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Intolerance of Uncertainty Relates to Anxiety and Depression Through Negative Coping and Worry: Evidence from a Repeated-Measures Study

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Abstract

The linking mechanisms underlying the association between intolerance of uncertainty (IU) and anxiety and depression still await clarification. The current study investigated how the prospective and inhibitory components of IU related to anxiety and depression through worry and coping style. A repeated-measures design was utilized. IU and coping were measured at the first time point, worry at the second time points, and anxiety and depression were measured at the third time point. The relationship between these variables was explored using structural equation modelling. Results revealed that prospective IU led to increased worry, which further contributed to elevated levels of anxiety and depression. Inhibitory IU led to negative coping, which perpetuated worry and further resulted in anxiety and depression. The present study suggested that worry and negative coping were intermediated vulnerabilities linking IU to anxiety and depression. Further, the current study provided evidence supporting the assumption that prospective and inhibitory IU had divergent etiologic trajectories towards anxiety and depression.

Keywords Intolerance of uncertainty · Internalizing symptoms · Linking mechanism · Worry · Coping

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Introduction

Intolerance of uncertainty (IU) is defined as a dispositional incapacity to endure the aversive responses triggered and sustained by the perception of uncertainty (Carleton, 2016a). Substantial theoretical and empirical evidence has suggested IU's roles in triggering and maintaining anxiety and depression, as well as its importance as a treatment target (Carleton et al., 2012; Einstein, 2014; Grupe & Nitschke, 2013; Shihata et al., 2016). It has been pointed out that a crucial step for future research is to clarify the trajectories through which IU precipitates and perpetuates anxiety and depression (Shihata et al., 2016). Previous studies have shown that the relationship between IU and the symptoms of anxiety and depression was mediated by cognitive and behavioral vulnerabilities, including negative metacognition, fear of negative evaluation, inflated responsibility, and agoraphobic cognitions (Shihata et al., 2017), anxiety sensitivity (Wright et al., 2016), worry (Dar et al., 2017; Swee et al., 2019), rumination (Huang et al., 2019), and maladaptive coping (Rettie & Daniels, 2020). These findings suggest that there are multiple pathways linking IU to anxiety and depression and that each pathway involves specific vulnerabilities or traits held by symptomatic individuals (Shihata et al., 2016).

Worry has been shown to play an important linking role in the association between IU and the symptoms of anxiety and depression (Dar et al., 2017; Swee et al., 2019). Earlier literature conceptualized IU as a "key process variable in GAD" that generates worry (Dugas et al., 1998). Agreeing with this proposal, later studies have consistently shown that individuals with increased levels of IU demonstrated higher levels of worry (Ladouceur et al., 2000). Meanwhile, although earlier research tended to associate worry with anxiety, later studies observed that more intense worry was related to greater symptom severity of both anxiety and depression (Muris et al., 2004). McLaughlin et al. (2007) posited that a focus on the past and/or a feeling of hopelessness during worry may be involved in the development of depression, while worry with a focus on the future and/or a problem-solving intention likely generates anxiety. More importantly, the role of worry in linking IU to anxiety and depression was recently identified, demonstrating that a higher level of IU contributed to increased worry which further resulted in an enhanced level of anxiety and depression (Dar et al., 2017; Swee et al., 2019).

Moreover, IU may be associated with maladaptive ways of coping (Einstein, 2014). Coping is defined as a process of "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984; p. 141). Previous research showed that some coping efforts are adaptive and associated with increased well-being and reduced emotion disturbance (e.g., active coping), whereas other coping efforts are considered relatively maladaptive and associated with psychological symptoms (e.g., denial; Carver et al., 1989). Considering the mediating role of coping, researchers observed that individuals with high IU were more inclined to adopt emotion-focused coping in the

face of stress, which, in turn, contributed to greater anxiety (Taha et al., 2014). Similarly, Rettie and Daniels (2020) observed that maladaptive coping is a mediator in associating IU with the symptoms of anxiety and depression, supporting the assumption that the inability to tolerate uncertainty leads to ineffective coping and further results in psychological maladaptation.

