Two Exploratory Pathways Between Intolerance of Uncertainty, Anxiety And Depression In The Context Of COVID-19, Indonesia

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Abstract

Intolerance of uncertainty plays a key role in adverse psychological responses to virus pandemics. However, no studies have examined its association with depression in this context. Thus, this study examined two pathway models: IU to depression and IU to anxiety. Cognitive appraisals and emotional and behavioural responses to COVID-19 were mediators. Online psychological measures - intolerance of uncertainty-short form; depression, anxiety and stress scale-21; and four COVID-19 scales, including perceived severity, controllability, knowledge, and emotional and behavioural responses - were administered to 406 Indonesian participants. Indirect pathways were found between IU and emotional and behavioural responses; IU and depression (mediated by cognitive appraisals and emotional and behavioural responses to COVID-19); and then repeated between IU and anxiety. Accordingly, IU represents a risk factor for emotional and behavioural difficulties, depression and anxiety during COVID-19. Psychological interventions should incorporate IU specific modules, especially for perceived severity of pandemics.

Keywords: Indonesia; COVID-19; Intolerance of Uncertainty; Depression; Emotional and Behavioural Difficulties.

Introduction

Indonesia and SARS-CoV-2 coronavirus (COVID-19)

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; reaching 1,686,373 with 46,137 deaths (May 6th, 2021). Government responses have been mixed, with large scale restrictions being enforced at varying times and rigour. Health consequences of the virus, as well as the social, psychological and economic ramifications can be observed across the country (Suryahadi et al., 2020); worsened by inconsistent preventative measures and no coherent scientific government message. Accordingly, many have sought refuge in unscientific and unsupported information on the virus (i.e. cures, transmission) (Koran Tempo, 2020), increasing the sense of uncertainty. It's important, therefore, to understand what role uncertainty plays in adverse psychological outcomes for different psychological difficulties.

COVID-19, Depression And Anxiety

Psychological distress has accompanied an increasing prevalence of depression and anxiety, with Indonesian studies reporting a moderate-high prevalence (e.g. Almira, 2020; Mulya et al., 2021; Sunjaya et al., 2021). For example, in a mental-health survey conducted online by the Association of Indonesian Mental Medicine Specialists (PDSKJI), 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 depressive symptoms (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% experienced mild depression, 17% moderate depression and 34% severe depression (Hasanah et al., 2020).

The pandemic has led to an increased reliance on technology for everyday tasks. Siste et al (2020) examined effects of the pandemic on several variables, including internet addiction (IA), psychopathological symptoms, and sleep quality in numerous provinces. IA was significantly higher for participants in households with confirmed/suspected COVID-19 cases. Moreover, the highest correlation with IA and highest scores in general for participants with actual/potential COVID-19 contact was depression. Importantly, 66.8% of subjects lived in provinces without PSBB (social restrictions), highlighting the inconsistency between provinces and guidance on how to manage life during the pandemic.

Finally, this research is supported from other countries. Evidence indicates a global spike in psychological distress and symptoms of mental illness (Bao et al., 2020) and possibly 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%) rated the psychological impact as moderate or severe, while 16.5% reported moderate to severe 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 and 22% for anxiety. Thus, contributing to depression and its relationship with uncertainty need to be examined.

Intolerance of Uncertainty, Anxiety and Depression

Novel virus outbreaks are characterised by ambiguity and uncertainty, as the original cause and severity is initially unknown, and this uncertainty can contribute to psychosocial mobility (Desclaux et al., 2017; DiGiovanni et al., 2004). Intolerance of Uncertainty (IU), (Freeston et al., 1994), the distress caused by not knowing - or having insufficient evidence to know - the outcome or experience of an event, could heighten distress during COVID-19. IU can result in cognitive, emotional and behavioural responses for resolving or avoiding the distressing experience (Carleton, 2016).

