

PSYCHOLOGICAL FEATURES

Catastrophizing and Perceived Injustice

Risk Factors for the Transition to Chronicity After Whiplash Injury

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Study Design. The article will summarize research that has supported the role of pain catastrophizing and perceived injustice as risk factors for problematic recovery after whiplash injury.

Objective. This article focuses on two psychological variables that have been shown to impact on recovery trajectories after whiplash injury; namely pain catastrophizing and perceived injustice.

Summary of Background Data. Research has shown that psychological variables play a role in determining the trajectory of recovery after whiplash injury.

Methods. This article will focus on two psychological variables that have been shown to impact on recovery trajectories after whiplash injury; namely pain catastrophizing and perceived injustice. The article will summarize research that has supported the role of pain catastrophizing and perceived injustice as risk factors for problematic recovery after whiplash injury.

Results. Several investigations have shown that measures of catastrophizing and perceived injustice prospectively predict problematic trajectories of recovery after whiplash injury. Basic research points to the potential roles of expectancies, attention, coping and endogenous opioid dysregulation as possible avenues through which catastrophizing might heighten the probability of the persistence of pain after whiplash injury. Although research has yet to systematically address the mechanisms by which perceived injustice might contribute to prolonged disability in individuals with whiplash injuries, there are grounds for suggesting the potential contributions of catastrophizing, pain behavior and anger.

Conclusion. A challenge for future research will be the development and evaluation of risk factor-targeted interventions

aimed at reducing catastrophizing and perceived injustice to improve recovery trajectories after whiplash injury.

Key words: catastrophizing, disability, pain, perceived injustice, whiplash. **Spine 2011;36:S244–S249**

Over the past two decades, considerable research has accumulated indicating that medical status variables alone cannot fully account for presenting symptoms of pain and disability associated with whiplash injury.^{1–3} Biopsychosocial models have been put forward suggesting that a complete understanding of pain experience and pain-related outcomes associated with whiplash injury will require consideration of physical, psychological, and social factors.^{4–7} Numerous investigations have shown that psychological variables play a role in determining the trajectory of recovery after whiplash injury.^{8–10}

This article will focus on two psychological variables that have been shown to impact on recovery trajectories after whiplash injury; namely pain catastrophizing and perceived injustice. The paper will summarize research that has supported the role of pain catastrophizing and perceived injustice as risk factors for problematic recovery after whiplash injury.

RELATION BETWEEN PAIN CATASTROPHIZING AND WHIPLASH INJURY OUTCOMES

Pain catastrophizing has been broadly defined as an exaggerated negative orientation to actual or anticipated pain comprising elements of rumination, magnification, and helplessness.¹¹ A number of descriptive studies have reported findings indicating that measures of catastrophizing correlate significantly with distress-related variables such as anxiety, fear, and depression.¹¹ It has been suggested that catastrophizing might be a cognitive antecedent of emotional distress associated with pain.¹²

Numerous cross-sectional studies have shown that pain catastrophizing is associated with a number of adverse health and mental health outcomes in patients with whiplash injuries.^{13–18} Several studies have also examined the predictive value of pain catastrophizing within prospective designs. Söderlund *et al*¹⁹ found that high scores on a measure of catastrophizing were associated with less symptom reduction after a rehabilitation intervention for acute whiplash. Sullivan *et al*²⁰ reported that treatment-related reductions in catastrophizing

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were associated with greater probability of return to work in a sample of patients with chronic whiplash after a 10-week rehabilitation intervention. In a sample of individuals with mixed musculoskeletal injuries (*i.e.*, back sprain, whiplash), Sullivan *et al*²¹ reported that high scores on pain catastrophizing predicted pain intensity at 1-year follow-up, even when controlling for initial pain severity, depression, and fear of movement and re-injury.

