trans-diagnostic issue of psychological difficulties across a range of anxiety (Yuniardi, 2020) and non-anxiety disorders (Rosser, 2019), including depression. Pre-pandemic literature on the association between IU and depression demonstrates a strong relationship between the two even in the absence of anxiety (e.g. Carleton, 2012; de Jong-Meyer et al., 2009; Dugas et al., 2004; Gentes & Ruscio, 2011; Mahoney & McEvoy, 2012; McEvoy & Mahoney, 2011; Miranda et al., 2008; Paulus et al., 2015; Yook et al., 2010).

Other researchers argue that this relationship can be fully accounted for by anxiety after methodological and conceptual issues have been properly examined (Boelen et al., 2010; Boelen & Reijntjes, 2009; Khawaja & McMahon, 2011). Jensen et al (2016), for example, found that while trait anxiety and depression correlated with IU (i.e. general factor, prospective IU and inhibitory IU) when entered into hierarchical analyses separately, only anxiety did when entered. The exception was that depression moderately but independently correlated with inhibitory IU in the

undergraduate sample, even when entered simultaneously. This provides at least some evidence for an independent link between IU and depression.

Liao and Wei (2011) provided evidence for the mediating and moderating effects of rumination between IU, depression and anxiety. They found there was a significant rumination effect in the association between IU and depressive symptoms, which was enhanced by high levels of rumination. Furthermore, rumination fully mediated the association between IU and depression and only partially for IU and anxiety symptoms. Thus, empirical and conceptual links between IU and depression exist. While rumination is only one example, there may be more indirect and direct links between IU and depression, such as passive coping styles and the paralyzing nature of IU. Importantly, while there are many studies linking IU to anxiety during pandemics, to the authors' awareness, this relationship has not been examined for depression.

One clear similarity between IU, anxiety and depression is the dysfunction at cognitive, emotional and behavioural levels of functioning. IU has been known to cause alterations in certain cognitive processes relating to uncertainty (demonstrated through correlational and experimental studies). Focusing on uncertain aspects of an event has been characterized as uncertainty based reasoning (Reuman et al., 2015), and tendencies to overestimate the likelihood of negative events and IU has been well documented (e.g. Dugas et al., 2004, 2005; Koerner & Dugas, 2008; Ladouceur, 2004; Ladouceur et al., 1997), with uncertainty being estimated as threatening. There is also substantial evidence that IU associates with a series of alterations in different neural and physiological networks associated with threat, such as increased reactivity to uncertainty represented by heightened activity of the amygdala and anterior insula (*for review see* Tanovic et al., 2018).

Accordingly, research has demonstrated that IU can alter cognitive appraisals of virus pandemics. Cognitive appraisals are the interpretation of events that happen to an individual (Lazarus, 1966), and play a major role in determining the psychobiological responses and action tendencies to that event (Mehu & Scherer, 2015). That is, cognitive appraisals are heavily involved in the bodies stress response to perceived threats, and afford an adaptive psychological mechanism, whereby, individuals can enhance a response to a situation by decoupling response and stimulus (Scherer, 1984).

However, maladaptive cognitive appraisals can increase psychological distress and vulnerability to emotional disorders, articulated by the framework of cognitive risk factors and emotional dysfunction (Cox et al., 2001; Roberts et al., 1998; Spasojević & Alloy, 2001). During COVID-19, Li et al (2020) found that perceived severity was associated with adverse emotional and behavioural outcomes (i.e. negative emotion, positive emotion, sleep problems, aggression and so forth), consistent with previous studies (Prasetyo et al., 2020; Xin et al., 2020; Yıldırım & Güler, 2020; Zhong et al., 2020).

Strong situational evaluations are associated with heightened emotional responses (Mehu & Scherer, 2015), and the more intense the response, the more need

for processes of emotional regulation. However, this can be disrupted by various deficits and bias's in cognition, which can impair an individual's ability to regulate emotions effectively, thereby increasing vulnerabilities to emotional disorders (Joormann & Gotlib, 2010). Many studies demonstrate the link between cognitive appraisals and depression, such as in breast cancer patients (Bigatti et al., 2012), and long-term depressive symptoms have been predicted by the link between daily cognitive appraisals and negative affect (Lee-Flynn et al., 2011). Taha et al (2014) demonstrates how IU can serve to increase anxiety during virus pandemics through the alterations of cognitive appraisals and subsequent reliance on maladaptive emotion-focused coping strategies. It's likely that a similar pathway is operating during the current pandemic. However, should IU represent a transdiagnostic construct of psychological difficulties, and cause the perception of uncertainty itself to appear threatening and lead to adverse emotional and behavioural outcomes; it's important to examine these associations for depression during COVID-19. Given the high levels of uncertainty surround the current pandemic for Indonesian's, this is required to understand what role IU is playing in both anxiety and depression.

