

## RESEARCH ARTICLE

# Pain catastrophizing and worry about health in generalized anxiety disorder

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## Abstract

Because the diagnostic criteria of generalized anxiety disorder (GAD) are not tied to specific worry domains (worry is ‘generalized’), research on the content of worry in GAD is lacking. To our knowledge, no study has addressed vulnerability for specific worry topics in GAD. The goal of the current study, a secondary analysis of data from a clinical trial, is to explore the relationship between pain catastrophizing and worry about health in a sample of 60 adults with primary GAD. All data for this study were collected at pretest, prior to randomization to experimental condition in the larger trial. The hypotheses were that (1) pain catastrophizing would be positively related to the severity of GAD, (2) the relationship between pain catastrophizing and the severity of GAD would not be explained by intolerance of uncertainty and psychological rigidity, and (3) pain catastrophizing would be greater in participants reporting worry about health compared to those not reporting worry about health. All hypotheses were confirmed, suggesting that pain catastrophizing may be a threat-specific vulnerability for health-related worry in GAD. The implications of the current findings include a better understanding of the ideographic content of worry, which could help focus treatment interventions for individuals with GAD.

## KEYWORDS

generalized anxiety disorder, intolerance of uncertainty, pain catastrophizing, psychological rigidity, worry about health

## 1 | INTRODUCTION

The hallmark of generalized anxiety disorder (GAD) is excessive worry and anxiety *about various life domains* (American Psychiatric Association [APA], 2013; italics added). In contrast to other anxiety disorders such as panic disorder or social anxiety disorder, the content of cognition in GAD is not circumscribed to a particular domain. For this

reason, clinicians must rely primarily on how much their clients worry (or, more precisely, if their worries are excessive and difficult to control) rather than what their clients worry about in determining the presence or absence of GAD. Consequently, the vast majority of the research on worry in GAD has focused on the general tendency to worry, whereas very little research has explored worry content (also referred to as domains, themes or topics) in individuals with GAD.

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There was, however, a brief flurry of research on the content of worry in GAD in the late 1980s and 1990s. In comparing the worry topics of individuals with GAD to those of nonclinical controls, Craske et al. (1989) found that both groups reported similar levels of worry about most topics, including family, home and interpersonal relationships. However, the GAD group reported more worry about health/injury and miscellaneous issues. Likewise, Sanderson and Barlow (1990) reported that individuals with GAD worried mainly about family, finances, work and personal illness. The authors also observed that worry about minor matters was more frequently reported by patients with GAD than by patients with other anxiety disorders. Similarly, Shadick et al. (1991) observed that, relative to nonclinical individuals, patients with GAD reported more miscellaneous worries, including worries about minor matters. In 1997, Roemer et al. reported that individuals meeting diagnostic criteria for GAD had higher relative frequencies of miscellaneous (minor, routine) worries than did nonanxious individuals. Finally, Dugas, Freeston et al. (1998) found that, compared to patients with other anxiety disorders, those with a principal or secondary diagnosis of GAD reported more worry about highly remote future events (but equivalent levels of worry about relationships, work, finances and physical distress). In summary, it appears that the worry topics of patients with GAD are similar to those of patients with other anxiety disorders and nonclinical individuals, with the exception of higher proportions of worry about minor matters and (possibly) highly remote future events.

What is striking about the research on the content of worry in GAD is that it is entirely descriptive. Indeed, research on worry topics in GAD has been limited to the description of what people with GAD worry about (e.g., Dugas, Freeston et al., 1998; Shadick et al., 1991). To our knowledge, no study has explored the predictors of specific worry topics in GAD. Stated differently, although we know what people with GAD generally worry about, we do not have a precise understanding of why the content of worry varies from one affected individual to another. This is unfortunate because a better understanding of the processes involved in the generation of specific worry themes could both enhance our understanding of individual presentations of GAD and improve the relevance of ideographic treatment interventions. Thus, by identifying the vulnerability factors for specific worry themes (or threat-specific vulnerabilities), we may ultimately be able to increase the efficacy of treatment for GAD, a disorder for which cognitive-behavioural therapy has consistently produced superior outcomes (Hunot et al., 2010).