Notably, IU itself can be categorized into two components, namely prospective IU and inhibitory IU (Carleton et al., 2007; McEvoy & Mahoney, 2011; Sexton & Dugas, 2009). It is assumed that prospective IU reflects a desire for predictability and leads to approach strategies (e.g., seeking information) when experiencing uncertainty, while inhibitory IU reflects the difficulty of action in the face of uncertainty and leads to avoidant strategies (e.g., delayed decision making; Birrell et al., 2011). Accordingly, prospective IU is presumed to mainly represent the cognitive dimension of IU, while inhibitory IU mainly represents the behavioral dimension of IU (Carleton, 2012). Einstein (2014) further suggested that prospective IU is sustained by the belief that having exhaustive anticipation of future possibilities is helpful. However, when imagining numerous possibilities, effective problem solving ends up being inhibited. Meanwhile, when attempting to regulate uncomfortable feelings triggered by uncertainty, individuals with high inhibitory IU may resort to a range of maladaptive behaviors (e.g., avoidance and other safety behaviors) that impair adaptive functioning (Einstein, 2014). Based on these assumptions, there may be divergent pathways linking the two components of IU to psychological symptoms.

However, few studies have examined the pathways through which prospective and inhibitory IU respectively lead to anxiety and depression symptoms. Instead, the majority of previous studies examined the direct associations between the two IU components and a variety of disorder-related vulnerabilities and symptoms (Hong & Lee, 2015; McEvoy & Mahoney, 2011, 2012). These studies demonstrated differences between the two IU components by showing that prospective IU is more strongly related to future-oriented anxiety symptoms (e.g., GAD symptoms), while inhibitory IU is more strongly related to present-focused phobic symptoms and depression (Hong & Lee, 2015; McEvoy & Mahoney, 2011). Recently, Groves et al. (2020) observed that prospective IU increased worry through positive beliefs about worry, whereas inhibitory IU was associated with negative problem orientation (i.e., not believing in one's problem-solving ability or that the problems are solvable) which consequently enhanced worry. This finding supported the assumption that the two IU components trigger distinct initial responses in the face of uncertainty (Birrell et al., 2011). Nevertheless, more research is needed to investigate the differences between prospective IU and inhibitory IU in their etiologic pathways to anxiety and depression.

Given that the mediating roles of worry (Dar et al., 2017; Swee et al., 2019) and coping (Rettie & Daniels, 2020; Taha et al., 2014) in the relationship between IU and the symptoms of anxiety and depression have been established, the current study aimed to examine whether and how the two IU components (i.e., prospective IU and inhibitory IU) were linked to anxiety and depressive symptoms through worry and coping using a repeated-measures design. Building on the abovementioned assumptions (Birrell et al., 2011; Carleton, 2012, 2016a; Einstein, 2014) and

findings (Groves et al., 2020), we proposed that individuals with high prospective IU may have an increased level of worry that serves as a cognitive strategy to seek predictability, which leads to greater anxiety and depression. We also proposed that individuals with high inhibitory IU may inhibit their behaviors and show increased negative coping (i.e., a passive way of coping) and/or decreased positive coping (i.e., an active way of coping), which perpetuates worry and increases the level of anxiety and depression. Therefore, we hypothesized that worry would mediate the association between prospective IU and the symptoms of anxiety and depression, while coping and worry would together mediate the association between inhibitory IU and these symptoms. The current study would add to the existing literature by illuminating the differences between prospective IU and inhibitory IU in their pathways to anxiety and depression. This may promote understanding of the unique contribution of prospective and inhibitory IU to the development and maintenance of anxiety and depression, and suggest potential treatment avenues for reducing the detrimental effects of IU on mental health.