CATASTROPHIZING AND CHRONICITY: MECHANISMS OF ACTION

Research to date has yet to elucidate the mechanisms by which catastrophizing might contribute to chronicity after whiplash. Nevertheless, other domains of pain research point to the potential roles of expectancies, attention, coping, and endogenous opioid dysregulation as possible avenues through which catastrophizing might heighten the probability of the persistence of pain and disability after whiplash injury.

Catastrophizing and Expectancies

Research has provided support for a relation between pain catastrophizing and response expectancies. In an experimental study, Sullivan *et al*²² reported that pain catastrophizing was associated with expectancies for heightened pain and expectancies heightened emotional distress. Van Damme *et al*²³ also found a significant relation between pain catastrophizing and pain expectancies and suggested that the pain expectancies of high pain catastrophizers might promote hypervigilance to pain signals.

It has been suggested that negative outcome expectancies have a detrimental impact on behavior or performance by compromising the effort or motivational resources that will be required to achieve certain outcomes.^{24,25} In the case of individuals who have sustained whiplash injuries, negative expectancies for the resumption of pre-injury activities might reduce the likelihood that individuals will choose or initiate behaviors necessary to resume these activities. Alternately negative expectancies might compromise the individuals' persistence in the face of challenges or obstacles in their goal pursuits. In turn, low levels of activity might lead to additional problems such as deconditioning, demoralization, and depression.

Catastrophizing and Attention

It has been suggested that pain catastrophizing might impact on pain-related outcomes by increasing attention to pain sensations. It is long been established that increased attention to pain sensations augments the intensity of perceived pain.²⁶⁻²⁹ A number of early studies provided data indicating that attention diversion strategies such as distraction were less effective when used by individuals with high levels of pain catastrophizing.³⁰⁻³³ In addition, several studies have reported that among the three subscales of the Pain Catastrophizing Scale (*i.e.*, rumination, magnification, helplessness), rumination was the best predictor of pain intensity and pain-related disability.³⁴⁻³⁶

In an elegant series of studies, Van Damme *et al*^{23,37} reported findings suggesting that pain catastrophizing might

be associated with an attentional disengagement deficit. The results of the latter studies indicated that pain catastrophizing did not necessarily lead individuals to be more vigilant to pain, but once attention was oriented to a pain stimulus, pain catastrophizing appeared to interfere with disengagement from the pain stimulus. Neuroimaging studies have also provided evidence that attentional mechanisms might account, at least in part, for the relation between catastrophic thinking and pain outcomes.^{11,38}

In individuals who have sustained whiplash injuries, increased attention to pain might contribute to a cascade of psychological and neurophysiological consequences ultimately contributing to a trajectory of chronicity. Increased attention to pain might lead to more intense pain experience, contribute to more intense emotional distress, and interfere with the effectiveness of coping strategies. It is not unreasonable to assume that, over time, these psychological influences might alter the central architecture of nociceptive processing leading to a chronic hyperalgesic state.³⁹

Catastrophizing and Coping

Coping generally refers to the strategies that individuals use to minimize the impact of life stressors on their psychological well-being.⁴⁰ In one of the earliest studies to address the relation between coping and pain catastrophizing, Spanos *et al*⁴⁰ reported that pain catastrophizers and non-catastrophizers did not differ in the number of coping strategies they reported using during a cold pressor procedure. Interestingly, however, for non-catastrophizers, there was an association between number of coping strategies and degree of pain reduction. For pain catastrophizers, number of coping strategies reported was not associated with pain reduction. Similar findings were subsequently reported by other investigators suggesting that pain coping strategies are less effective when used by pain catastrophizers.^{31,32}

There are indications that individuals who catastrophize might be more likely to adopt activity reduction as a strategy to manage their pain. Verbunt *et al*⁴¹ reported that, after an episode of low back pain, high catastrophizing was associated with more prolonged bed rest. At 1-year follow-up, individuals who used bed rest as a pain management strategy reported more pain and were more disabled. It appears that some of the strategies that catastrophizers use to manage their pain might yield short-term benefit but longer term costs.