The main goal of this study, then, is to investigate indirect links between IU and depression for Indonesian's during COVID-19. Of particular interest is the role of IU in disrupting cognitive, emotional and behavioural responses to the pandemic. However, this study also aims to provide further evidence for the role of IU for increasing anxiety. Thus, two hypothesized models are proposed. First, that IU forms an indirect pathway with and thereby increases depression. This pathway will be serially mediated by three cognitive appraisal styles – perceived knowledge, perceived severity, and perceived controllability of COVID-19 – and emotional and behavioural responses (i.e. increased negative affect, lower positive affect, anxious symptoms, and sleep disturbance). Secondly, that IU increases anxiety via the same route in a separate model.

Method

Participants

Participants were recruited through an online questionnaire developed on Google Forms. We collected valid data from 406 Indonesians from various regions, all of which provided consent. The data analysis excluded cases with missing values.

There were 293 females (72%) and 113 males (28%). The mean of the age was 27.69 (SD = 9.96); 250 participants (61.58%) were between 15-24 years of age, 54 participants (13.30%) were between 25-34 years of age, 75 participants (18.47%) were between 35-44 years of age, 18 participants (4.43%) were between 45-55 years of age, and 9 participants (2.22%) were above 55 years of age. More than half of participants were college students (58.62%). The complete demographic characteristics of the participants can be seen in Table 1.

Table 1. Demographic characteristics of participants

Variables	Frequency	%
Gender		
Male	113	27.83
Female	293	72.17
Age		
18-24	250	61.58
25-34	54	13.3
35-44	75	18.47
45-55	18	4.43
> 55	9	2.22
Education		
High school	15	3.69
Bachelor	281	69.21
Master	92	22.66
Doctor	18	4.43
Job		
Full-time job	110	27.09
Part-time job	33	8.13
Student	238	58.62
Not-working	22	5.42
Pension	3	0.74
Total	406	100

Notes: total population = 406. Mean participant age was 27.69 (SD = 9.96). All participants were Indonesian.

Measures

Intolerance of Uncertainty Short Form (IUS-12)

Participants' IU scores were recorded using the Indonesia version of IUS-12 (Yuniardi, 2020). IUS-12 was validated by Carleton, Norton and Asmundson (2007) based on the original IUS-27 (Freeston et al., 1994). This measure employs 12 items for examining ones tendency to find uncertain situations distressing (e.g. "When it's time to act, uncertainty paralyses me", "I always want to know what the future has in store for me") on a five-point Likert scale (*1 = "Not at all characteristic of me", 5 = "Entirely characteristic of me"*). The total score was used as it correlates sufficiently with different psychopathological concepts (e.g. Khawaja & Yu, 2010). Higher scores indicated greater IU. The internal consistency of this scale was excellent in the current sample (Cronbach's alpha = 0.83).

Depression, Anxiety and Stress Scale (DASS-21)

The DASS-21 was designed to measure emotional distress in three sub categories (Lovibond & Lovibond, 1995): depression (e.g. loss of self-esteem/incentives and depressed mood), anxiety (e.g. fear and anticipation of negative events) and stress (e.g. persistent state of over arousal and low frustration tolerance). The DASS-21 is a self-report questionnaire with 21 items (seven items for each category) based on a four-point Likert scale. Participants were asked to rate to what extent each statement applied to them over the past week, with "0 = did not apply to me at all" to "3 = applied to me very much, or most of the time". To calculate comparable scores with full DASS, the 7-items of depression and anxiety were multiplied by two. The higher the score the more severe the emotional distress was. However, only score from depression and anxiety were involved in the analysis of this study. Items included, "I found it hard to wind down", "I was aware of dryness of my month" and "I couldn't seem to experience any positive feeling at all". The internal consistency of this scale was good (Cronbach's alpha = 0.83).

Permission was granted from Li et al (2020) for the use of the following scales; developed for recording mental-health during COVID-19 in China. All scales demonstrated strong internal validity and psychometric properties.