One reason for the absence of research on the risk factors for specific worry themes may be that cognitive-behavioural theories of GAD aim primarily to explain why some people experience higher levels of general worry and anxiety than others. As a result, these theories do not attempt to systematically explain or predict the content of worry. In other words, although cognitive-behavioural theories of GAD can effectively account for level of worry and anxiety, it can be argued that they are not explicitly designed to explain why individuals with GAD worry about certain topics rather than others. Although some theories do address the general principles underlying the theme

### Key Practitioner Message

- Cognitive-behavioural models and treatments for GAD focus on the tendency to worry while paying little attention to the content of worry.
- Knowledge of vulnerability to specific worry topics may lead to improvements in models and treatments for GAD.
- Our findings show that pain catastrophizing is related to the presence of health-related worry and the severity of symptoms in individuals with GAD.

of threat in GAD (see, e.g., Hirsch & Mathews, 2012), they do not speak to the vulnerability for specific worry themes.

It is therefore our contention that the central risk factors of most if not all cognitive-behavioural theories of GAD can be labelled 'threat nonspecific'. For example, the construct of intolerance of uncertainty, which is the cornerstone of the intolerance of uncertainty model of GAD (Dugas, Gagnon et al., 1998; Hebert & Dugas, 2019), does not refer to a specific life domain; uncertainty can be experienced in any situation, be it domestic, social, professional or other. Intolerance of uncertainty refers to a trait-like, negative dispositional characteristic that results from holding catastrophic beliefs about uncertainty (Robichaud et al., 2019). Specifically, individuals who are intolerant of uncertainty believe that uncertainty has negative behavioural and self-referent implications and that uncertainty is unfair and spoils everything (Sexton & Dugas, 2009). Likewise, psychological rigidity, a key construct in the acceptance-based model of GAD (Roemer & Orsillo, 2007), is also unrelated to specific life domains. Indeed, worrisome thoughts about any topic can be the subject of rigid non-acceptance. Within the acceptance-based model of psychopathology, psychological rigidity has been defined as the 'rigid dominance of psychological reactions over chosen values and contingencies in guiding action' (Bond et al., 2011, p. 678). Stated differently, individuals who are psychologically rigid tend to act in ways that will allow them to avoid unpleasant internal experiences at the expense of their values and the situational demands. The central risk factors of other cognitive-behavioural theories of GAD such as the cognitive avoidance theory (Borkovec et al., 2004), emotional dysregulation theory (Mennin et al., 2005), metacognitive theory (Wells & King, 2006) and emotional contrast avoidance theory (Llera & Newman, 2014) also do not explicitly aim to explain the presence of specific worry topics. Thus, it can be argued that compared to theories of other anxiety disorders, theoretical accounts of GAD do not adequately address individual differences in the content of threat.

Although the content of worry appears to be partially determined by the day-to-day circumstances of individuals with GAD, the data also show that worry topics are relatively stable over time. Specifically, Constans et al. (2002) observed that, in individuals with GAD, worry topics identified at baseline continued to account for over 65% of the variance in overall worry 12 months later. It appears, therefore, that the content of worry in GAD is not simply the result of day-to-

day experiences or random fluctuations. Recently, Gústavsson et al. (2021) proposed that the construct of inflated responsibility could help to explain the content of worry in GAD. In simple terms, these authors suggest that when individuals high in intolerance of uncertainty experience an inflated sense of responsibility for a particular situation (e.g., preparing their child for school), the content of their worry will relate in some way to the same situation (e.g., worry about their child having a bad day at school). In this hypothetical account, the combination of intolerance of uncertainty and an inflated sense of responsibility is instrumental in determining the extent and content of worry. Although intriguing, this is but one example of how different vulnerabilities can potentially combine to determine the extent and content of worry in GAD.

As mentioned at the outset, individuals with GAD often report worrying about their health. In fact, in studies of worry content in GAD, worry about health is consistently reported as one of the main worry themes (e.g., Craske et al., 1989; Roemer et al., 1997; Shadick et al., 1991). Furthermore, the DSM-5 explicitly mentions health as a worry topic in the Diagnostic Features section of the description of GAD (APA, 2013, p. 222). Given the prevalence of health-related worry and the lack of research into specific worry themes in GAD, we were interested in exploring pain catastrophizing as a potential vulnerability factor for health-related worry in GAD. Although pain catastrophizing has been defined in many ways (Crombez et al., 2020), most definitions include the tendency to magnify the threat value of pain and to feel helpless in the context of pain (e.g., Eccleston & Crombez, 2007; Sullivan et al., 2001). In other words, individuals who are characterized by a high level of pain catastrophizing typically ascribe a threatening meaning to pain and believe they have no control over the experience of pain. We chose the construct of pain catastrophizing as a putative vulnerability factor for worry about health for a number of reasons. First, pain catastrophizing is content specific; it relates explicitly to the experience of current or potential physical discomfort. Second, there exists a considerable body of literature supporting the association between pain catastrophizing and repetitive negative thinking about illness and pain (for reviews, see Petrini & Arendt-Nielsen, 2020; Quartana et al., 2009; Sullivan et al., 2001). Considering that illness and pain often go hand in hand, we hypothesized that pain catastrophizing and worry about one's health would be closely related.