Catastrophizing and Endogenous Pain Modulation

A growing body of research suggests that catastrophizing might impact on adverse pain outcomes through its influence on neurophysiological mechanisms. It has been suggested that catastrophizing might be associated with dysregulation or dysfunction in endogenous opioid pain-control systems that might compromise the effectiveness of pharmacological interventions for pain.^{42,43} It has also been suggested that catastrophizing might compromise processes involved in descending inhibition of pain.⁴⁴ Recent findings suggest that pain catastrophizing may facilitate processes involved in temporal summation of pain or "windup."⁴⁵ It has been suggested that

pain catastrophizing might interfere with descending pain-inhibitory systems, facilitate neuroplastic changes in the spinal cord during repeated painful stimulation, subsequently promoting sensitization in the central nervous system.

Other studies have also established a link between pain catastrophizing and the operation of peripheral and central pain-modulatory systems. For example, two recently published articles have reported a negative association between pain catastrophizing and diffuse noxious inhibitory controls, a psychophysical measure of endogenous pain inhibition.^{46,47} Edwards *et al*⁴⁸ reported that higher levels of catastrophizing were associated with increased serum levels of cortisol and interleukin-6 after the administration of a noxious stimulus. The authors suggested that catastrophizing might influence pro-inflammatory immune system responses that might modulate pain experience. Clinical and experimental studies have shown that catastrophizing is associated with greater muscle fatigue during physical performance task.⁴⁹ Increased muscle fatigue and exaggerated inflammatory responses might be processes by which catastrophizing impacts negatively on functional abilities.

THE RELATION BETWEEN PERCEIVED INJUSTICE AND WHIPLASH INJURY OUTCOMES

Particularly in situations where injury has occurred as a result of another's error or negligence, the injury victim might experience post-injury life with a sense of injustice.⁵⁰ Perceptions of injustice can ensue from acts or conditions that might cause someone to suffer hardship or loss undeservedly.^{51,52} The experience of unnecessary suffering as a result of another's actions, or the experience of irreparable loss are likely to give rise to the perception of injustice.⁵⁰

A few recent studies have examined the relation between injury-related perceptions of injustice and pain-related outcomes after whiplash injury. Sullivan *et al*²¹ described the development of the Injustice Experience Questionnaire (IEQ). On this measure, perceived injustice is construed as an appraisal cognition comprising elements of the severity of loss consequent to injury ("Most people don't understand how severe my condition is"), blame ("I am suffering because of someone else's negligence"), a sense of unfairness ("It all seems so unfair"), and irreparability of loss ("My life will never be the same"). Research suggests that the IEQ yields two correlated factors that have been labeled severity/irreparability of loss and blame/unfairness.²¹

In a prospective study of individuals with mixed musculoskeletal injuries (*i.e.*, back sprain, whiplash), Sullivan *et al*²¹ reported that high scores on perceived injustice predicted work disability at 1-year follow-up, even when controlling for initial pain severity, catastrophizing, depression, and pain-related fears. Treatment-related reduction in perceived injustice was the only psychological variable that was associated with increases in walking speed in individuals with whiplash participating in a physical rehabilitation program.

Perceived injustice has also been associated with the persistence of post-traumatic stress symptoms in individuals who

have sustained whiplash injuries. Sullivan *et al*⁵³ examined the predictors of recovery of post-traumatic stress symptoms in a sample of individuals with recent onset whiplash injuries who were participating in a multidisciplinary rehabilitation program. Individuals who scored in the clinical range on a measure of post-traumatic stress symptoms, and who scored high on a measure of perceived injustice, were less likely to show recovery of their post-traumatic stress symptoms than individuals with low scores on perceived injustice.