Emotional and Behavioural Responses

Emotional and Behavioural responses were recorded using 20 items, which measured a number of dimensions including: Negative emotion (8 items, anxiety, worry, depressive, lonely, sadness, anger, nervous and panic), positive emotions (3 items, joy, happiness, excitedness) sleep difficulties (4 items, insomnia, light sleep, nightmares and lack of sleep), aggression (2 items, argumentative and physical aggression), use of substances (2 items, smoking and drinking), and mobile use (1 item). Participants scores were recorded using a five-point Likert scale, which asked them to compare these facets after the outbreak with ones before (from "1 = *much less compared to the days before the outbreak*" to "5 = *much more compared to the days before the outbreak*"). Positive emotion was reverse scored to comply with negative dimensions. Lastly, a higher score indicated more negative emotion, less positive emotion, sleep difficulties, aggression, substance use, and mobile use. The internal consistency of this scale was good (Cronbach's alpha = 0.81).

Perceived Severity

Perceived severity of COVID-19 was recorded with 5 items. Participants rated their perception of how severe the virus was on a five-point Likert scale with the following criteria: Rate of infection, mortality, morbidity, negative impact on social order and negative impact on economic stability (from "1 = *not severe at all*" to "5 = *very much severe*") (e.g. "How severe do you think the infectiousness of COVID-19 is?", "How severe do you think the morbidity of COVID-19 is?"). Higher scores indicated that the perception of COVID-19 was more severe. The internal consistency of the scale was acceptable (Cronbach's alpha = 0.71).

Perceived Controllability

Estimation of how the perceived controllability of the COVID-19 situation was measured using 9 items on a five-point Likert scale (from "1 = *totally uncontrollable*" to "5 = *totally controllable*") (e.g. "The ways of transmission", "The infectiousness"). Higher scores reflected participant perceptions that COVID-19 was more controllable. The scale held very good internal consistency (Cronbach's alpha = 0.87).

Perceived Knowledge of COVID-19

The perception of knowledge about different aspects of COVID-19 (e.g. aetiology, transmission, diagnostic criteria, symptoms etc.) was recorded using 11 items on a five-point Likert scale (from "1 = *totally do not know*" to "5 = *totally know*") (e.g. "Its aetiology", "symptoms"). Higher scores implied more knowledge about the difference aspects of COVID-19. The scale also retained very good internal consistency (Cronbach's alpha = 0.86)

Procedure

Following ethical approval from the Ethical Committee of the Directory of Research and Service Community of the University of Muhammadiyah Malang, the survey was developed in Bahasa Indonesia using Google Forms. The link for the online survey was circulated via a number of avenues using an opportunity sample. The survey could be completed from a personal computer, tablet or smartphone, and it took around 15 minutes to complete with approximately 78 items.

Results

Descriptive Statistics

Descriptive statistics for the variables used in this study and their correlations are shown in Table 2.

Table 2. Means, standard deviations, Cronbach's Alpha and correlations between variables

	Var	X	SD	α	1	2	3	4	5	6	7
1. IU	40.25	7.75	0.83	—						
2. Know	39.05	6.86	0.86	-0.02	—					
3. Sev	22	2.5	0.71	0.29***	0.16**	—				
4. Con	27.05	6.65	0.87	-0.04	0.25***	-0.18***	—			
5. EmBe	53.68	10.79	0.81	0.4***	-0.07	0.24***	-0.15**	—		
6. Dep	6.03	4.45	0.83	0.46***	-0.25***	0.08	-0.12*	0.39***	—	
7. Anx	6.43	4.37	0.78	0.43**	-0.19**	0.13**	-0.08	0.41**	0.68**	—

Note: IU = Intolerance of Uncertainty; Know = Perceived Knowledge; Sev = Perceived Severity; Con = Perceived Controllability; EmBe = Emotional Behavioural Response to COVID-19; Dep = Depression; Anx = Anxiety. * = $p < .05$, ** = $p < .01$, *** = $p < .001$

The results show that all of the variables have acceptable internal consistency with Cronbach's Alpha above 0.70. Mean scores of each scale revealed that, overall, perceived knowledge about COVID-19 was moderate-high (M = 39.05, SD = 6.86), perceived severity was moderate (M = 22, SD = 2.5), perceived control was moderate (M = 27.05, SD = 6.65), emotional and behavioural difficulties were moderate (M = 53.68, SD = 10.79), depression was normal (M = 6.03, SD = 4.45) and anxiety was normal (M = 6.43, SD = 4.37). IU moderately correlated with perceived severity ($r = 0.29$), emotional/behaviour ($r = 0.4$), depression ($r = 0.46$) and anxiety ($r = 0.43$). Although perceived severity weakly correlated with emotional/behaviour ($r = 0.24$) and anxiety ($r = 0.13$), it did not with depression. Subsequently, emotional/behavioural moderately correlated with depression ($r = 0.39$) and anxiety ($r = 0.41$). This correlational matrix revealed that there is no multicollinearity ($r > 0.80$).