Past research on the role of IU during virus pandemics has focused on anxiety. This is understandable as IU initially emerged from and displays strong empirical links with Generalized Anxiety Disorder (GAD) and related constructs (Freeston et al., 2020). For example, Taha et al (2014) found that IU increased perceptions of threat toward the H1N1 virus, which, alongside emotion-focused coping strategies, correlated with increased health anxiety.

However IU is now known as a trans-diagnostic issue of psychological difficulties across anxiety and non-anxiety disorders, including depression (Rosser, 2019). Pre-pandemic literature demonstrates a strong relationship between IU and depression, 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; Paulus et al., 2015; Yook et al., 2010).

Other researchers argue this relationship can be fully accounted for by anxiety after methodological and conceptual issues have been examined (Boelen et al., 2010; Boelen & Reijntjes, 2009; Khawaja & McMahon, 2011). Jensen et al (2016) found that, in an undergraduate and clinical sample, 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 simultaneously. However, depression moderately but independently correlated with inhibitory IU in the undergraduate sample, even when entered simultaneously. Thus, despite arguments for an 'accounted relationship', there is evidence for direct associations between IU and depression. Indirect effects through other constructs are also likely.

Liao and Wei (2011) provide an example of this, namely, the mediating and moderating effects of rumination between IU and depression, and IU and anxiety. The association between IU and depressive symptoms was enhanced by higher levels of rumination as a moderator. Similarly, rumination fully mediated the association between IU and depression but only partially for IU and anxiety symptoms. This demonstrates that empirical and conceptual links between IU and depression exist. While rumination is one example, indirect and direct links between IU and depression such as passive coping styles or the paralyzing nature of IU are also possible. Importantly, many studies link IU to anxiety during pandemics, but to our awareness, this relationship has not been examined for depression.

Cognitive, Emotional and Behavioural dysfunction

All three psychological problems - IU, anxiety and depression – seem to be accompanied by dysfunction at cognitive, emotional and behavioural levels. This pathway should be considered when exploring interactions between them, broadly articulated by the framework of cognitive risk factors and emotional (and behavioural) dysfunction (Cox et al., 2001; Roberts et al., 1998; Spasojević & Alloy, 2001). For instance, cognitive appraisals (CA) are one construct that associates with adverse emotional and behavioural outcomes, as well as IU, anxiety and depression.

CA are one's interpretation of events (Lazarus, 1966), and play a major role in determining subsequent psychobiological responses and action tendencies (Mehu & Scherer, 2015). That is, CA are involved in the bodies stress response to perceived threats. They afford an adaptive psychological mechanism by enhancing situational responses through the decoupling of response and stimulus (Scherer, 1984).

On the other hand maladaptive CA can increase psychological distress and vulnerability to emotional disorders. Strong situational evaluations have been said to heighten emotional responses that require greater processes of emotional regulation (Mehu & Scherer, 2015). However, this can be disrupted by various deficits and bias's in cognition. Interestingly, an impaired ability for effective emotional regulation could also increase vulnerabilities to emotional disorders (Joormann & Gotlib, 2010). Recently, Li et al (2020) found that perceived severity of COVID-19 was associated with adverse emotional and behavioural outcomes (i.e. negative emotion, positive emotion, sleep problems, aggression), consistent with previous studies (Prasetyo et al., 2020; Xin et al., 2020; Yıldırım & Güler, 2020; Zhong et al., 2020).

IU has been known to cause alterations in certain cognitive processes relating to uncertainty (demonstrated through both correlational and experimental studies). For example, focusing on uncertain aspects of an event has been characterized as uncertainty based reasoning (Reuman et al., 2015), and overestimations in the likelihood of negative events and IU has been documented (e.g. Dugas et al., 2004, 2005; Koerner & Dugas, 2008; Ladouceur, 2004; Ladouceur et al., 1997), with uncertainty estimated as threatening. There is also evidence that IU associates with alterations to different neural and physiological networks associated with threat, such as increased reactivity to uncertainty represented by heightened amygdala and anterior insula activity (for review see Tanovic et al., 2018).