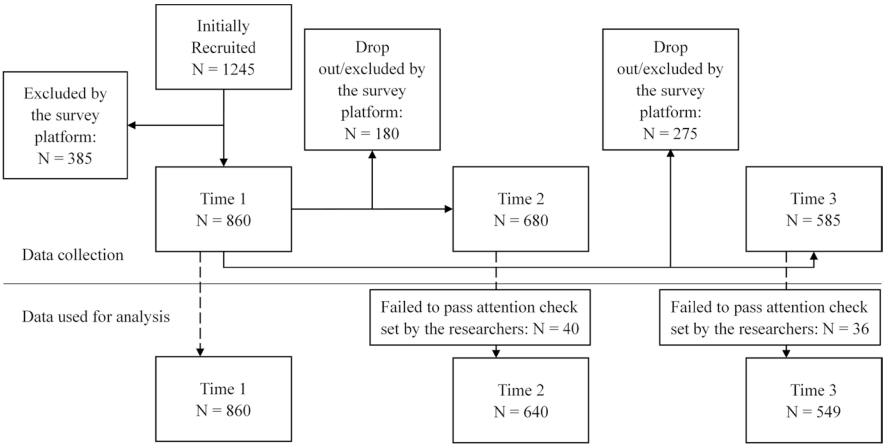
Method

Sample and Procedure

The current study contained three measurement occasions from October to December 2019. The time interval between measurement occasions was approximately 1 month. Demographic information, the level of IU, and coping styles were only measured on the first occasion, while the level of worry and the severity of anxiety and depression were measured on all three occasions.[1] All questionnaires used in the current study were in Chinese. We collected data by convenience sampling through WJX (http://www.wjx.cn), which is a commercial online survey service provider used by many universities and companies in China (Mei & Brown, 2018). WJX has a large sampling pool of registered users, who can respond to online surveys for financial incentives. In the current study, WJX served to administer our questionnaires to its registered users who were least 18 years old[2] on each measurement occasion and matched the data of each participant based on the user ID. The following procedures were employed for quality control. First, each registered user could only complete our questionnaires once.

[1] Given that uncertainty and stress embedded in everyday life could be an important contributor of psychological symptoms, the number of recent life events was also measured. Thus, the potential influence of uncertainty and stress in daily life can be controlled for. The pattern of results was generally the same whether or not the number of life events was included as a covariate. Relevant results were provided in Supplementary Materials.

[2] We did not explicitly require our participants to be Chinese speaking. Considering that WJX is a local online survey platform, it would be difficult for a non-Chinese-speaking individual to become a registered user. Further, it would also be difficult for a non-Chinese-speaking individual to respond correctly to all the attention check questions. Thus, we believe that only data from Chinese-speaking individuals were included for analysis in the current study.



Note. The survey platform served to administer questionnaires to its registered users. Only participants who met the inclusion and quality control criteria on the first occasion were invited to participate on the second and third occasions. The questionnaires contained attention check questions added by the authors, and data of participants who failed to respond correctly to these questions were not included in data analysis.

Fig. 1 Data collection procedure

Second, the survey platform would remind the participants if there were unanswered questions to ensure the completeness of the data. Third, the platform set the minimum time that participants should spend on filling in the questionnaires (i.e., 3–5 s per item) and added attention check questions intermittently to exclude participants who did not pay attention when responding to the questionnaires. See Fig. 1 for the data collection and cleaning procedure.

On the first occasion, 1245 participants were recruited by the survey platform, with 860 participants meeting the inclusion and quality control criteria. Therefore, 860 participants were invited to participate on the second and third measurement occasions. Of the 860 participants, 180 and 275 participants dropped out or were excluded by the platform (for failing to pass the attention checks) on the second and third occasions, respectively. Overall, the platform had a repeated-measures sample of 860, 680, and 585 participants on each occasion (with the 585 participants on the third occasion having also completed the second test). Beyond the attention check questions added by the platform during data collection, the authors inserted another set of attention check questions. If a participant failed to correctly respond to one of our attention check questions, his/her responses on that specific occasion were not included in data analysis, resulting in a final sample size of 860, 640, and 549 on each occasion (Fig. 1).