Depression Pathway Analysis

In order to test the first hypothesis we ran a path analysis using AMOS version 23 (Arbuckle, 2014). Direct and indirect effects were estimated using bootstrap analysis. Figure 1 shows the path model and the standardized estimate effects of variables studied.
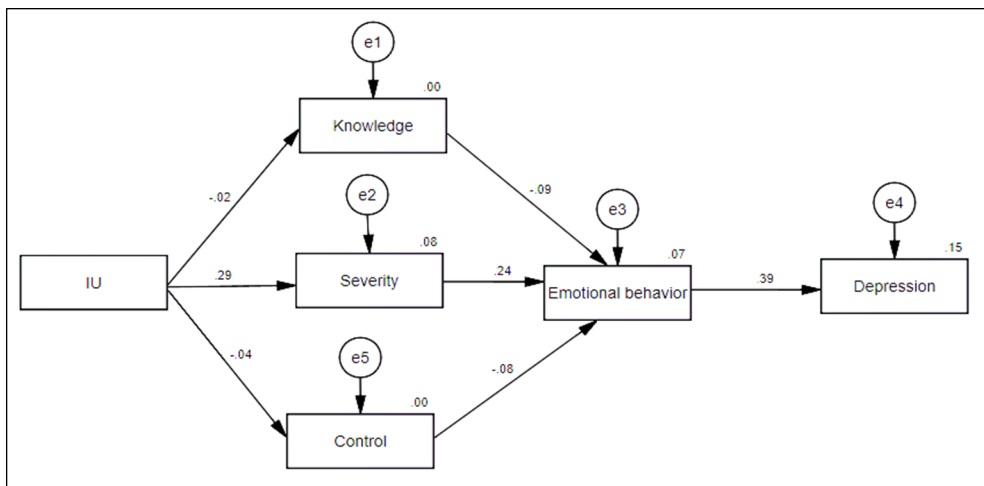
Figure 1. The mediational model of IU to depression via cognitive appraisal variables and emotional/behaviour responses

The direct path from IU to severity was positive and statistically significant (estimated effect = 0.290, $p = .01$, CI = 0.178, 0.283), but not to knowledge or control. On the path from cognitive appraisal variables to emotional and behavioural

responses, only severity had a positive significant path to emotional/behaviour (estimated effect = 0.242, p = .01, CI = 0.135, 0.328). Emotional/behaviour itself forms a significant direct path to depression (estimated effect = 0.387, p = .01, CI = 0.313, 0.468).

The indirect path reveals that there is a significant effect of IU to emotional/behaviour via cognitive appraisals (estimated effect = 0.076, p = .10, CI = 0.030, 0.125), and also, that there is a significant effect of IU to depression via cognitive appraisals and emotional/behaviour (estimated effect = 0.029, p = .010, CI = 0.010, 0.048). Consequently, cognitive appraisals and emotional/behavioural responses mediate the relation between IU and depression. However, since it was only severity that has a significant path from IU, then only severity among the cognitive appraisal variables acts as a mediator. Although perceived severity did not directly correlate with depression, it did contribute in an indirect way by heightening emotional/behaviour. Table 3 shows the indirect effects and their associated 95% confidence intervals.
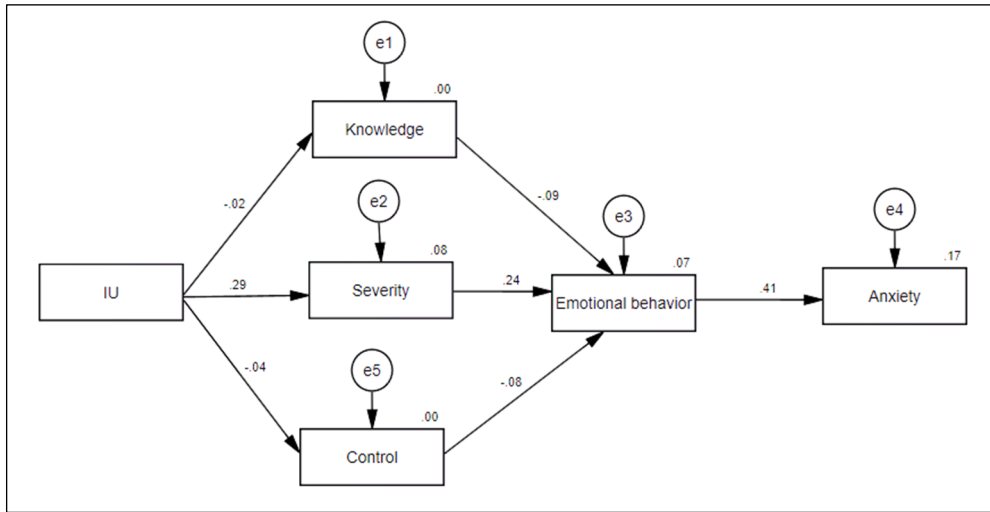
Table 3. Direct and indirect effects and 95 % confidence intervals for the depression model