The Taha et al (2014) study demonstrates how IU can increase anxiety during virus pandemics through the alterations of cognitive appraisals and subsequent reliance on maladaptive emotion-focused coping strategies. Moreover, CA has been linked to depression in numerous studies, 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). Thus, cognitive appraisals and associated emotional and behavioural difficulties may connect IU, anxiety and depression during COVID-19.

The present study

This study aims to demonstrate indirect links between IU and depression for Indonesian's during COVID-19 and support findings for associations between IU and anxiety. Of particular interest is how IU may disrupt cognitive, emotional and behavioural

responses. Thus, two hypothesized models are proposed. First, IU will form an indirect pathway with depression, 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, sleep disturbance). Secondly, IU increases anxiety via the same route in a separate model. The authors predict that IU will form direct and indirect associations with the above mentioned constructs and associate indirectly with both depression and anxiety.

Method

Participants

Participants were recruited through an online questionnaire on Google Forms. We collected valid data from 406 Indonesians from various regions (1st of April – 6th June, 2020), all of which provided consent. The data analysis excluded cases with missing values. There were 293 females (72%) and 113 males (28%), and the participants mean age was 27.69 (SD = 9.96). Participants were aged 18-24 years old (n = 250; 61.58%), 25-34 year olds (n = 54; 13.30%), 35-44 years old (n = 75; 18.47%), 45-55 years old (n = 18 people; 4.43%), and above 55 years old (n = 9; 2.22%). Most 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	Percent
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)

Intolerance of Uncertainty scores were recorded using the IUS-12, developed and validated by Carleton, Norton and Asmundson (2007). This measure employs 12 items for examining tendencies 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. This scale had good internal consistency 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 how many of each items (in the form of statements) 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". Comparable scores with full DASS were calculated by multiplying the 7-items of depression and anxiety by two. The higher the score the more severe the emotional distress was. 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 following scales; developed for recording psychological responses to COVID-19 in China. Scales demonstrated strong internal validity and psychometric properties.

Emotional and Behavioural Responses

Emotional and Behavioural responses were recorded using 20 items that measured several 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), substance use (2 items: smoking and drinking), and mobile use (1 item). A five-point Likert scale was employed for participants to compare these facets after the outbreak with 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. etiology, 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 etiology", "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 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 various avenues using an opportunity sample. This could be completed from a personal computer, tablet or smartphone, and took around 15 minutes to complete with approximately 78 items.

Results

Descriptive Statistics

Descriptive statistics for the variables and their correlations are shown in Table 2. 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). However, the correlational matrix demonstrated that although perceived severity weakly correlated with emotional/behaviour (r = 0.24) and anxiety (r = 0.13), it did not with depression. Subsequently, emotional/behaviour moderately correlated with depression (r = 0.39) and anxiety (r = 0.41). IU correlated moderately with perceived severity (R = 0.29), emotional/behaviour (R = 0.4), depression (R = 0.46) and anxiety (r = 0.43).

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

Variables	Mean	SD	Cronbach's α	1	2	3	4	5	6	7
1. IU	40.25	7.75	0.83	—						
2. Knowledge	39.05	6.86	0.86	-0.02	—					
3. Severity	22	2.5	0.71	0.29***	0.16**	—				
4. Control	27.05	6.65	0.87	-0.04	0.25***	-0.18***	—			
5. Emotional/Behaviour	53.68	10.79	0.81	0.4***	-0.07	0.24***	-0.15**	—		
6. Depression	6.03	4.45	0.83	0.46***	-0.25***	0.08	-0.12*	0.39***	—	
7. Anxiety	6.43	4.37	0.78	0.43**	-0.19**	0.13**	-0.08	0.41**	0.68**	—

