SUMMARY

Over the past two decades increasingly compelling research has identified pain catastrophizing as an important psychological risk factor for a wide range of pain-related outcomes. In response to this literature, there have been calls for the clinical use of catastrophizing as a prognostic indicator of problematic recovery, and for the development of clinical interventions that target catastrophizing and its correlates. This article provides a review of the evidence-based assessment and management tools that are available.

Previous research has linked elevated levels of catastrophic thinking to increased pain intensity, exaggerated pain behavior, decreased physical function and prolonged disability.

The Pain Catastrophizing Scale is a 13-item questionnaire that instructs participants to rank the frequency of their pain-related thoughts on a five-point scale; scores above 20 indicate elevated risk for problematic recovery and warrant further clinical attention.

A multipronged approach that incorporates different interventions to target catastrophic thinking and its correlates is likely to be one of the most effective methods to reduce elevated levels of pain catastrophizing.

Cognitive behavioral treatments that include 5–10 weeks of weekly thought monitoring and restructuring interventions have been associated with reductions in the frequency and impact of catastrophic thinking.

Disclosure interventions can be used to control the pain intensity of individuals with elevated levels of pain catastrophizing and to facilitate engagement with multipronged intervention programs.

The wide range of mediums for implementing brief reassurance and activity encouragement interventions make them particularly well suited to primary care settings.

Emerging research suggests that one face-to-face session of neurophysiological education can help reduce levels of pain catastrophizing.

Graded activity and graded exposure interventions have been demonstrated to be effective in improving pain-related outcomes in individuals with low-to-moderate levels of psychosocial risk.

Practice Points

- Reducing catastrophic thinking associated with pain

Timothy H Wideman & Michael JL Sullivan

McGill University, Psychology Department, Montreal, Quebec, H3A 1B1, Canada

Author for correspondence: Tel.: +1 514 398 5877; Fax: +1 514 398 4896; michael.sullivan@mcgill.ca
for the clinical management of patients with elevated levels of catastrophic thinking. Recent research and clinical implementation strategies are discussed for the following interventions: cognitive behavioral techniques, emotional disclosure, reassurance and activity encouragement, neurophysiological education, and graded activity and exposure.

Over the past three decades, increasing research has suggested that pain and pain-related disability cannot be fully explained by traditional medical models. In response to these findings, biopsychosocial models have emerged as the predominant framework for conceptualizing pain management [1–3]. In addition to physical factors, these models highlight the influence of psychological and social variables in determining pain-related outcomes. Pain catastrophizing is one psychological factor that has emerged as a robust determinant of a variety of clinical pain outcomes. Pain catastrophizing, defined as an exaggerated negative orientation toward pain-related stimuli, has been characterized by three maladaptive dimensions: rumination (i.e., persistent negative thoughts about pain), magnification (i.e., increased threat value attributed to pain-related stimuli) and helplessness (i.e., perceived lack of control over pain-related symptoms) [4]. The purpose of this article is to provide a brief review of the current evidence-based management strategies that are relevant for patients with elevated levels of catastrophic thinking.

Clinical importance of catastrophic thinking
Previous research has linked catastrophic thinking to increased pain intensity, exaggerated pain behavior, decreased physical function and prolonged disability [4–7]. Previous results suggest that levels of catastrophizing explain up to 31% of the variance in pain intensity [4]. Elevated levels of catastrophic thinking have been linked with indicators of emotional distress, such as anxiety, pain-related fear, depression and suicidal ideation [5,8,9]. Pain catastrophizing has also been linked with negative pain-related outcomes within samples of children and across a wide range of ethnic groups [10–13]. In acute settings, presurgical levels of catastrophizing have been linked to postsurgical pain, analgesic intake and duration of hospitalization [14–16]. In samples of individuals with work-related injuries, elevated levels of catastrophic thinking have been linked prospectively with poor treatment response and decreased likelihood of return to work [17].

Pain catastrophizing has been suggested to influence pain-related outcomes through a range of theoretical mechanisms, including activation of negative pain schemas, maladaptive appraisals of pain-related stressors and coping resources, attention biases to pain-related stimuli, and solicitation of social support through the expression of exaggerated pain behaviors [4,5,18]. Past research also suggests that pain catastrophizing is related to alterations in pain modulation pathways. For example, recent findings suggest that pain catastrophizing interferes with descending inhibitory pathways and enhances pain-facilitation pathways [19].