There were significant group differences between the individuals who were excluded or dropped out versus those who remained and were included on the second and third occasions. Generally, individuals who were younger and single were more likely to have incomplete data on the second and third occasions. Furthermore, individuals who had lower levels of IU and higher levels of depression at baseline were more likely to drop out or be excluded on the third occasion. Otherwise, the

groups of completers and non-completers were similar. See Supplementary Materials for further details.

The mean age of the total sample ($n = 860$) was 30.89 ($SD = 7.30$) ranging from 18 to 69, and 49.8% were female. The education levels of the sample were as follows: middle school and below (0.5%), high school (2.3%), higher diploma from a junior college (12.4%), bachelor's degree (75.1%), master's degree and above (9.7%). The majority of the participants were employed (89.1%), while 10% of them were students and 0.9% of them were unemployed. Regarding marital status, 66.9% of the participants were married, 32.7% were single, 0.3% were divorced, and 0.1% widowed. The study was approved by the institutional ethics board. An informed consent statement introducing the current research, the usage of data, confidentiality, and the right of participants was provided along with the questionnaires.

Measures

Intolerance of Uncertainty Scale-Short Form (IUS-12; Carleton et al., 2007; Yang, 2013)

The IUS-12 is a 12-item scale assessing negative beliefs about and reactions to uncertainty. Each item is rated on a 5-point Likert scale (1 = *not at all characteristic of me*; 5 = *entirely characteristic of me*). In correspondence with the aims of our study, the two-factor model of the IUS-12 was used to measure the prospective and inhibitory components of IU (Carleton et al., 2007). The Chinese version of the IUS-12 exhibited adequate reliability and validity (Yao et al., 2020). Descriptive statistics of the IUS-12 and its subscales were as follows: IUS-12, mean (SD) = 38.73 (7.57), $\alpha = 0.79$; prospective IU scale (IUS-P), mean (SD) = 23.91 (4.13), $\alpha = 0.55$; inhibitory IU scale (IUS-I), mean (SD) = 14.82 (4.33), $\alpha = 0.79$.

Simplified Coping Style Questionnaire (CSQ; Wang et al., 1999)

The CSQ is a 20-item questionnaire measuring the ways of coping among people in China and consists of two subscales. The positive coping style questionnaire (CSQ-P) contains 12 items measuring active ways of coping (e.g., talk to others about your concern; find different ways to solve the problem), while the negative coping style questionnaire (CSQ-N) contains 8 items measuring passive ways of coping (e.g., try to find relief by smoking, drinking, eating, and using drugs or medications). Participants were required to indicate what they generally do when facing adversity. Each item is rated on a 4-point Likert scale (0 = *Never*; 3 = *Often*). The CSQ is commonly used in China and has acceptable reliability and validity (Wang et al., 1999). In the current study, the descriptive statistics were as follows: CSQ-P, mean (SD) = 23.20 (4.56), $\alpha = 0.63$; CSQ-N, mean (SD) = 9.49 (3.84), $\alpha = 0.64$. The alpha values of the positive and negative coping scales were relatively low. As noted by previous researchers, this may be because each of the scales contained a group of coping responses and using one coping response could lessen the need to use the other coping responses when faced with adversities, resulting in low between-item

correlations (Folkman & Moskowitz, 2004). The total scores of the CSQ-P and the CSQ-N were used in data analysis.

Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990; Zhong et al., 2009)

The PSWQ is a 16-item scale measuring trait worry. Participants were required to rate each item on a Likert scale ranging from 1 (*not at all typical of me*) to 5 (*very typical of me*). The Chinese version of the PSWQ has good reliability and validity (Zhong et al., 2009). In the current study, the descriptive statistics were as follows: time point 1 ($n=860$), mean (SD) = 46.63 (11.27), $\alpha=0.92$; time point 2 ($n=640$), mean (SD) = 47.22 (11.69), $\alpha=0.93$; time point 3 ($n=549$), mean (SD) = 46.60 (11.35), $\alpha=0.92$. Data from time point 2 were analyzed. The one-factor model of the PSWQ (with a method factor) was used.