* p < .05, ** p < .01, *** p < .001

Note: Correlational matrix based on Pearsons r. SD = standard deviation. Mean records average scores for each scale in horizontal column. Correlations are represented whereby horizontal values intersect with vertical Colum. For all scales, higher mean scores indicate higher self-reported levels of that variable. IU = Intolerance of Uncertainty short form (IUS-12) (Carleton, Norton and Asmundson, 2007); Knowledge = Perceived Knowledge about COVID-19 (Li, et al., 2020); Severity = Perceived Severity of COVID-19 (Li, et al., 2020); Control = Perceived Controllability of COVID-19 (Li, et al., 2020); Emotional Behaviour = Adverse Emotional and Behavioural difficulties due to COVID-19 (Li, et al., 2020); Depression = Depression Anxiety and Stress Scale – Short form (DASS-21) (Lovibond & Lovibond, 1995); Anxiety = Depression Anxiety and Stress Scale – Short form (DASS-21) (Lovibond & Lovibond, 1995).

Depression Pathway Analysis

The first hypothesis was tested by running 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. The direct path from IU to severity is 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 has a positive significant path (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).

In the indirect pathway there is a significant effect of IU to emotional/behaviour via cognitive appraisals (estimated effect = 0.076, p = .10, CI = 0.030, 0.125). Also, 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, only severity among the cognitive appraisal variables acts as a mediator. Although perceived severity did not correlate with depression directly, it did contribute in an indirect way by heightening emotional/behaviour. Table 3 shows the indirect effects and their associated 95% confidence intervals.
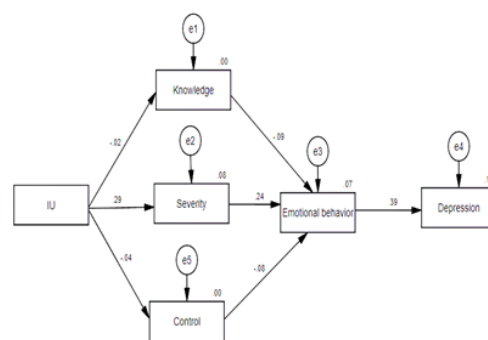

Figure 1. The mediational model of IU to depression via cognitive appraisal (knowledge, severity, control) and emotional/behaviour responses

Model pathways	Estimated effect	SE	p	95% confidence interval	
				Lower	Upper
Direct effect					
IU → knowledge	-0.025	0.052	0.616	-0.133	0.076
IU → severity	0.290	0.050	< 0.01	0.178	0.283
IU → control	-0.040	0.060	0.422	-0.161	0.100
Knowledge → emotional behavior	-0.087	0.048	0.068	-0.179	0.017
Severity → emotional behavior	0.242	0.052	< 0.01	0.135	0.325
Control → emotional behavior	-0.084	0.050	0.081	-0.174	0.028
Emotional behavior → depression	0.387	0.039	< 0.01	0.313	0.468
Indirect effect					
IU → cognitive appraisal → emotional behavior	0.076	0.024	.010	0.030	0.125
IU → cognitive appraisal → emotional behavior → depression	0.029	0.009	.010	0.010	0.048

Note: SE = standardized error. P = statistical significance Arrows indicate direction of the pathway.

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. The model remained the same except for variation in strength of 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.
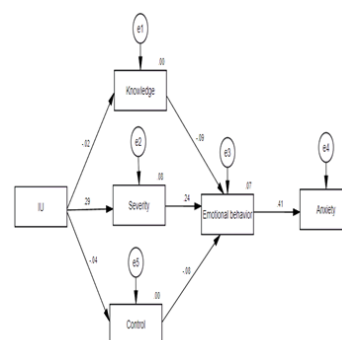

Figure 2. The mediational model of IU to anxiety via cognitive appraisal (knowledge, severity, control) and emotional/behaviour responses