Pain catastrophizing has also been demonstrated to be a modifiable risk factor. Reductions in levels of catastrophizing have been achieved through targeted interventions [17,20,21], and have been shown to prospectively predict improvements in pain intensity and return-to-work outcomes [20,22,23]. This has prompted calls for the clinical identification of pain catastrophizing as a risk factor for problematic recovery and for the development of interventions that target elevated levels of catastrophizing as a means of improving pain-related outcomes [4–6].

Clinical assessment
In 1983, Rosenstiel and Keefe developed the first clinical scale to include a measure of pain catastrophizing [24]. The Coping Strategies Questionnaire (CSQ) quantifies participants’ use of seven coping styles, one of which is pain catastrophizing. The six items that form the catastrophizing dimension of the CSQ primarily measure thoughts related to helplessness. While the CSQ has been demonstrated to be a reliable and valid measure of pain-related coping [24–27], recent findings suggest that the catastrophizing dimension of this scale shares considerable overlap with measures of negative mood; therefore, it is possible that the unidimensional nature of the CSQ’s catastrophizing scale may limit its predictive utility [27].

In 1995, Sullivan developed the Pain Catastrophizing Scale (PCS) [28]. Today, the PCS represents the most comprehensive and widely used measure of catastrophizing. The PCS combines the helplessness items from the CSQ, with additional items to tap the magnification
and rumination dimensions of pain catastrophizing. The PCS is a 13-item questionnaire that instructs participants to rate the frequency of their pain-related thoughts on a five-point scale that ranges from ‘not at all’ (zero) to ‘all the time’ (four) [101]. The scale takes approximately 5 min to complete and is written at a grade-six literacy level (a modified version of the PCS, written at a grade-four reading level, has been developed for children) [29]. The PCS is available for public use without cost and can be downloaded in several languages [101]. The reliability and validity of the PCS and its underlying constructs have been supported in diverse clinical populations, and across genders, age groups, cultures and languages [30]. Previous research has identified a cut-off score of 20 as a useful indicator for identifying increased risk of problematic recovery [31].

Reducing pain catastrophizing in clinical settings

Research has shown that a wide variety of interventions can lead to reductions in levels of catastrophizing. For example, both interventions that do and do not target psychosocial processes (e.g., cognitive–behavioral interventions vs engagement in physical activity) have been demonstrated to reduce levels of catastrophizing [21,23]. While a range of untargeted interventions have been demonstrated to lower levels of catastrophizing, it remains unclear whether the reductions in pain catastrophizing achieved through these interventions are sufficient to prevent the long-term, negative implications associated with this risk factor.

Growing literature suggests that a multipronged approach might be the most effective means of reducing elevated levels of pain catastrophizing. Such an approach incorporates different intervention techniques that target not only catastrophic thinking, but also its psychosocial and behavioral correlates, such as depression, pain-related fear, pain behavior and activity avoidance. Recently developed multipronged intervention programs have been effective in reducing both the frequency and negative impact of catastrophic thinking. For example, Sullivan developed a 10-week structured intervention program that aimed to reduce levels of catastrophizing through a variety of avenues, such as emotional disclosure, graded activity and cognitive behavioral techniques [31–33]. Recent results suggest that patients who participated in both this program and standard physical therapy experienced, on average, a 37.7% reduction in their levels of catastrophic thinking, and were 50% more likely to return to work than individuals who only received physical therapy [33]. Clinical interventions that have been integrated within such multipronged programs, or have been shown to be effective as standalone treatments for pain catastrophizing, are reviewed in the following sections.

- **Cognitive behavioral interventions**

  Cognitive behavioral therapy (CBT) refers to a class of treatments that aim to directly intervene with maladaptive thinking. These interventions are guided by the theoretical framework that thoughts influence emotions, which in turn influence behaviors [34,35]. Thought monitoring and cognitive restructuring are two CBT techniques that have been used to target elevated levels of catastrophizing. Within these interventions, patients are first asked to log their pain-related thoughts, feelings and activities. Next, patients are assisted in identifying the maladaptive consequences of a catastrophic interpretation of their symptoms. Strategies are then developed to help patients develop a less pessimistic interpretation of pain-related stimuli.

