

# Catastrophizing and Pain: Mechanisms of Action



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The University of Queensland and Griffith University.



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## Pain Catastrophizing

*...has emerged as one of the most robust and powerful predictors of adverse recovery outcomes following whiplash injury.*

## Pain Catastrophizing

*as an exaggerated negative "mental set" brought to bear during actual or anticipated pain experience,,,,,comprising elements of rumination, magnification and helplessness.*



 University of Utah  
 Psychological Services  
**PCS**

Client No: \_\_\_\_\_ Age: \_\_\_\_\_ Sex: M\_ F\_ Date: \_\_\_\_\_

Experience experimental painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. There are other exposure to situations that they have pain such as stress, worry, dental procedures or injury.

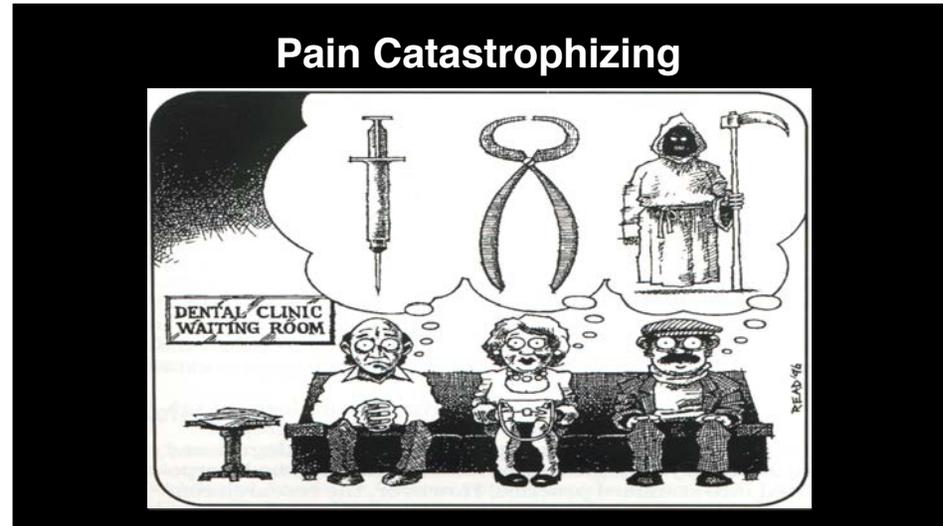
We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are broader statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

0 - not at all    1 - to a slight degree    2 - to a moderate degree    3 - to a great degree    4 - all of the time

When I'm in pain ...

- I worry all the time about whether the pain will end.
- I feel I can't go on.
- It's terrible and I think it's never going to get any better.
- It's awful and I feel that it overwhirls me.
- I feel I can't stand it anymore.
- I become afraid that the pain will get worse.
- I keep thinking of other painful events.
- I occasionally want the pain to go away.
- I can't seem to keep it out of my mind.
- I keep thinking about how much it hurts.
- I keep thinking about how badly I want the pain to stop.
- There's nothing I can do to reduce the intensity of the pain.
- I wonder whether something serious may happen.

...Total



Research Paper  
PAIN

### Heritability of pain catastrophizing and associations with experimental pain outcomes: a twin study

Zina Trost<sup>1\*</sup>, Eric Strachan<sup>2†</sup>, Michael Sullivan<sup>3</sup>, The Vervoort<sup>4</sup>, Aly R. Avery<sup>5</sup>, Nicolae Atarfi<sup>6\*</sup>

**Abstract**

This study used a twin paradigm to examine genetic and environmental contributions to pain catastrophizing and the observed association between pain catastrophizing and cold-pressor task (CPT) outcomes. Male and female monozygotic (n = 206) and dizygotic twins (n = 194) from the University of Washington Twin Registry completed a measure of pain catastrophizing and performed a CPT challenge. As expected, pain catastrophizing emerged as a significant predictor of several CPT outcomes, including cold-pressor immersion Tolerance, Pain Tolerance, and Delayed Pain Rating. The heritability estimate for pain catastrophizing was found to be 37% with the remaining 63% of variance attributable to unique environmental influence. Additionally, the observed associations between pain catastrophizing and CPT outcomes were not found attributable to shared genetics or environmental exposure, which suggests a direct relationship between catastrophizing and experimental pain outcomes. This study is the first to examine the heritability of pain catastrophizing and potential processes by which pain catastrophizing is related to experimental pain response.