Model pathways	Estimated effect	SE	p	95% confidence interval	
				Lower	Upper
Direct effect					
IU → Know	-0.025	0.052	0.616	-0.133	0.076
IU → Sev	0.290	0.050	< 0.01	0.178	0.283
IU → Con	-0.040	0.060	0.422	-0.161	0.100
Know → EmBe	-0.087	0.048	0.068	-0.179	0.017
Sev → EmBe	0.242	0.052	< 0.01	0.135	0.325
Con → EmBe	-0.084	0.050	0.081	-0.174	0.028
EmBe → Dep	0.387	0.039	< 0.01	0.313	0.468
Indirect effect					
IU → CA → EmBe	0.076	0.024	.010	0.030	0.125
IU → CA → EmBe → Dep	0.029	0.009	.010	0.010	0.048

Note: IU = Intolerance of Uncertainty; Know = Perceived Knowledge; Sev = Perceived Severity; Con = Perceived Controllability; EmBe = Emotional Behavioural Response to COVID-19; Dep = Depression; CA = Cognitive appraisal; SE = standardized error; p = statistical significance; Arrows indicate direction of the pathway; * = p < .05, ** = p < .01, *** = p < .001

Anxiety Pathway Analysis

We tested the second hypothesis by performing another analysis of the model with anxiety as a dependent variable. Figure 2 demonstrates the path analysis model and standardized estimate effects of variables studied. The pattern of the model is similar with the previous model.

Figure 2. The mediational model of IU to anxiety via cognitive appraisal
variables and emotional/behaviour responses

The model remained the same except for a variation in strength in the
indirect pathway from IU to anxiety; with a slightly higher estimated effect between
IU and anxiety than with IU and depression (estimated effect = 0.031, p = .01, CI =
0.010, 0.055). Table 4 shows the indirect effects and their associated 95% confidence
intervals. Implications are discussed below.

Table 4. Direct and indirect effects and 95 % confidence intervals for the anxiety model

Model pathways	Estimated effect	SE	p	95% confidence interval	
				Lower	Upper
Direct effect					
IU → Know	-0.025	0.052	0.616	-0.133	0.076
IU → Sev	0.290	0.050	< 0.01	0.178	0.283
IU → Control	-0.040	0.060	0.422	-0.161	0.100
Know → EmBe	-0.087	0.048	0.068	-0.179	0.017
Sev → EmBe	0.242	0.052	< 0.01	0.135	0.325
Con → EmBe	-0.084	0.050	0.081	-0.174	0.028
EmBe → Anx	0.413	0.038	< 0.01	0.337	0.498
Indirect effect					
IU → CA → EmBe	0.076	0.024	.010	0.030	0.125
IU → CA → EmBe → Anx	0.031	0.010	.010	0.010	0.055

Note: IU = Intolerance of Uncertainty; Know = Perceived Knowledge; Sev = Perceived Severity; Con = Perceived
Controllability; EmBe = Emotional Behavioural Response to COVID-19; Anx = Anxiety; CA = Cognitive
appraisal; SE = standardized error; p = statistical significance; Arrows indicate direction of the pathway; * = $p <$
.05, ** = $p <$ .01, *** = $p <$ .001

Discussion

The current study aimed to explore two hypothesized pathways IU and depression and IU and anxiety in an Indonesian sample. Importantly, these pathways were proposed to be serially mediated by cognitive appraisals and emotional and behavioural disturbance during COVID-19. Predictions of indirect and direct association between IU and depression, which the association was serially mediated by cognitive appraisals and emotional and behavioural responses to COVID-19 (i.e. increased negative affect, lower positive affect, anxious symptoms, and sleep disturbance), were supported by the results of the pathway analysis. Similar evidence is also provided for the second pathway with an indirect association between IU and anxiety.