  Thorn et al. recently conducted a randomized trial that compared the efficacy of CBT with wait-lists control at reducing the frequency of catastrophic thinking in individuals with chronic headaches [21]. Patients were guided through ten classes that implemented thought monitoring and restructuring interventions. Results revealed significant reductions in catastrophic thinking, improvements in pain-related affect and, for half of the treatment sample, clinically meaningful reductions in headache symptoms. Upon treatment completion, study participants averaged a 25.7% reduction in levels of pain catastrophizing; 1 year later, catastrophizing levels were further reduced by 21.8%. Similar CBT interventions have been associated with 10–38% reductions in catastrophizing [23,36–40]. Research exploring the mechanisms by which CBT influences pain-related outcomes is limited, but suggests that reductions in catastrophizing mediate improvements in levels of pain intensity and function [23,36]. Few studies have compared the effects of CBT to alternative evidence-based interventions. One such study demonstrated that activity-based interventions and CBT interventions are equally more effective in their ability to reduce levels of catastrophizing compared with wait-list controls [23]. Results from previous CBT
Emotional disclosure

Emotional disclosure is a brief psychosocial intervention designed to help patients communicate perceptions of their pain experience and its emotional impact. Previous research suggests that emotional disclosure may be an important intervention for individuals with elevated levels of catastrophizing [34,43]. In an early study involving patients with arthritis, four sessions of disclosure resulted in improved psychological symptoms compared with high catastrophizers who did not disclose. Further studies investigating the effectiveness and mechanism of action of disclosure interventions are needed to warrant its use as a standalone intervention for individuals with elevated levels of catastrophizing [49].

While evidence supporting the clinical impact of emotional disclosure as a standalone treatment is scarce, it has been suggested that this intervention can be conceptualized as a motivational tool to enhance the impact of complementary treatments [43]. For example, emotional disclosure has been used at the onset of an intervention program that targets elevated psychosocial risk factors for disability [20,31,32]. In this context, emotional disclosure has been conducted by asking a series of open-ended, interview-style questions that aim to facilitate the narration of patients’ pain stories. Questions are organized such that their emotional content progresses from low (e.g., can you describe the events surrounding the onset of your symptoms?) to high (e.g., how has your pain condition influenced your hopes for the future?). After disclosing their pain stories, patients are expected to experience positive feelings, and to associate these feelings with their therapist. Within the context of a multipronged pain management program, this increased therapeutic alliance is expected to facilitate engagement and positive expectations with other interventions, such as graded activity and cognitive behavioral interventions [43]. While these mechanisms have been proposed to explain the benefits of using disclosure as part of a multipronged intervention, they await empirical validation.

Reassurance & activity encouragement

Reassurance and activity encouragement are brief psychosocial interventions designed to facilitate the resumption of physical activities following the development of pain symptoms [1,43]. Previous research suggests that these interventions are associated with improvements on several of pain catastrophizing’s correlates, such as pain intensity, pain-related fear and disability [50–52]. Reassurance aims to demystify and demedicalize the pain condition by providing accurate medical information, describing the expected trajectory of recovery and identifying signs that may be indicative of serious pathology (i.e., red flags). The intended message of reassurance is that the pain condition does not pose a serious health risk, pain is not a reliable sign of tissue damage and that recovery is possible without invasive interventions. Activity encouragement aims to convey the message that, despite persistent pain-related symptoms, physical activity is safe, beneficial and should not be avoided.
Reassurance and activity encouragement have been successfully administered via a variety of mediums that range from information booklets, to group classes, to televised media campaigns. Recent randomized controlled trials suggest that single interventions of reassurance and activity encouragement can have an impact on a variety of pain-related outcomes. For example, Brison et al. demonstrated that a 20-min video intervention delivered to individuals with acute whiplash disorders resulted in significant reductions in levels of pain intensity 6 months following the intervention [51]. A recent study using healthy individuals revealed that a 45-min presentation supplemented with an information booklet resulted in significant improvements in fear avoidance beliefs [52]. Despite these results, effect sizes associated with one-time interventions remain quite modest [53], and are further reduced in individuals with elevated levels of catastrophizing [43]. For these reasons, reassurance and activity encouragement interventions are commonly administered in the context of multipronged, disability-prevention programs [54,55].

**Neurophysiology education**

Recent findings suggest that education regarding the neurophysiological mechanisms of pain is associated with improved pain-related outcomes. The goal of physiology-based pain education is to use evidence-based theory to teach patients about the processes underlying their pain experiences. Patients receive instruction on the structure, function and plasticity of the pain-related neurological system.