We were also interested in exploring the uniqueness of the association between pain catastrophizing and health-related worry (and, more generally, the severity of GAD). Consequently, we chose to examine the contribution of pain catastrophizing above and beyond threat-nonspecific vulnerability factors for GAD. Although many such risk factors have been identified, we chose intolerance of uncertainty and psychological rigidity. Intolerance of uncertainty was selected because over 25 years of research supports its theoretical and clinical significance in GAD (for a review, see Robichaud et al., 2019) and because it is consistently a strong predictor of the severity of worry and GAD (e.g., Buhr & Dugas, 2006; Dugas et al., 2007). Psychological rigidity, the cornerstone of the acceptance-based model of GAD (Roemer & Orsillo, 2007), was chosen because of its well-established

transdiagnostic nature (Goldberg et al., 2018) and high relevance to current psychological theory (Follette & Hazlett-Stevens, 2016) and practice (Michalak et al., 2020). In summary, we aimed to explore the relevance of pain catastrophizing, a putative threat-specific vulnerability factor for worry about health, while accounting for the contributions of intolerance of uncertainty and psychological rigidity, well-established general (threat-nonspecific) vulnerability factors for GAD.

The main goal of the current study was to explore the relationship between pain catastrophizing, worry about health and the severity of GAD. The first hypothesis was that pain catastrophizing would be positively related to the severity of GAD. The second hypothesis was that the relationship between pain catastrophizing and the severity of GAD would not be fully explained by intolerance of uncertainty and psychological rigidity. Finally, the third hypothesis predicted that pain catastrophizing would be greater in participants reporting worry about health compared to those not reporting worry about health. Of note, the present study examines the relationships between three psychological/cognitive processes (pain catastrophizing, intolerance of uncertainty and psychological rigidity) and one psychological syndrome (GAD) characterized by a specific type of cognitive product (worry). Thus, from a theoretical point of view, we were interested in exploring how different psychological processes relate to a specific psychological syndrome or disorder.

## 2 | METHOD

### 2.1 | Participants

The present study is a secondary analysis of data from a clinical trial of a recently developed treatment for GAD, *Behavioural Experiments for Intolerance of Uncertainty* (Dugas et al., 2022). The design of the larger clinical trial was preregistered; see <https://clinicaltrials.gov/ct2/show/NCT02552108?term=Dugas&draw=2&rank=2>.

The current study uses intake data from the 60 participants included in the original trial and randomly allocated to treatment ( $n = 30$ ) or wait-list control ( $n = 30$ ). All data included in the present study were collected before randomization to condition. Participants were French-speaking adults with a primary diagnosis of GAD, as diagnosed with the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; see Section 2.2). Fifty-one (51) of the 60 participants were women, and the mean age for the total sample was 34.60 years ( $SD = 12.47$ ). Comorbid conditions were diagnosed in 40 participants, and the most common secondary conditions were social anxiety disorder ( $n = 14$ ), panic disorder ( $n = 9$ ) and agoraphobia ( $n = 9$ ; see Dugas et al., 2022, for a detailed description of the sample and recruitment procedures).

Inclusion criteria for the original clinical trial were the following: (a) at least 18 years of age; (b) primary diagnosis of GAD; (c) no change in medication type or dose in 4–12 weeks before study entry (4 weeks for benzodiazepines, 12 weeks for antidepressants and hypnotics); (d) willingness to keep medication status stable while participating in the study; (e) no evidence of suicidal intent (based on clinical

judgement); (f) no evidence of current substance abuse, schizophrenia or bipolar disorder; (g) no current participation in other trials; and (h) no evidence of anxiety symptoms due to a general medical condition based on clinical judgement (e.g., hypoglycaemia and anaemia).

## 2.2 | Measures

The ADIS-IV (Di Nardo et al., 1994) assesses anxiety disorders and screens for various other psychiatric conditions and medical problems. The ADIS-IV includes a 9-point *Clinician's Severity Rating* scale ranging from 0 (*absent or none*) to 8 (*very severe or very severely disturbing/disabling*), which provides information of the presence and severity of each disorder. Brown et al. (2001) found that the diagnostic reliability of the anxiety disorders obtained with the ADIS-IV is good,  $\kappa = .67$ . In previous studies, we obtained reliability scores ranging from  $\kappa = .66$  to  $\kappa = .70$  for the presence and severity of GAD.