**Keywords:** Catastrophizing, Twins, Genetics, Pain sensitivity

“The heritability estimate for pain catastrophizing was 37% with the remaining 63% of variance attributable to environmental influence”

## The Biology of Pain Catastrophizing

## Association of catastrophizing with interleukin-6 responses to acute pain

Robert R. Edwards<sup>a,b,\*</sup>, Tarek Kronfli<sup>b</sup>, Jennifer A. Haythornthwaite<sup>b</sup>,  
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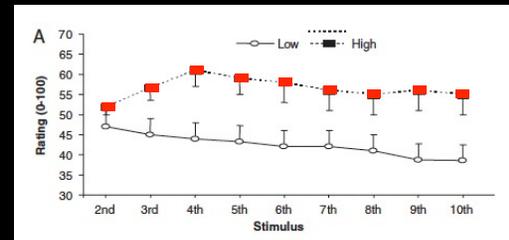
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**“The amplification of inflammatory responses to acute stress may partly underlie catastrophizing’s enduring effects on pain outcomes.”**

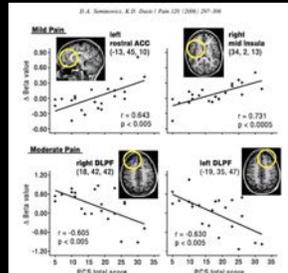
ORIGINAL ARTICLE

## Pain-related Catastrophizing in Healthy Women Is Associated With Greater Temporal Summation and Reduced Habituation to Thermal Pain

Robert R. Edwards, PhD<sup>a</sup>, Michael T. Smith, PhD<sup>a</sup>, Gregory Stoneruck, BA,<sup>a</sup>  
and Jennifer A. Haythornthwaite, PhD<sup>a</sup>



**“...alterations in central pain processing may play a role in the effects of catastrophizing”.**



**Catastrophizing associated with increased activation of brain centres responsible for modulation of affective, and motor aspects of pain.**

**Catastrophizing associated with decreased activation of brain centres involved in descending inhibition of pain.**

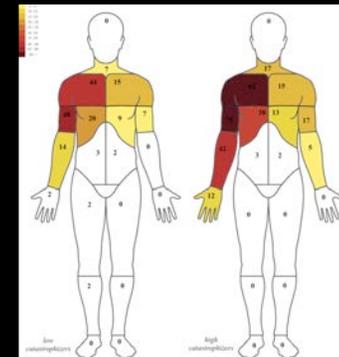
## Catastrophizing and Widespread Pain

Delayed onset muscle soreness  
DOMS



Day 1

Low PCS      High PCS



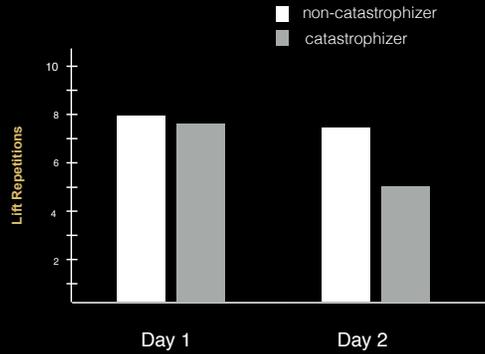
Day 2

# Catastrophizing and Physical Performance Decrements

Delayed onset muscle soreness  
DOMS



Day 1



Activity-related summations of pain and functional disability in patients with weightlift injuries

Wahner JL, Sahrmann M, Christian Linderoth M, Magnusson M

**Abstract**

**Objective:** To investigate the relationship between pain and functional disability in patients with weightlift injuries.

**Design:** Cross-sectional study.

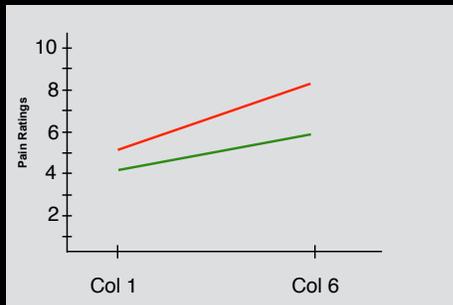
**Setting:** Outpatient clinic.

**Participants:** 100 patients with weightlift injuries.

**Measures and Main Results:** The study found a significant correlation between pain and functional disability. The mean pain rating was 4.5 (SD 1.5) and the mean functional disability was 17.4 (SD 17.6). The correlation coefficient was 0.60 (p < 0.001).

**Conclusion:** Pain and functional disability are significantly correlated in patients with weightlift injuries.

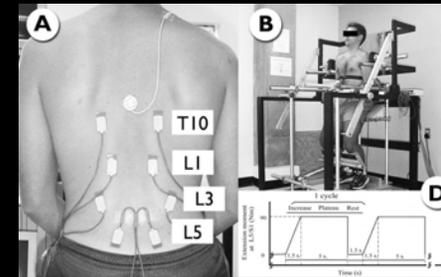
Measure	Mean	SD	95% CI
Pain rating	4.5	1.5	3.0-6.0
Functional disability	17.4	17.6	0.0-35.0



*“Catastrophizing was associated with a 60% increase in pain across repeated lifts.”*