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

Estimated effect	SE	*p*	95% confidence interval	
			Lower	Upper
-0.025	0.052	0.616	-0.133	0.076
0.290	0.050	< 0.01	0.178	0.283
-0.040	0.060	0.422	-0.161	0.100
-0.087	0.048	0.068	-0.179	0.017
0.242	0.052	< 0.01	0.135	0.325
-0.084	0.050	0.081	-0.174	0.028
0.413	0.038	< 0.01	0.337	0.498

Discussion

The current study aimed to explore two hypothesized pathways between intolerance of uncertainty and depression, and IU and anxiety, in an Indonesian sample. Cognitive appraisals and emotional and behavioural disturbance during COVID-19 acted as mediators. Predictions of several indirect and direct associations between IU and depression, IU and anxiety, mediated by cognitive appraisals (perceived severity, controllability and knowledge) and emotional and behavioural responses to COVID-19 (i.e. increased negative affect, lower positive affect, anxious symptoms, sleep disturbance) were supported by the findings.

Depression

The first model provides evidence for two indirect correlational pathways: first between IU and emotional/behavioural responses as mediated by perceived severity and the second between IU and depression. This supports the notion that IU increases cognitive risk factors – here by heightening perceived severity – emotional and behavioural disturbance, and psychopathology, congruent with previous studies on 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 and emotional focused coping, which then 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).

IU was expected to increase participants perceived severity of COVID-19. As stated, IU is associated with reasoning styles likely to fixate on uncertain aspects of an event and to find the uncertainty threatening. This is supported by neurophysiological alterations in brain regions typically involved with threat responses, 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 than these 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 less important than potential harm. Similarly, for controllability, precautionary actions can reduce uncertainty to an extent, but the overarching uncertainty of the pandemic cannot be easily reduced.

Secondly, direct associations between perceived severity and emotional and behavioural disturbance was expected. Cognitive contributions to threat perception are usually accompanied by an emotional component. In the absence of information, researchers postulate that risk perception and related behaviour might 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 each contribute to the perception of threat (e.g. Van Gelder et al., 2009). Both possibly play a role here although it cannot be confirmed. Likewise, perceived severity associates with increased emotional and behavioural disturbance during COVID-19 (i.e. Li et al., 2020) and has mediated between IU and anxiety alongside emotion-focused coping strategies (opposed to problem-focused) (Taha et al, 2014).

The current findings support the notion that IU can increase appraisal biases toward threat. Moreover, through a direct association in the correlational matrix and indirectly through the cognitive appraisal mediated pathway; 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 situational appraisals. Although research tends to suggest 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). However, it's likely that cognitive, emotional and behavioural factors are mutually reciprocal.

As for behavioural responses, emotional processing in humans can modulate motor-related areas (Baumgartner et al., 2007; Hajcak et al., 2007; Oliveri et al., 2003), and defensive reactions of human beings can be intensely activated in response to aversive stimuli (Mobbs et al., 2007, 2010). As such, when presented with aversive stimuli in a laboratory, the input of aversive stimuli on motor output is a central determinant of the modulation of behaviour by emotion

(Junior et al., 2013). These defence cascades could be part of the regulation process. As emotion increases in response to aversive stimuli, so does the behavioural modulation attempting to reduce it. Increased emotional intensity from the appraisal styles of IU could engage defence orientated behaviour for coping with the pandemic's threat. Interestingly, Freeston et al (2020) argued that IU is strongly associated with uncertainty-reducing behaviours for avoiding or resolving 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 increase the risk for depression. Here, Indonesian's 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 higher 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. This suggests that variables which increase perceptions of threat, such as IU, could increase the risk of depression through emotional and behavioural difficulties.

The framework of cognitive risk factors and emotional (and behavioural) dysfunction provides one interpretation. Kaiser and Scherer (1998) argued for the utility of conceptualizing various clinically salient affective disorders as malfunctions of intraindividual and interindividual regulation of normal emotions. Because powerful emotions require efforts of emotional regulation, emotion-related disturbances such as depression could develop if regulation is impaired (Mathews & MacLeod, 2005). Moreover, some researchers suggest that increased emotion, possibly due to appraisal biases, present a vulnerability factor for affective disorders (Roseman & Kaiser, 2001; Scherer & Brosch, 2009).