The *Worry and Anxiety Questionnaire* (WAQ; Dugas et al., 2001), which was developed in French, is an 11-item self-report measure of DSM-IV (and DSM-5) diagnostic criteria for GAD. Items are rated on a 5-point Likert scale ranging from 1 to 5, with qualifiers adapted to each item. One question asks respondents to list worry themes (not included in the scoring scheme), three items assess cognitive symptoms (e.g., 'Do your worries seem excessive or exaggerated?'), six items assess somatic symptoms (e.g., 'Restlessness or feeling keyed up or on edge') and one item assesses interference ('To what extent does worry or anxiety interfere with your life?'). To ensure that the cognitive and somatic symptoms are given equal weight, the total score of the WAQ is based on a weighted sum score, where the cognitive items have a weight of 1, the somatic items have a weight of 0.5 and the interference item has a weight of 1. The WAQ has demonstrated strong psychometric properties in nonclinical and clinical samples, with strong criterion-related validity and good test-retest reliability over 4 weeks,  $r = .76$  (Dugas et al., 2001). In the current sample, the internal consistency of the WAQ was  $\alpha = .79$ .

The *Pain Catastrophizing Scale* (PCS; Sullivan et al., 1995) includes 13 items that measure thoughts and emotions related to the experience of pain. Examples of items include 'I wonder whether something serious may happen' and 'There is nothing I can do to reduce the intensity of the pain'. Items are rated on a 5-point scale varying from 0 (*Not at all*) to 4 (*All the time*). Higher scores are indicative of a greater tendency to catastrophize pain. The Original English version of the PCS has been shown to have good construct and criterion-related validity, as well as good to excellent test-retest reliability at 6 weeks,  $r = .75$  (Sullivan et al., 1995). The French translation of the PCS also has good psychometric properties, with good internal consistency,  $\alpha = .87$ , and good test-retest reliability after 6 weeks,  $r = .77$  (French et al., 2005). Although the PCS was initially developed to have three subscales (Rumination, Magnification and Helplessness), factor

analyses of both the English and French versions of the scale suggest that the use of a total score is more robust and appropriate. The internal consistency of the PCS in the present study was  $\alpha = .94$ .

The *Intolerance of Uncertainty Scale* (IUS; Freeston et al., 1994), which was also developed in French, is a self-report measure consisting of 27 items that measure negative beliefs about uncertainty (e.g., 'When I am uncertain, I can't function very well' and 'Uncertainty makes life intolerable'). Items from the IUS are rated on a 5-point scale ranging from 1 (*Not at all characteristic of me*) to 5 (*Entirely characteristic of me*), with higher scores indicating greater intolerance of uncertainty. The IUS shows excellent internal consistency ( $\alpha = .91$ ; Freeston et al., 1994), good test-retest reliability over 5 weeks ( $r = .78$ ; Dugas et al., 1997) and evidence of convergent and divergent validity (Freeston et al., 1994). The internal consistency of the IUS was  $\alpha = .91$  in the current sample.

The *Acceptance and Action Questionnaire-II* (AAQ-II; Bond et al., 2011) is a measure of psychological rigidity. Examples of items include 'I'm afraid of my feelings' and 'Emotions cause problems in my life'. The French translation of AAQ-II (Monestès et al., 2009) includes 10 items that are rated on a 7-point scale ranging from 1 (*Never true*) to 7 (*Always true*). Items 1, 6 and 10 are reverse-scored, and higher total scores are indicative of greater psychological rigidity. The original English version of the AAQ-II shows high internal consistency,  $\alpha = .84$ , and good test-retest reliability at 3 months,  $r = .81$  (Bond et al., 2011). The French translation used in this study also shows high internal consistency,  $\alpha = .83$ , and good test-retest reliability at 4 weeks,  $r = .80$  (Monestès et al., 2009). In the current sample, the internal consistency of the AAQ-II was  $\alpha = .81$ .

The *Beck Depression Inventory-II* (BDI-II; Beck et al., 1996) includes 21 items, with each item made up of 4 statements reflecting different levels of depressive symptoms (e.g., sadness, loss of interest and indecision). Respondents indicate which statement best describes them over the past 2 weeks, with scores ranging from 0 to 3. The original version of the BDI-II has very good internal consistency,  $\alpha = .92$ , and excellent test-retest reliability over 1 week,  $r = .93$  (Beck et al., 1996). The French translation of the BDI-II also has sound psychometric properties, including showing evidence of convergent, divergent and discriminant validity (Alsaleh & Lebreuilly, 2017). The internal consistency of the BDI-II was  $\alpha = .84$  in the present sample.