Research on the prognostic value of perceived injustice for recovery outcomes of individuals with whiplash injuries is still in its infancy. Nevertheless, the studies that have been conducted to date suggest that perceived injustice might be a significant determinant of response to rehabilitation interventions, and a powerful predictor of prolonged occupational disability in individuals who have sustained whiplash injuries. Although research has yet to systematically address the mechanisms by which perceived injustice might contribute to prolonged disability in individuals with whiplash injuries, there are grounds for suggesting the potential contributions of catastrophizing, pain behavior, and anger.

Perceived Injustice and Catastrophizing

In the research conducted to date, perceived injustice has been highly correlated with catastrophizing. With respect to mechanisms of action, the high correlation between perceived injustice and catastrophizing suggests that perceived injustice might impact on pain outcomes, at least in part, in a manner similar to catastrophizing. In other words, attentional disengagement difficulties, emotional distress, and maladaptive coping might also be vehicles through which perceived injustice impacts on pain outcomes. As with catastrophizing, perceived injustice might contribute to excessive focus on pain symptoms, or focus on loss, thereby contributing to depressive reactions further complicating recovery.⁵⁴

The magnitude of the correlations that were observed between catastrophizing and perceived injustice invites reflection about the degree of overlap between these constructs. The "severity/irreparability of loss" dimension of the IEQ likely overlaps to a substantive degree with the exaggerated negative orientated toward pain that characterizes catastrophizing. However, the "blame/unfairness" dimension of the IEQ is neither reflected in the conceptual framework that underlies catastrophizing or the item content of the pain catastrophizing scale.³² Catastrophizing has been discussed in terms of threat appraisals or coping orientation; neither model entertains blame as a central element of the processes involved in catastrophizing.^{11,55} There are a few studies that suggest that catastrophizers might be prone to experiencing various aspects of their lives in terms of injustice. One study showed that catastrophizing was correlated with a measure of interpersonal vindictiveness.⁵⁶ Another study showed that catastrophizing was associated with higher scores on a measure of support entitlement.⁵⁷ These findings further suggest that catastrophizing and perceived injustice might impact on pain and disability through similar mechanisms and might respond to similar intervention approaches.

Perceived Injustice and Pain Behavior

A recent experimental study showed that high scores on perceived injustice were associated with heightened displays of pain behavior in individuals who had sustained whiplash injuries.⁵⁸ Pain behaviors can take varied forms including activity avoidance, redistribution of weight to alleviate pressure on affected limbs, holding or rubbing affected areas of the body, facial grimaces, and vocalizations.⁵⁹ Research shows that heightened expressions of pain behavior are associated with a variety of adverse outcomes such as increased pain, depression, functional disability, and prolonged work absence.^{60,61}

There is research to show that pain behavior is a significant and independent predictor of prolonged work absence after musculoskeletal injury.⁶¹ The expression of pain behavior might contribute to disability directly by compromising task performance efficiency. The expression of pain behavior might also contribute to disability indirectly by influencing others' judgments of an individual's ability to perform certain tasks. Pain behavior is one of the primary means by which observers infer someone's pain experience.^{59,62} The observation of heightened levels of pain behavior in an injured patient might lead physicians to infer high levels of pain and in turn, consider prescribing an extended period of sick leave. The observation of heightened levels of pain behavior might also lead an employer to consider that the employee is unable to meet his or her occupational responsibilities. As such, pain behavior may not only be disruptive to activity engagement, but the social response to pain behavior might also contribute to prolonged disability.

Perceived Injustice, Anger, and Revenge Motives

It has been suggested that anger reactions might be elicited by perceptions of injustice.⁶³ Social psychological research has shown that the blame attributions for negative outcomes are likely to trigger anger responses.⁶⁴ Anger reactions have been discussed as central to the experience of perceived injustice.^{50,65} Anger reactions that take the form of nonadherence to treatment recommendations could impact on recovery trajectories after whiplash injuries.