Beck Anxiety Inventory (BAI; Beck et al., 1988; Wang et al., 1999)

The BAI is a 21-item scale measuring severity of anxiety symptoms. Each item describes an anxiety symptom (e.g., numbness or tingling). Participants were required to indicate to what extent they experienced a specific symptom during the last week on a Likert scale ranging from 0 (*not at all*) to 3 (*severely, I could barely stand it*). The Chinese version of the BAI has acceptable reliability and validity (Wang et al., 1999). In the current study, the descriptive statistics were as follows: time point 1 ($n=860$), mean (SD) = 10.64 (7.84), $\alpha=0.89$; time point 2 ($n=640$), mean (SD) = 10.60 (7.57), $\alpha=0.89$; time point 3 ($n=549$), mean (SD) = 10.22 (7.63), $\alpha=0.90$. Data from the third time point were analyzed. The one-factor model of the BAI was used.

Beck Depression Inventory (BDI; Beck et al., 1988; Wang et al., 1999)

The BDI is a 21-item scale measuring the severity of depression. For each item, participants were required to indicate the extent to which they experienced a depressive symptom during the last week by choosing from four statements rated from 0 to 3. The four statements describe normal responses and mild, moderate, and severe manifestations of the depressive symptom, respectively. The Chinese version of the BDI has acceptable reliability and validity (Wang et al., 1999). In the current study, the BDI was administered on all measurement occasions, while the item related to suicide was removed on the second and third measurement occasions in order to reduce the possibility that repeated questions concerning suicidal ideation and behaviors might trigger those thoughts and urges. The 20-item BDI with the suicide item removed was used in data analysis. The descriptive statistics were as follows: time point 1 ($n=860$), mean (SD) = 11.40 (8.95), $\alpha=0.91$; time point 2 ($n=640$), mean (SD) = 12.34 (9.37), $\alpha=0.92$; time point 3 ($n=549$), mean (SD) = 11.71 (9.58), $\alpha=0.93$. Data from the third time point were analyzed. The one-factor model of the BDI was used.

Table 1 Correlations between study variables

	N	IUS_P	IUS_I	COPE_P	COPE_N	PSWQ_T2	BAI_T3
IUS_P	860						
IUS_I	860	.60**					
COPE_P	860	−.09**	−.22**				
COPE_N	860	.14**	.31**	.01			
PSWQ_T2	640	.35**	.41**	−.30**	.24**		
BAI_T3	549	.22**	.28**	−.16**	.24**	.55**	
BDI_T3	549	.22**	.29**	−.18**	.26**	.65**	.73**

Note. ** $p < .01$. Pairwise deletion was used to deal with missing data. *IUS_P*, prospective IU (time 1); *IUS_I*, inhibitory IU (time 1); *COPE_P*, positive coping (time 1); *COPE_N*, negative coping (time 1); *PSWQ_T2*, worry (time 2); *BAI_T3*, anxiety (time 3); *BDI_T3*, depression (time 3)

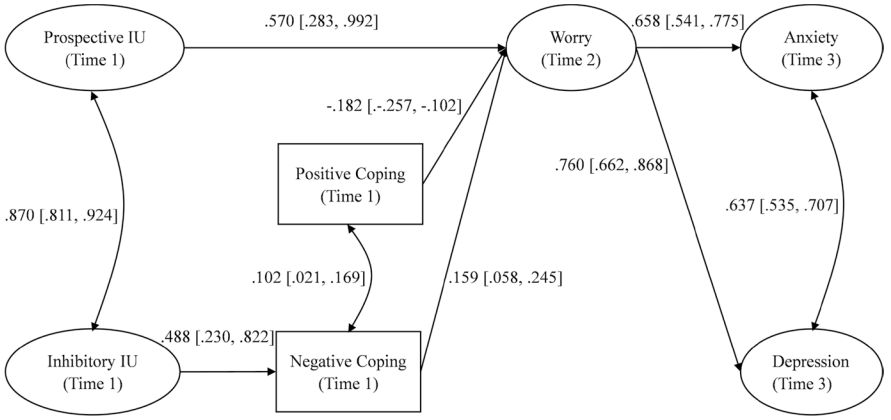
Table 2 The proportion of participants with low, median, and high levels of prospective IU and inhibitory IU and their overlaps