The *Beck Anxiety Inventory* (BAI; Beck et al., 1988) is a 21-item measure of anxiety (primarily somatic anxiety) experienced during the past week (e.g., numbness or tingling, heart pounding/racing and hands trembling). Items are rated on a 4-point scale, ranging from 0 (*not at all*) to 3 (*severely*). The original English version of the BAI has high internal consistency,  $\alpha = .92$ , and good test-retest reliability at 1 week,  $r = .81$  (Beck et al., 1988). The French translation of the BAI shows high internal consistency,  $\alpha = .92$ , acceptable test-retest reliability at 4 weeks,  $r = .63$ , and evidence of convergent and divergent validity (Freeston et al., 1994). In the current study, the internal consistency of the BAI at intake was  $\alpha = .87$ .

## 2.3 | Data analytic approach

The first hypothesis (that pain catastrophizing would be positively related to the severity of GAD) was tested using a zero-order correlation between the PCS and the WAQ. To test the second hypothesis (that the relationship between pain catastrophizing and the severity of GAD would not be explained by intolerance of uncertainty and psychological rigidity), we used a hierarchical linear regression predicting scores on the WAQ. The IUS and AAQ-II were entered in the first step, and the PCS was entered in the final step. The third hypothesis (that pain catastrophizing would be greater in participants reporting worry about health compared to those not reporting worry about health) was tested with a one-way analysis of variance (ANOVA) comparing scores on the PCS in participants reporting or not reporting health worries. Note that the BDI-II and the BAI were not used to test the study's hypotheses; they were solely used to describe the sample and present their correlations with the other measures.

**TABLE 1** Sociodemographic and clinical characteristics of sample.

	<i>n</i>	%	<i>M</i>	<i>SD</i>
Sex				
Women	51	85.0		
Men	9	15.0		
Age			34.60	12.47
Racial and ethnic identity				
White/European Canadian	52	86.7		
Black/African-Canadian	3	5.0		
Hispanic/Latinx	1	1.7		
Asian Canadian	1	1.7		
Multi-ethnic	1	1.7		
Education				
High school	8	13.3		
College	16	26.7		
College certificate	3	5.0		
Bachelor's degree	20	33.3		
Master's or doctorate	13	21.7		
Number of comorbid disorders				
0	20	33.3		
1	25	41.7		
2	9	15.0		
3	6	10.0		
Study measures				
Worry and Anxiety Questionnaire			42.63	6.93
Pain Catastrophizing Scale			25.43	11.40
Intolerance of Uncertainty Scale			82.38	17.64
Acceptance and Action Questionnaire-II			35.75	9.24
Beck Depression Inventory-II			21.20	8.84
Beck Anxiety Inventory			24.73	10.69

## 3 | RESULTS

The data were first screened for multivariate outliers, univariate outliers and normality of distribution. All statistical assumptions were met, and no corrections were applied to the dataset. The sociodemographic and clinical characteristics of sample are presented in Table 1.

### 3.1 | Hypothesis 1: Pain catastrophizing will be positively related to the severity of GAD

The first hypothesis was tested using a zero-order correlation between scores on the PCS and the WAQ, which revealed a positive and significant correlation between both measures,  $r = .41, p < .001$ . The strength of the association between the PCS and the WAQ was moderate (Cohen, 1988). Thus, in the total sample ( $N = 60$ ), the greater the tendency to catastrophize the experience of pain, the

greater the severity of GAD. Table 2 presents the zero-order correlations between all study measures.

### 3.2 | Hypothesis 2: The relationship between pain catastrophizing and the severity of GAD will be independent of intolerance of uncertainty and psychological rigidity

Hypothesis 2 was tested with a stepwise linear hierarchical regression, where the severity of GAD as measured by the WAQ was the predicted variable. The IUS and the AAQ-II were entered in the first step of the regression, and the combination of these variables significantly predicted 30% of the variance in scores on the WAQ,  $F = 12.37$ ,  $p < .001$ . In addition, each measure (IUS and AAQ-II) made a unique and significant contribution to the prediction of scores on the WAQ. We then entered the PCS in the second step to explore the unique contribution of pain catastrophizing to the severity of GAD. The results show that the addition of the PCS significantly increased the variance explained in scores on the WAQ by 6% ( $F = 5.12$ ,  $p = .027$ ). In the final model, only the IUS and PCS made unique and significant contributions to the prediction of scores on the WAQ. The complete results of the stepwise linear regression are presented in Table 3.