Results from several studies suggest that neurophysiological education is associated with reductions in levels of pain catastrophizing. Moseley et al. demonstrated that chronic back pain patients receiving one 3-h education session experienced significant improvements in measures of pain catastrophizing, physical impairment and disability [56]. More recently, results from a double-blind, randomized controlled trial revealed that pain education resulted in significant reductions in the rumination dimension of catastrophizing [57]. Results from uncontrolled studies have also lent support for this intervention when delivered in clinical settings [58–60]. Despite these encouraging findings, research relating to neurophysiological education is still in its infancy, and questions still remain regarding its mechanisms of action, long-term effects and the potential benefits of combining this treatment with established intervention programs.

**Graded activity & graded exposure**

The fear avoidance model of pain suggests that elevated levels of pain catastrophizing are associated with increased levels of fear of movement and progressive avoidance of pain-related activities [8]. The fear avoidance model of pain also suggests that increased levels of catastrophizing and fear are associated with heightened expectations that pain-related activities will be followed by (re-)injury [61]. Graded activity (GA) and graded exposure are behavioral interventions designed to help patients progressively increase their participation in pain-related activities and, in doing so, challenge maladaptive beliefs that physical activity causes harm [8,62].

Graded activity encourages patients to increase their participation in pain-related activities by using progressive activity-based, or time-based quotas. GA is initiated by monitoring current levels of physical activity to establish baseline levels of tolerance. Based on these findings, daily activity quotas are established and assigned as homework. Patients are encouraged to adhere to the quotas regardless of pain levels. By dissuading patients to surpass pre-established quotas, even when they feel no increase in pain, there is a decreased likelihood that the physical activity will flare up their symptoms. As a result, patients are expected to experience positive feelings of achievement and self-efficacy upon completing their activity quotas. At follow-up appointments, therapists further reinforce these positive feelings with reassurance and activity encouragement. Weekly activity quotas are then re-evaluated and progressively increased.

Graded exposure works toward a similar objective as GA, but progresses the level of activity involvement based on levels of fear [63]. Participants are first asked to generate a ranked list of fear-related physical activities. Starting with their least feared activity, patients are asked to describe the anticipated consequences of performing the activity. Once the activity has been completed, the patient is asked to re-rate their activity-related fear and to reflect on its actual pain-related consequences. The progressive participation in feared activities is designed to explicitly challenge patients'
pessimistic expectations regarding the consequences of physical activity, thereby decreasing levels of fear and catastrophizing and increasing levels of activity.

Both GA and graded exposure have been associated with improvements in psychosocial risk factors and levels of disability [64–67]. Previous research suggests that, despite their divergent approaches, these interventions are associated with comparable improvements in levels of pain-related disability [68,69]. Recent findings suggest that improvements in levels of pain-related disability were dependent on reductions in levels of pain catastrophizing, rather than the type of graded intervention used [68]. GA has been identified as a cost-effective, standalone intervention that is effective for individuals with low-to-moderate levels of psychosocial risk [67]. While some studies suggest that graded exposure is more effective than GA in reducing levels of catastrophizing [69,70], this effect appears to be buffered when individuals have high levels of catastrophizing [71,72]. The efficacy of these interventions for individuals with high levels of fear and catastrophizing is probably improved by implementing them within a multipronged treatment program [33,66,73].

Conclusion & future perspective

Compelling research suggests that elevated levels of pain catastrophizing are associated with a wide range of negative outcomes. Reliable and valid self-report measures have been developed to help clinicians evaluate the risk associated with patients’ levels of catastrophic thinking. In recent years, there has also been increased data to support the use of clinical interventions that specifically target pain catastrophizing and its correlates.

The next 5–10 years of research in this field is expected to focus on the further development and testing of cost-effective treatment strategies for individuals with elevated levels of catastrophizing. Future research will need to further explore secondary prevention programs that can effectively target psychosocial risk factors within primary care settings. Research exploring subgroups of patients that are most likely to be treatment responders for particular interventions is expected to further improve the cost-effectiveness of such preventative programs. Furthermore, research addressing the combination of different therapies, such as pharmaceutical and psychosocial interventions, will be instrumental in the development of clinically valid guidelines for patient management. Future research is also expected to shed further light on the mechanisms by which catastrophic thinking is reduced, and the most cost-effective means of achieving these reductions in clinical practice.

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Reducing catastrophic thinking associated with pain REVIEW


64 Comprehensive textbook that addresses the theory and implementation of graded exposure interventions.


Website


Excellent resource for scoring and interpreting the Pain Catastrophizing Scale. This manual also provides percentile distributions for the Pain Catastrophizing Scale and its subscales.