## Poor Back Muscle Endurance Is Related to Pain Catastrophizing in Patients With Chronic Low Back Pain

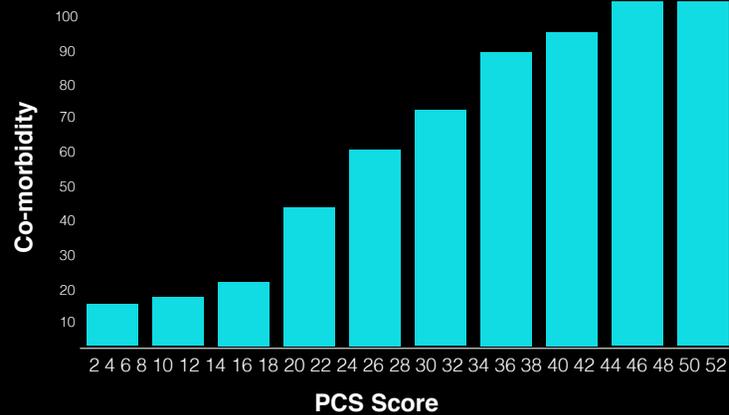
Christian Larivière, PhD,\*† Martin Bilodeau, PT, PhD,‡ Robert Forget, PT, PhD,†§  
Roger Vadeboncoeur, MD,† and Hakim Mecheri, Eng, MSc†



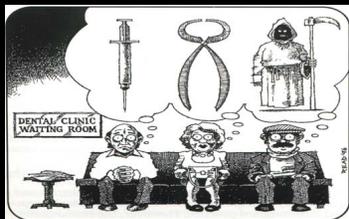
# Catastrophizing and Treatment Response



## Co-Morbidity of Depression or PTSD



*End-of-treatment PCS Scores above 20 predict failure to maintain treatment gains made in rehabilitation.*

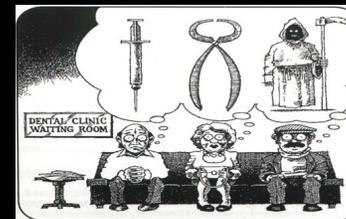


**Pain Severity**

Exaggerated inflammatory response leading to sensitisation of the nerve system?

Increased pain sensitivity may reflect dysfunction of central pain modulation?

Spreading of pain might reflect a deficit in endogenous pain inhibition?

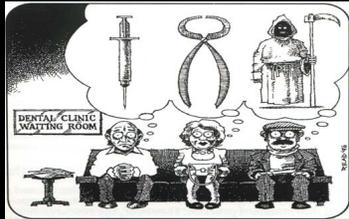


**Disability**

Fatigue could lead to lower tolerance for physical activity.

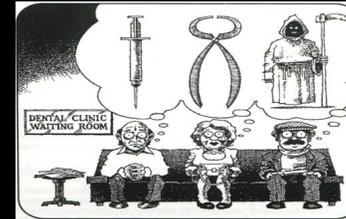
Physical performance decrements in response to pain could compromise ability to successfully complete physical tasks.

Sensitivity to movement-evoked pain might lead to negative expectancies for recovery.



**Opioid Misuse**

- Poor response to analgesics.
- Poor response to rehabilitation interventions.
- Poor response to surgical interventions.



**Depression**

- Excessive focus on symptoms.
- Cognitive disengagements deficits.
- Inability to effectively use distraction strategies.
- Deficient mental control over pain-related stimuli.

**Can catastrophizing be reduced for therapeutic benefit?**



- Physical therapy.
- Rehabilitation interventions.
- Pain management interventions.
- Psychological interventions.
- Analgesic medication.
- Surgical interventions.

Was the intervention provided only to individuals with PCS scores in the risk range?

Was the magnitude of reduction in PCS scores sufficient to have meaningful impact on clinical outcomes?



A Tool Kit for Targeting  
Psychosocial Risk Factors for  
Prolonged Disability

[www.PGAPworks.com](http://www.PGAPworks.com)

## Techniques to Target Catastrophizing

*Education.*

*Disclosure techniques.*

*Thought monitoring and emotional problem-solving.*

*Activity participation as a means of assisting the client in disengaging from catastrophic rumination.*



## Conclusions

*Catastrophizing has emerged as the most robust psychological predictor of adverse pain outcomes.*

*Measures of catastrophizing should be included as standard approach to assessment of pain-related conditions.*

*Rehabilitation outcomes can be enhanced by the inclusion of techniques designed to target catastrophic thinking.*

## Knowledge Gaps

*What is the best collection of techniques required to yield meaningful and sustainable reductions in catastrophizing.*

*What are the mechanisms linking catastrophizing to pathological pain processing?*

*Can reductions in catastrophizing alter pathological pain processes?*

## PGAP Training Workshops

*July 14-15, 2017. Sydney, AU.*

*November 17-18, 2017. Melbourne, AU.*

[www.PGAPworks.com](http://www.PGAPworks.com)



*Merci!*



Recover is a joint initiative of the Motor Accident Insurance Commission,  
The University of Queensland and Griffith University.



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