### 3.3 | Hypothesis 3: Pain catastrophizing will be greater in participants reporting worry about health compared to those not reporting worry about health

Prior to testing the third hypothesis, the total sample was divided into two subsamples: (1) participants reporting worry about their personal health and (2) participants not reporting worry about their personal health. To do so, we used the data from Question 1 of the WAQ, which asks participants to list their six most common worry themes (Question 1 is not used to calculate the score on the WAQ). Participants who reported worrying about their health comprised the first group (Health Worry Group,  $n = 29$ ), whereas those who did not report worrying about their health made up the second group (Other

**TABLE 2** Zero-order correlations between study measures.

	WAQ	PCS	IUS	AAQ-II	BDI-II	BAI
WAQ	-					
PCS	.41**	-				
IUS	.50***	.20	-			
AAQ-II	.45***	.45***	.52***	-		
BDI-II	.35**	.28*	.43***	.53***	-	
BAI	.56***	.28*	.55***	.62***	.60***	-

Abbreviations: AAQ-II, Acceptance and Action Questionnaire-II; BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory-II; IUS, Intolerance of Uncertainty Scale; PCS, Pain Catastrophizing Scale; WAQ, Worry and Anxiety Questionnaire.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

**TABLE 3** Linear hierarchical regression: Analysis of scores on the Worry and Anxiety Questionnaire.

Predictors	$\Delta R^2$	$\beta$	$t$	$p$
Model 1	.30***			
IUS		.36	2.81	.007
AAQ-II		.27	2.06	.044
Model 2	.06*			
IUS		.38	3.01	.004
AAQ-II		.14	1.00	.324
PCS		.27	2.26	.027

$N = 60$

Abbreviations: AAQ-II, Acceptance and Action Questionnaire-II; IUS, Intolerance of Uncertainty Scale; PCS, Pain Catastrophizing Scale.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

Worry Group,  $n = 31$ ). The clinical characteristics of each group are presented in Table 4.

We then used a one-way ANOVA to test the third hypothesis. Specifically, we compared pain catastrophizing as measured by the PCS in the Health Worry Group and in the Other Worry Group. The results reveal a significant difference between the groups, with a medium effect size  $F(1, 58) = 6.21$ ,  $p = .016$ ,  $d = 0.62$ . As predicted, the tendency to catastrophize pain was stronger in the Health Worry Group ( $M = 29.07$ ,  $SD = 11.36$ ) than in the Other Worry Group ( $M = 22.03$ ,  $SD = 10.51$ ). Of note, we found no between-group differences for the WAQ,  $F(1, 58) = 1.47$ ,  $p = .230$ ,  $d = 0.31$ ; the IUS,  $F(1, 58) = 0.042$ ,  $p = .838$ ,  $d = 0.05$ ; and the AAQ-II,  $F(1, 58) = 2.98$ ,  $p = .090$ ,  $d = 0.44$ . Thus, compared to participants in the Other Worry Group, participants in the Health Worry Group reported a higher level of pain catastrophizing but similar levels (nonsignificant differences) of GAD severity, intolerance of uncertainty and psychological rigidity. Nonetheless, to ensure that the between-group difference in pain catastrophizing was independent of the severity of GAD, we conducted an analysis of covariance (ANCOVA) comparing scores on the PCS in both groups, with scores on the WAQ as the covariable. The results were unchanged; scores on the PCS continued to distinguish the Health Worry Group from the Other Worry Group,  $F(1, 57) = 4.62$ ,  $p = .036$ ,  $d = 0.56$ . The effect size of the between-group difference remained in the moderate range when controlling for the severity of GAD.

Because scores on the PCS can be influenced by the presence of pain, we explored between-group differences in self-reported pain. To do so, we asked participants to answer the following question (yes or no) at intake assessment: 'During our lives, most of us feel pain from time to time (for example, headaches, toothaches). Over the past eight days, have you felt pain that went beyond this type of "normal" pain?' (see Cleeland & Ryan, 1994). In response to this question, 16 of 29 participants (55.2%) in the Health Worry Group and 17 of 31 participants (54.8%) in the Other Worry Group reported the experience of pain. A Chi-square test revealed no difference in self-reported pain between the groups ( $\chi^2 = .001$ ,  $p < .979$ ), suggesting that the higher

**TABLE 4** Clinical characteristics of the health worry group and the other worry group ( $n = 31$ ).

Measures	Health worry group ( $n = 29$ )		Other worry group ( $n = 31$ )	
	M	SD	M	SD
WAQ	43.74	6.03	41.58	7.62
PCS	29.07	11.36	22.03	10.51
IUS	81.90	16.63	82.84	18.80
AAQ-II	33.66	8.33	37.71	9.75
BDI-II	21.69	7.85	20.74	9.78
BAI	25.69	11.07	23.84	10.42

Abbreviations: AAQ-II, Acceptance and Action Questionnaire-II; BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory-II; IUS, Intolerance of Uncertainty Scale; PCS, Pain Catastrophizing Scale; WAQ, Worry and Anxiety Questionnaire.