			Inhibitory IU		
			Group 1	Group 2	Group3
Prospective IU	Group 1	Count	72	58	0
		% within IUP groups	55.4%	44.6%	0.0%
		% within IUI groups	45.6%	10.5%	0.0%
	Group 2	Count	86	446	83
		% within IUP groups	14.0%	72.5%	13.5%
		% within IUI groups	54.4%	80.4%	56.5%
	Group 3	Count	0	51	64
		% within IUP groups	0.0%	44.3%	55.7%
		% within IUI groups	0.0%	9.2%	43.5%

Note. Group 1, 1 SD below the mean; group 2, between the mean ± 1 SD; group 3, 1 SD above the mean. *IUP*, prospective IU; *IUI*, inhibitory IU

Statistical Analysis

Descriptive statistics and correlations between study variables (Table 1) were analyzed using SPSS 19. The proportion of participants with low (i.e., 1 SD below the mean), median (i.e., within mean ± 1 SD), and high (i.e., 1 SD above the mean) levels of prospective IU and inhibitory IU as well as their overlaps were also analyzed (Table 2). Mplus 8.4 was used for structural equation modelling. Measurement models for the IUS-12, the PSWQ, the BAI, and the BDI were examined using CFA (see Supplementary Materials). Weighted least squares estimation with chi-square correction of means and variances (WLSMV) was used. Model fit was evaluated using several fit indices, including CFI > 0.90, TLI > 0.90, SRMR < 0.08, and RMSEA < 0.08.



Note. Standardized coefficients and 95% confidence intervals are presented. Only significant paths are delineated.

Fig. 2 The influence of prospective and inhibitory IU on symptoms

Then, we used the WLSMV estimator (delta parameterization) to evaluate a structural equation model (SEM). The latent variables of prospective and inhibitory IU (time point 1), worry (time point 2), and anxiety and depression (time point 3) were modeled. The CSQ-P and the CSQ-N scores (time point 1) were used as the observed predictors. We specified the following regression paths in the model. Anxiety and depression were regressed on worry, positive and negative coping, and prospective and inhibitory IU. Worry was regressed on the two coping styles and the two IU components. The two coping styles were regressed on the two IU components. (Residual) covariances between prospective and inhibitory IU, between positive and negative coping, and between anxiety and depression were included. Regression paths that reached statistical significance were included in the final model (Fig. 2). To estimate the indirect effects involved in the SEM, a bias-corrected bootstrap procedure with 1000 replications was used.[3] The Mplus default setting that uses all available data was adopted in the current study to deal with missing data (Muthén & Muthen, 2017). Given the evidence for age and gender differences in emotional disturbance as well as the influence of stressful life events on emotion (APA, 2013), we examined the abovementioned model with age, sex, and the number of life events as covariates. The model estimation results were the same with or without these covariates. Therefore, we reported the model without covariates in the main text and the model with covariates in the supplementary materials.

[3] There are some variables (i.e., several items of the BAI and the BDI) with less than ten observations in the highest category (possibly because we used a non-clinical sample), and bootstrap draws may fail to have any observation in the highest category. Therefore, for variables with less than ten observations in the highest category, we collapsed the highest two or three categories to have at least ten observations.

Results

Correlations between the study variables were all significant except for the correlation between positive coping and negative coping (Table 1). There were 115 participants who scored 1 SD above the mean of the IUS-P, while 147 participants scored 1 SD above the mean of the IUS-I. Among these participants, 64 participants scored 1 SD above the means of both the IUS-P and the IUS-I. That is, 55.7% of those who had a high level of prospective IU also had a high level of inhibitory IU; 43.5% of those who had a high level of inhibitory IU also had a high level of prospective IU.