Depression

In the proposed model for depression, an indirect pathway provides correlational support for the construct's association with IU. Additionally, the other indirect pathway supports the notion that IU increases cognitive risk factors – in this case, by heightening perceived severity – and emotional and behavioural disturbance. This is congruent with previous studies highlighting the role of IU during virus pandemics. For example, IU mediated the relationship between perceived threat of COVID-19, biological rhythms and psychosomatic symptoms (Gica, Kavakli, Durduran, & Ak, 2020); associated with increased perceptions of threat during the H1N1 crisis, as well as reliance on emotional focused coping, which mediated the relationship between IU and virus-related anxiety (Taha et al, 2014); and outside of a pandemic context, where IU contributed to threat appraisals of women who survived breast cancer (Wonghongkul et al., 2000).

Firstly, it was unsurprising that IU would increase participants' perceived severity of COVID-19. As stated in the introduction, IU is associated with reasoning styles with the tendency to fixate on uncertain aspects of an event and to find this uncertainty threatening. This is supported by neurophysiological alterations in brain regions typically involved with responding to threat, such as the amygdala and anterior insula.

It was, however, surprising that neither perceived controllability nor knowledge about COVID-19 directly associated with IU, or mediated its relationship with emotional and behavioural responses. Possibly, perceived threats are more salient to individuals with higher IU then the aforementioned appraisals because it represents a more direct threat to ones' well-being. Contrarily, perceived knowledge may not be as relevant to IU either because the pandemic remains uncertain regardless of how much information one receives, or because the bias appraisals of IU toward threat renders available knowledge as less important than potential harm. Similarly, in regards to controllability, precautionary actions can reduce uncertainty

to an extent, but the overarching uncertainty of the pandemic is something that cannot be easily reduced.

Secondly, the direct association between perceived severity and emotional and behavioural disturbance was also expected. Cognitive contributions to threat perception are usually accompanied by an emotional component. In the absence of information, researchers have postulated that risk perception and related behaviour seems to be predicated on people's anticipated emotions (Mellers et al., 1999), gut feelings (Bechara et al., 1997) and past experiences (Wagar & Dixon, 2006). Theories of a dual-process between cognition and emotion has been proposed, whereby, cognition and emotion contribute to the increased perception of threat (e.g. Van Gelder et al., 2009). Both possibly play a role here although it cannot be confirmed. Likewise, perceived severity has been associated with increased emotional and behavioural disturbance during COVID-19 (Li et al., 2020) and a mediating variable between IU and anxiety alongside emotion-focused coping strategies (opposed to problem-focused) (Taha et al, 2014).

The potential role of IU, therefore, a notion supported by the current findings, is to increase appraisal biases towards threat. Moreover, through a direct association in the correlational matrix and indirectly through the cognitive appraisal mediated pathway; to increase the intensity of adverse emotional and behavioural responses to COVID-19. Appraisals have been positively associated with increased emotional intensity (Ellsworth & Smith, 1988), as has IU, indicating that affect intensity may be related to the way that a situation is appraised. Although much research has been conducted suggesting that emotions are central to the appraisal process; alternative research emphasizes the role of cognitive appraisals, not just in emotional regulation (Ellsworth & Scherer, 2003), but also in the production of affective states that are difficult to regulate (Mehu & Scherer, 2015). It should be noted that cognitive, emotional and behavioural factors are likely mutually reciprocal. It would be fruitful for future research to examine this interplay over time.