PCS scores in the Health Worry Group were not explained by higher frequencies of current self-reported pain.

Taking this approach one step further, we asked individuals reporting pain over the past 8 days how long they had been experiencing this pain. We subsequently compared the proportion of participants in the Health Worry Group and Other Worry Group who reported experiencing significant pain for at least the previous 3 months, following guidelines regarding current definitions of chronic pain. We found that 14 of 28 participants (50.0%) in the Health Worry Group and 12 of 31 participants (38.7%) in the Other Worry Group reported the experience of significant (beyond 'normal') pain lasting at least 3 months. A Chi-square test again showed no difference in self-reported chronic pain between these groups ( $\chi^2 = .761$ ,  $p < .383$ ), similarly suggesting that the higher PCS scores in the Health Worry Group were not explained by higher frequencies of self-reported chronic pain.

## 4 | DISCUSSION

The findings of the current study suggest that pain catastrophizing is related to the severity of GAD, with higher levels of pain catastrophizing being related to more severe symptoms of GAD. Moreover, the relationship between pain catastrophizing and the severity of GAD does not seem to be accounted for by psychological rigidity and intolerance of uncertainty. In addition, pain catastrophizing and intolerance of uncertainty appear to be uniquely associated with the severity of GAD, whereas this does not seem to be the case for psychological rigidity. The findings also suggest that health-related worry in GAD is related to greater pain catastrophizing, yet unrelated to the severity of GAD, psychological rigidity and intolerance of uncertainty. Finally, the relationship between pain catastrophizing and health-related worry is not explained by the severity of GAD or the experience of pain.

From a theoretical perspective, the current findings have noteworthy implications. As mentioned at the outset, because the content of worry in GAD is both extensive and variable, existing cognitive-behavioural models of GAD have not been explicitly designed to predict or explain individual patterns of worry content. Given the

diagnostic criteria of GAD (APA, 2013), this is of course understandable. Nonetheless, a better understanding of the vulnerability factors for specific worry themes could promote a better understanding of the aetiology of GAD. For example, as correctly pointed out by Gústavsson et al. (2021), individuals with GAD are not intolerant of uncertainty in every situation. One way to make sense of this observation is that their negative beliefs about uncertainty are activated in specific situations. It may be that the situations that are most likely to activate negative beliefs about uncertainty (leading to biased cognitive processing, worry, anxiety and avoidance/safety-seeking behaviours) are those that are closely related to the person's threat-specific vulnerabilities. Pain catastrophizing appears to be such a vulnerability factor. To illustrate, imagine an individual with high levels of intolerance of uncertainty and pain catastrophizing and who experiences sudden chest pain. Given their tendency to overestimate the dangerousness of the chest pain and to feel helpless when experiencing pain (i.e., catastrophic appraisal of pain), their negative beliefs about uncertainty would most likely be activated. In such a context, the individual would have great difficulty tolerating the uncertainty of the origins of their chest pain and would experience health-related worry.

A similar dynamic could also apply to other threat-specific vulnerability factors. For instance, vulnerabilities related to social situations such as having unrealistic social standards (Hofmann, 2007) could very well lead to catastrophic appraisals of social situations and excessive worry about interpersonal issues in individuals who are intolerant of uncertainty (or who possess other general vulnerabilities for GAD). Likewise, vulnerabilities related to beliefs about the value of asceticism (Fairburn et al., 1999) could promote biased appraisals and worry about physical appearance in GAD. If this were indeed the case, our understanding of GAD could be improved by considering both general vulnerabilities (such as intolerance of uncertainty, psychological rigidity, cognitive avoidance or emotional dysregulation) and threat-specific vulnerabilities (such as pain catastrophizing, having unrealistic social standards or having strongly held beliefs about the value of asceticism). Stated differently, the combination of general and specific vulnerabilities could account for both the overall tendency to worry as well as the ideographic content of worry.