CFA showed that the two-factor model of the IUS-12 and the one-factor models of the PSWQ (with a method factor), the BAI, and the BDI had acceptable fit (see Supplementary Materials). Subsequently, we examined how prospective and inhibitory IU affected anxiety and depression via coping and worry ($\chi^2 = 3642.070$, $df = 2390$, CFI = 0.967, TLI = 0.965, SRMR = 0.058, RMSEA [90%CI] = 0.025 [0.023, 0.026]). The findings of the model together with the standardized estimates and 95% confidence intervals are presented in Fig. 2. We further examined the indirect effects of prospective and inhibitory IU on anxiety and depressive symptoms. First, the specific indirect effects linking prospective IU to anxiety (0.375 [0.186, 0.699]) and depression (0.433 [0.210, 0.812]) through worry reached significance. Second, the specific indirect effects from inhibitory IU to anxiety (0.051 [0.015, 0.127]) and depression (0.059 [0.017, 0.145]) through negative coping and worry were significant.[4] Other specific indirect effects failed to reach significance. The results suggested that prospective and inhibitory IU were associated with anxiety and depression via different intermediary variables.

Discussion

The current study aimed to examine how prospective and inhibitory IU related to anxiety and depression via worry and coping style using a repeated-measures design. Consistent with previous studies (Dar et al., 2017; Rettie & Daniels, 2020), we observed that the two IU components exerted negative effects on mental health through increased negative coping and worry. From a stress and coping perspective (Folkman & Moskowitz, 2004), individuals with high IU may experience a higher level of distress when faced with uncertain situations and are thus motivated to seek predictability or to avoid uncertainty. However, as uncertain situations are ubiquitous in everyday life, the attempts to reduce uncertainty are often futile. As such, worry and negative coping could be regarded as examples of failed attempts to resist perceived uncertainty. Specifically, worry may facilitate exhaustive thinking of future possibilities as a way to seek predictability (Einstein, 2014), while negative coping may serve to avoid uncertain situations and postpone action or decision

[4] *p*-values for the two indirect effects were .08 (anxiety) and .09 (depression). As *p*-values are calculated based on the normal distribution assumption and bias-corrected bootstrapped intervals allow for non-normality, the latter is more appropriate when examining indirect effects.

making (Taha et al., 2014). Altogether, it is possible that both worry and negative coping could help individuals with high IU to cope with perceived uncertainty in the short term, but they are maladaptive and lead to greater emotional distress in the long term (Dar et al., 2017; Rettie & Daniels, 2020; Swee et al., 2019; Taha et al., 2014).

More importantly, the current results demonstrated that the two IU components had divergent paths to the symptoms of anxiety and depression. Based on the results of mediation analyses, prospective IU affected anxiety and depression through worry, while inhibitory IU increased negative coping which fueled worry and finally led to anxiety and depression. These findings suggested that prospective IU and inhibitory IU were associated with different response patterns in the face of uncertainty. It is possible that individuals with high prospective IU tend to resort to cognitive strategies such as worry to form a preview of future possibilities and to attain some feeling of predictability. Meanwhile, individuals with high inhibitory IU may be inclined to inhibit their behaviors by adopting negative coping strategies, which inevitably impedes effective problem-solving or self-regulation and results in an increased level of worry. The two paths observed in the current research provided support for the proposal that prospective IU is the more cognitive component of IU and primarily triggers approach strategies (i.e., worry) to seek certainty, while inhibitory IU is the more behavioral component of IU and primarily triggers avoidance (i.e., negative coping; Birrell et al., 2011; Carleton, 2012; Einstein, 2014; McEvoy & Mahoney, 2011).