As for behavioural responses, many studies have demonstrated that emotional processing in humans modulates motor-related areas (Baumgartner et al., 2007; Hajcak et al., 2007; Oliveri et al., 2003), and that defensive reactions of human beings can be activated intensely in response to aversive stimuli (Mobbs et al., 2007, 2010). As such, when presented with aversive stimuli in a laboratory, it has been shown that the input of aversive stimuli on motor output is a central determinant to the modulation of behaviour by emotion (Junior et al., 2013). These defence cascades may also be part of the regulation process, as emotion increases in response to aversive stimuli, so does the behavioural modulation attempting to reduce it. The increased emotional intensity resulting from the appraisal styles of IU is may engage defence orientated behaviour aimed at coping with the threat of the pandemic. Interestingly, Freeston et al (2020) argued that IU is strongly associated with uncertainty-reducing behaviours designed to avoid or resolve uncertainty distress. It would be interesting to examine the relationship between IU, cognitive appraisals

and emotion in the context of maladaptive defence cascades in response to a virus pandemic.

Finally, these associations seem to also increase the risk for depression. For the following reasons, this implicates IU as an important risk factor for heightened psychological disturbance and psychopathology during a pandemic like COVID-19, similar to previous studies (e.g. Taha et al., 2014). Indonesians from this sample had, overall, low rates of depression and mild-to-moderate levels of emotional and behavioural responses to COVID-19; but the latter two variables intensified with a higher presence of IU. Thus, although perceived severity did not correlate with depression in the correlational matrix, it did associate with emotional and behavioural difficulties in the pathway, which in turn increased depression. At least in this model, this suggests that variables which increase perceptions of threat, such as IU, are also likely to increase the risk of depression through emotional and behavioural difficulties.

One interpretation of this result is provided by the previously mentioned framework of cognitive risk factors and emotional (and behavioural) dysfunction. Kaiser and Scherer (1998) previously argued for the utility of conceptualizing a variety of clinically salient affective disorders as malfunctions of intraindividual and interindividual regulation of normal emotions. Because powerful emotions require increased efforts of emotional regulation, emotional-related disturbances such as depression are more likely to develop if regulation is impaired (Mathews & MacLeod, 2005). Moreover, some researchers have suggested that increases in these emotions, possibly due to appraisal biases, present a vulnerability factor for affective disorders (Roseman & Kaiser, 2001; Scherer & Brosch, 2009).

This would seem particularly relevant under significant life stress like the current pandemic. Increasing need for intraindividual regulation can deplete psychophysiological resources and opportunities for interindividual regulation are limited. Moreover, pandemics are characterized by a heightening of normal negative affect in response to a threatening event, which would place individuals with cognitive vulnerabilities to affective disorders, such as those with IU, at risk of developing affective disorders. Finally, this could be aggravated by disruptions to daily life due to social restrictions. That is, by increasing the difficulty of maintaining healthy behavioural patterns especially for higher IU individuals who typically engage maladaptive safety seeking behaviours.

Anxiety

While the main purpose of this article was to demonstrate links between IU and depression in the context of virus pandemics; this paper also provides further evidence of the strong theoretical association between IU and anxiety. Overestimation of threat compared with real threats is a typical feature of anxiety disorders and disorders with an anxious component (Abramowitz & Blakey, 2020). Accordingly, many models of anxiety are based on threat, such as panic disorder

(Clark, 1986.), obsessive-compulsive disorder (Salkovskis, 1985) and social anxiety (Clark & Wells, 1995). As mentioned, this model follows a similar design to Taha et al (2014) study, although the current study demonstrated a link with general anxiety rather than health anxiety.

The current study also supports research during COVID-19 (Tull et al., 2020). IU significantly predicted the health anxiety dimension of bodily vigilance at a one-month follow-up. Furthermore, affective risk assessments and IU uniquely associated with the perceived likelihood that one would develop an illness and that the outcome would be negative at a one month follow up measurement. The role of IU and perceived severity for COVID-19 in the results from this study help to elucidate this relationship.

Uncertainty Distress

The findings presented here, more so for anxiety than depression, can be contextualized by a recent framework for 'uncertainty distress' (Freeston et al., 2020). This model was developed not only for COVID-19, but also for wider clinical applications to psychological difficulties. Importantly, they highlighted that dispositional IU may be responsible for moderating both perception of threat and uncertainty, which in turn, increases situational uncertainty regarding specific events (e.g. wearing a face mask, social restrictions). Moreover, uncertainty-reducing behaviours can exasperate or prologue both dispositional and situational IU. Actual threat and actual uncertainty are translated through dispositional intolerance into a recursive pattern of perceived threat, perceived uncertainty and situational IU and collectively contributing uncertainty distress.