It has also been suggested that anger might give rise to revenge motives to "right the wrongs" of the unjust situation.⁶⁶ There are indications that revenge motives are associated with a higher frequency of intrusive cognitions related to the injustice event.⁶³ Under some circumstances, it is possible that "disability" might represent the only "power" that an individual possesses in efforts to bring about retribution for losses sustained.

SUMMARY OF RESEARCH ON MECHANISMS AND CONSEQUENCES OF PAIN CATASTROPHIZING AND PERCEIVED INJUSTICE

Research to date suggests that catastrophizing prospectively predicts prolonged pain and disability after whiplash injury. Catastrophizers expect to experience more pain than non-catastrophizers, and they experience more intense and widespread pain than non-catastrophizers. Catastrophizers

may have mental control deficits in relation to disengaging their attention from painful stimuli, and in turn, attentional disengagement deficits might contribute to their heightened pain experience and increased emotional distress. Cognitive coping strategies appear to be less effective when used by catastrophizers, perhaps as a result of difficulties in disengaging their attention from pain. Catastrophizers are more likely to use activity reduction as a means of coping with their pain, which might contribute to a number of additional problems such as disuse, deconditioning, and prolonged disability. Disuse and deconditioning may also emerge as a result of exaggerated inflammatory responses and increased muscle fatigue associated with catastrophizing. Pro-inflammatory responses, increased muscle fatigue, and greater susceptibility to windup pain might explain why catastrophizing might contribute to poor response to physical rehabilitation interventions.

The research suggests that directly or indirectly, catastrophizing appears to lead to an "amplification" of pain experience. The amplification of pain experience can lead to the experience of more intense and prolonged emotional distress states, which, in turn, might also increase the probability of adverse outcomes. Coupled with the attentional disengagement difficulties, negative outcome expectancies, and ineffective coping strategies, high catastrophizers might be impaired in their ability to modulate or manage their pain experience, again increasing the probability that pain experience will be more intense or more prolonged.

Perceived injustice is emerging as a potential risk factor for prolonged pain and disability after whiplash injury. Research points to pain behavior as one vehicle through which perceived injustice impacts on whiplash-related disability. Pain behavior may be used as a vehicle to convince observers about the magnitude of the client's suffering and disability. A number of theoretical frameworks have proposed that communication goals might underlie many forms of pain behavior.^{62,67} Pain behavior displays may also influence the clinicians' or the employers' judgments about readiness to return to work, indirectly contributing to prolonged work absence.⁶⁸ Challenges for future research will include the development of paradigms that might elucidate the motives underlying the expression of different forms of pain behavior and the degree to which these motives are consciously represented.

As a result of the robust relation between pain catastrophizing, perceived injustice and adverse health and mental health outcomes associated with whiplash injury, numerous investigators have called for greater consideration of the pain-related psychological risk factors in the clinical management of individuals with whiplash injuries.^{14,17,69} It has been suggested that assessment of pain catastrophizing and perceived injustice should be part of routine clinical evaluation of individuals with whiplash injuries and that interventions be implemented that specifically target these risk factors. Although numerous investigations have reported reductions in catastrophizing after participation in a variety of rehabilitation interventions, there have been no clinical trials evaluating the effectiveness of different interventions for the reduction of pain catastrophizing or perceived injustice.⁷⁰ Furthermore,

it remains unclear whether the reductions in catastrophizing reported after participation in rehabilitation interventions are of sufficient magnitude to translate into improved clinical outcomes. A challenge for future research will be the development and evaluation of risk factor-targeted interventions aimed at reducing catastrophizing and perceived injustice to improve recovery trajectories after whiplash injury.

➤ Key Points

- ❑ Research supports the role of pain catastrophizing and perceived injustice as risk factors for problematic outcomes after whiplash injury.
- ❑ Measures of pain catastrophizing and perceived injustice should be considered in clinical evaluations of individuals with whiplash injuries.
- ❑ Risk factor-targeted interventions might improve recovery outcomes for individuals with initial high scores on measures of pain catastrophizing and perceived injustice.

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