It is important to note that unlike negative coping, positive coping failed to become a significant mediator in the relationship between inhibitory IU and the symptoms of anxiety and depression. In the current mediation analysis, the association between inhibitory IU and positive coping was not significant. This result suggested that the paralyzing effect of inhibitory IU primarily led to an increased use of negative coping rather than a decreased use of positive coping. Similar to the current findings, Rettie and Daniels (2020) used the 27-item IUS as a measure of IU and failed to observe a significant association between IU and adaptive coping in their mediation analyses. They suggested that IU may increase the use of some adaptive coping strategies while reducing the use of others. Specifically, they proposed that help-seeking behaviors, such as seeking social and instrumental support, could be a covert way of reassurance seeking, and individuals with high IU may rely on reassurance seeking to reduce their feelings of uncertainty. This resulted in an unstable association between IU and adaptive coping. We believe the proposal of Rettie & Daniels (2020) could help to understand our failure to observe a significant association between inhibitory IU and positive coping.

The findings of the current study have several theoretical and clinical implications. First, when considering the effects of coping and worry, the direct paths linking prospective and inhibitory IU to anxiety and depression were not significant. This result suggests that these intermediate vulnerabilities play a critical role in associating IU with the symptoms of anxiety and depression, which provides support for the possibility that IU is a basic risk factor for anxiety and depression and affects the severity of anxiety and depression in a hierarchical structure (Carleton, 2016a, b; Shihata et al., 2016, 2017). Second, the current study added to the

existing literature by illuminating the linking mechanisms underlying the relationship between the two IU components and the symptoms of anxiety and depression. By examining the pathways through which the prospective and inhibitory components of IU influenced mental health, the current findings provided empirical evidence supporting the assumption that prospective and inhibitory IU differed in their etiologic trajectories to these symptoms (Birrell et al., 2011; Carleton, 2012; Hong & Lee, 2015; McEvoy & Mahoney, 2011; Shihata et al., 2016). Third, the current findings suggested that worry and negative coping may serve as a treatment target to reduce the detrimental effects of IU on mental health. Although 55.7% of participants who had a high level of prospective IU also had a high level of inhibitory IU in the current study, these two IU components still had divergent paths to the symptoms of anxiety and depression. Therefore, we believe that assessing the levels of prospective and inhibitory IU respectively in clinical settings will provide therapists with the advantages of forming a more precise case conceptualization regarding the cognitive and behavioral vulnerabilities of their clients and developing more suitable treatment plans. Particularly, worry may be an important treatment target for individuals with high prospective IU and/or high inhibitory IU, while negative coping may be a specific treatment target for individuals with high inhibitory IU (with or without high prospective IU).

The current study also has several limitations. First, the current research used an internet-based sample of registered users of WJX, which may limit the representativeness and reliability of the current sample. Second, although we adopted a repeated-measures design, the time intervals between measurement occasions were short. Future research may stretch the time span to better delineate the development trajectories from IU to symptomology. Third, we intended to examine how IU leads to symptoms through coping and worry and measured IU and coping on the first occasion, worry on the second occasion, and symptoms on the third occasion. It would be better to also have a time lag between the measurement of IU and coping, which may allow causal inference regarding the association between IU and coping. Fourth, we measured positive and negative coping using the CSQ, yet the CSQ cannot distinguish between specific coping strategies (e.g., between seeking social support and active problem solving), making it difficult to clarify how IU was associated with different types of coping strategies. Future research may use coping scales that have subscales for particular coping strategies.

Conclusion

The current study examined how IU relates to the symptoms of anxiety and depression through coping and worry. Our results showed that prospective IU led to these symptoms through increased worry, while inhibitory IU was associated with enhanced negative coping which consequently contributed to increased worry and the experience of anxiety and depressive symptoms. These findings served to illuminate potential pathways associating prospective and inhibitory IU with the symptoms of anxiety and depression, providing empirical evidence in support of the assumption that IU affects these symptoms in a hierarchical structure and the

two IU components differed in their etiologic trajectories (Carleton, 2016a, b; Einstein, 2014). These findings also suggested treatment avenues targeting IU-related symptoms.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s41811-021-00130-w.

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Availability of Data and Materials Data and relevant materials are included in supplementary materials.

Declarations

Conflict of Interest The authors declare no competing interests.

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee.

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