This seems particularly relevant under significant life events such as COVID-19. The 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, which would place individuals with cognitive vulnerabilities to affective disorders, such as those with IU, at risk of developing affective disorders. Furthermore, this could be aggravated by disruptive social restrictions. That is, by increasing difficulties in maintaining healthy behavioural patterns, especially for higher IU individuals prone to maladaptive safety seeking behaviours.

Anxiety

While this studies main purpose is to demonstrate links between IU and depression in the context of virus pandemics; evidence also supports of 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). Our 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.

This study also supports research during COVID-19. Tull et al (2020) found that IU significantly predicted health anxiety dimensions 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 with a negative outcome at a one month follow up measurement. The role of IU and perceived severity for COVID-19 in this study help to elucidate this relationship.

Uncertainty Distress

The current findings, more so for anxiety than depression, can be contextualized by Freeston et al's (2020) recent framework for 'uncertainty distress'. This was developed not just for COVID-19, but wider clinical applications to psychological difficulties. Importantly, they highlight that dispositional IU may be responsible for moderating both perception of threat and uncertainty, and, increase 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 to 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 reflect 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 during virus pandemics. Another possible interpretation is that specific emotions generated from particular appraisal patterns 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 increase the latter emotions, it provides a possible pathway for depression to 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 explore mediating or moderating effects of various constructs related to anxiety, depression and IU.

Implications for Practice

The findings of this study have theoretical and practical implications. Firstly, they support the heightening role of IU for emotional and behavioural disturbance during pandemics, and it's contribution to anxiety and affective disorders like depression. This study strengthens the link between IU and perceptions of threat, as well as research highlighting how appraisals are central to regulation of one's emotional and behavioural responses during stressful life

events. Accordingly, psychological interventions should consider incorporating IU specific treatments to help individuals distressed by the uncertainty of COVID-19, placing emphasis on the perception of threat.

It cannot be stated with certainty, but the results support arguments that affective disorders arise from maladaptive normal emotions. This seems more salient during a global pandemic than under normal circumstances, given widespread fear and disruptions to everyday life. This implies that, insofar as possible, helping individuals, especially those with high IU, manage not only their trait appraisals, but their emotional states and behaviour during pandemics is important for reducing emotional disturbance. Profiling whether specificities exist in what emotions give rise to different psychological difficulties would also be interesting. In line with previous research on coping styles, clinicians and researchers could then promote tailored problem-focused coping styles as opposed to emotion-focused coping styles, which has the potential to reduce distress caused by a pandemic.

Despite these results, the study has several limitations. A correlational and cross-sectional design was used, so inferences of causation and how variables relate overtime cannot be made. Furthermore, the measures reliability was generally good, but should be improved. Possibly, this reflects the translation process of English measures into Bahasa Indonesia. The study would benefit from more examination of translated measures. Also, the study may not be representative of the general population as the questionnaire was administered online (might not capture Indonesian citizens without access to the internet or unfamiliar with online platforms) and an unbalanced sample comprised of more female participants (72.17%).

Conclusion

COVID-19's uncertainty has been compounded for Indonesians by the lack of clear scientific and evidence-based government responses. Here, evidence is provided that intolerance of uncertainty is a risk factor for psychological distress during COVID-19 and potentially anxiety and affective disorders like depression. A part of this relationship was explained by perceived severity of COVID-19. It's possible that the cognitive perceptions of threat in IU increase maladaptation's in normal emotions and behaviour. Accordingly, educating and helping people who are intolerant to uncertainty to manage their cognitive, emotional and behavioural responses during a pandemic like COVID-19 might be key for reducing adverse psychological outcomes. Greater attention should be paid to the factors that effectively reduce the influence of IU during pandemics.

Conflicts of Interest

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

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