From a clinical point of view, the current findings suggest that the assessment of pain catastrophizing in clients with GAD who report

worrying about their health may provide considerable benefits. First, the standardized assessment of pain catastrophizing at pretreatment can provide a baseline of the client's overall level of pain catastrophizing. Second, the identification of specific strongly held beliefs related to the experience of pain (e.g., on the PCS, 'There is nothing I can do to reduce the intensity of the pain' or 'I feel I can't stand it anymore') can provide valuable information for the design of exposure exercises or behavioural experiments. For example, a behavioural experiment in which the client adopts a mild and progressive exercise programme for 1 month and rates fluctuations in their level of pain can be used to test the belief that there is nothing they can do to reduce the intensity of their pain. Although there is no clear consensus on the gold standard for the measurement of pain catastrophizing (see Crombez et al., 2020), there exist a number of acceptable measures that allow for the identification of specific testable beliefs about the experience of pain.

The repeated assessment of pain catastrophizing during treatment also provides the client and therapist with the opportunity to measure treatment progress. Considering that pain catastrophizing appears to be a vulnerability factor for health-related worry in GAD, decreases in pain catastrophizing scores during therapy should signal a diminished susceptibility to engage in worry about health. This may offer important advantages. Indeed, when one considers that the content of worry in GAD shows a moderate level of fluctuation over time (Constans et al., 2002), simply monitoring the frequency or intensity of worry about health may not be sufficient to reliably predict future changes in health worry. However, if the repeated assessment of pain catastrophizing reveals a significant and stable decrease in catastrophic beliefs about the experience of pain, then the chances of a subsequent recurrence of excessive health-related worry should be lessened. Obviously, the same should hold true for other vulnerability factors, whether they be general or threat-specific.

The present study, of course, is not without limitations. First, like all measures of pain catastrophizing, the PCS (Sullivan et al., 1995) has recently come under criticism. For example, Crombez et al. (2020) conducted an item content analysis of six measures of pain catastrophizing (including the PCS) and found that all measures showed less than ideal content validity. The authors even suggested that the measures do not actually assess pain catastrophizing when one uses a narrower definition ('to view or present pain-related problems as considerably worse than they actually are'). In other words, existing measures of pain catastrophizing may be too broad and may consequently overestimate the explanatory power of pain catastrophizing. Having said this, the PCS is the most commonly used measure of pain catastrophizing currently available, and its psychometric properties (in English and French) are more than acceptable, making it the best choice for the current study.

A second limitation of this study is that psychological rigidity was conceptualized and measured as a general, threat-nonspecific vulnerability factor. However, some authors have argued that the construct of psychological rigidity should be viewed as a threat-specific

vulnerability factor. In fact, there exists a measure of acceptance of pain, the Chronic Pain Acceptance Questionnaire (CPAQ; McCracken et al., 2004), which measures psychological rigidity as it relates to the experience of pain. Because we did not administer the CPAQ in the current study, we are not in a position to disentangle the contributions of pain catastrophizing and acceptance of pain to health-related worry. Finally, our study was limited in that only two general vulnerability factors were measured, intolerance of uncertainty and psychological rigidity. Consequently, our results speak only to the intolerance of uncertainty model of GAD (Dugas, Gagnon et al., 1998; Hebert & Dugas, 2019) and the acceptance-based model of GAD (Roemer & Orsillo, 2007). Whether pain catastrophizing makes a unique contribution to the severity of GAD and health-related worry when other general vulnerabilities are considered remains open to question and awaits further study.

In summary, the present study explored the relationship between pain catastrophizing, the severity of GAD and worries about health. The results show that pain catastrophizing made a unique contribution to the severity of GAD and was related to the presence of health-related worry. To our knowledge, this study is the first to explore a threat-specific vulnerability factor in GAD. Although our study was highly exploratory in nature, the results suggest that our understanding of GAD can be refined by considering the potential role of vulnerability factors that are specific to topics, themes or domains. It is our hope that future studies will address the precise theoretical and clinical implications of our novel findings.

#### CONFLICT OF INTEREST STATEMENT

We have no conflicts of interest to disclose.

#### DISCLAIMER

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#### REGISTRATION

This study was registered with [ClinicalTrials.gov](https://clinicaltrials.gov) (Identifier NCT02552108).

#### DATA AVAILABILITY STATEMENT

The data and measures used in the current study can be obtained from the primary author (MJD).

#### ETHICS APPROVAL

The handling of study participants was in accordance with established ethical guidelines and the study was approved by the Human Research Ethics Committee of the *Université du Québec en Outaouais*.

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