In both models of the current study, dispositional IU appears to heighten the perceived severity of COVID-19, supporting the notion that individuals with dispositional IU perceive threats higher than people with low IU. The contribution of increased perceived severity on emotional and behavioural difficulties could possibly reflect the uncertainty distress arising from the interplay between perceived threat, perceived uncertainty, situational uncertainty and uncertainty-reducing behaviours as a consequence of dispositional IU. Furthermore, uncertainty distress explains why emotional and behavioural difficulties may lead to anxiety and depression.

One remaining question is how exactly does IU relate to depression theoretically? It's possible that rumination plays a role in mediating between the two consistent with previous studies (i.e. Liao & Wei, 2011; Yook et al., 2010). Future studies should investigate this link in the context of virus pandemics. Another possible interpretation is that specific emotions generated from a particular appraisal pattern give rise to emotions which associate with an affective disorder (Scherer & Brosch, 2009). Freeston et al (2020) suggested that although IU is typically characterized by anxiety and worry, it can be accompanied by other emotions. For example, regret, guilt, shame or sadness can be present. If appraisal patterns give rise

to the latter emotions, it provides a pathway congruent with the notion that depression can arise out of specific maladaptive emotions, such as sadness. Whether this relationship can exist outside the precipitating influence of anxiety remains to be seen. Future studies should also focus on exploring any mediating or moderating effects of anxiety on associations between IU and depression.

Implications for Practice

The findings of this study have several theoretical and practical implications. Firstly, this study supports the view that IU plays a role in heightening emotional and behavioural disturbance during a pandemic, which may contribute to the development of anxiety and affective disorders like depression. These findings also strengthen the link between IU and perceptions of threat, as well as research highlighting how appraisals are central to the process of regulating ones emotional and behavioural responses during stressful life events like the current pandemic. Accordingly, psychological interventions should consider incorporating IU specific treatment methods to help individuals who are distressed by the uncertainty of COVID-19, placing specific interest on the perception of threat.

It cannot be stated with any certainty, but the results also lend support to arguments that affective disorders arise from maladaptation in normal emotional patterns. This would seem more salient during the pressure of a global pandemic than it would under normal circumstances, given the widespread fear and disruptions to everyday life. This would imply that insofar as possible, helping individuals, especially those with high IU, to manage not only their trait appraisals, but also their emotional states and behaviour during pandemics is important, as it would reduce the risk of developing more severe emotional disturbances. It would be fruitful to profile the relationship between IU and different emotional states to determine whether there are specificities in what emotions give rise to different psychological difficulties. In line with previous research on coping styles, one potential avenue for treatment would be to encourage problem-focused coping styles as opposed to emotion-focused coping styles, which has the potential for reducing distress caused by a pandemic. Future studies should investigate how the promotion of problem-focused coping styles might mitigate the influence of IU during pandemics.

Despite these results, the study does have several limitations. This was a cross-sectional study, so inferences cannot be made of how variables relate overtime, and the correlational nature of the study means that causation cannot be determined between variables. Furthermore, the reliability of the measures was generally acceptable, but should be improved for future studies. Possibly, this reflects the translation process of English language measures into Bahasa Indonesia, and further investigations would benefit from more thorough examination of translated measures before implementation. Also, the study may not be representative of the general population for two reasons. Firstly, the questionnaire was administered online, and so the study did not represent sections of the Indonesian population who

did not have access to the internet, or that were not familiar with online research platforms. Secondly, the sample was unbalanced, being comprised from more female participants (72.17%).

Conclusion

The global uncertainty surrounding COVID-19 has been compounded for Indonesian citizens by lack of a clear scientific and evidence-based government response. Here, further evidence has been provided that IU is an important risk factor for heightened psychological distress during the current pandemic, as well as potentially increasing the risk for anxious disorders and affective disorders like depression in an Indonesian sample. Particular considerations should be taken surrounding the perceptions of severity toward COVID-19 in higher IU individuals, which appears to be the main cognitive appraisal style which mediates between IU and adverse emotional and behavioural responses. Likewise, direct associations between the emotional and behavioural responses and depression could suggest that depression arises from maladaptation in normal emotions and behaviour. Based on these findings, and those of previous research, educating and helping people who are intolerant to uncertainty to manage the cognitive, emotional and behavioural responses during a pandemic like COVID-19 might be key for reducing adverse psychological outcomes. In the future, greater attention should be paid to the factors that effectively reduce the influence of IU during pandemics, which can inform the design of psychological interventions.

Data Availability

Data is available by request.

Conflicts of Interest

The authors of this study can confirm that have no conflicts of interest to disclose.

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