Threat-evoked pain facilitation is not influenced by experimental reductions in pain catastrophizing

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Introduction

Pain catastrophizing is a tendency to ruminate, exaggerate, and negatively assess one’s ability to cope when a painful stimulus is present and when anticipating it. Previous research has experimentally induced pain anticipation by manipulating the predictability (i.e., threat value) of a painful stimulus. These studies found that threat-related anticipation facilitates the nociceptive flexion reflex (NFR, measure of spinal nociception) and pain. Unfortunately, these studies did not assess catastrophizing to determine whether it contributes to threat-evoked pain facilitation.

Objective

To address this issue, the present study experimentally reduced catastrophizing with a brief, cognitively-behavioral intervention to reduce catastrophic thoughts or a control intervention that involved education about pain processing, without learning skills to reduce catastrophic thoughts or a control intervention that involved education about pain processing.

Methods: Threat Paradigm

- Threat was manipulated by 8 altering periods of “Danger” and “Safe” (4 Danger, 4 Safe)
- Each period was 30 seconds-long
- Abdominal shock was given 22.6 s after onset for 50% of danger periods to evoke threat
- NFR measured in response to ankle stimulations during every period, 9-21 following period onset

Outcome: Threat Paradigm

- NFR Magnitude Testing

- Abdominal Stimulation may be given at any time
- No Abdominal Stimulation will be given

- Pain Education (PE) Group

- Catastrophizing Reduction (CR) Group

- Exclusion Criteria:
  - Average age = 28.1 yrs (±2.9), and employed (52.6%)
  - Women, White/Caucasian (70.2%), married (19.6%),
  - White/Caucasian (70.2%), married (19.6%), 25-45 yrs (28.8%), 10.51 yrs (±2.2)
  - Failure to catastrophize during baseline testing

Procedure

- Informed consent obtained
- Sensors and stimulating electrode applied to ankle and abdomen
- Stimulation intensity for ankle stimulations and abdominal stimulations
- Baseline Testing: 1) a block of 8 alternating periods of safe (no abdominal shock) and threat (abdominal shock given) during which NFR was evoked by suprathreshold electric stimulations to the ankle and 2) Questionnaires administered to rate pain intensity and pain unpleasantness, as well as their situational-specific pain catastrophizing immediately after the block of 8 periods
- Intervention: Participants were randomly assigned to: 1) a brief, 30-min, cognitive-behavioral (CB) intervention designed to reduce catastrophic thoughts or 2) a control intervention that did not include education about pain processing, without learning skills to reduce catastrophic thoughts
- Post-Test: The same block of 8 threat/ankle periods were delivered after the interventions to examine changes in situational-specific pain catastrophizing and threat-evoked pain and NFR facilitation

Data Analysis

- One-way ANOVAs and Chi Square analyses were conducted to verify groups did not differ on demographic variables
- Primary analyses were conducted by mixed models (MEDE model procedure, SPSS 23)
- Phase effects of post and Trial-Type (safe vs. threat) as within-subject variables and Group (Pain Education vs. Catastrophizing Reduction) as a between-subjects variable
- Mediation analyses were conducted to determine if there was full or partial mediation by the change in situational-specific pain catastrophizing

Results: Pain Intensity Ratings

- There was a significant main effect Trial-Type (F[1, 269] = 45.70, p < .001), indicating that NFR magnitudes were greater during threat relative to safe periods
- There was a significant Group X Trial-Type interaction (F[1, 269] = 17.56, p < .001), indicating both groups showed statistically significant reductions in NFR magnitudes
- However, threat-evoked pain/NFR was observed. Specifically, pain intensity, pain unpleasantness, but rating were lower for the CR group relative to the PE group at post-test (p < .003)

Results: Pain Unpleasantness Ratings

- Change in pain catastrophizing fully or partially mediated changes in intensity and unpleasantness ratings (p < .001), but NFR magnitude (> .05) during threat.

Results: Pain Catastrophizing Scale

- A significant main effect Trial-Type (F[1, 1031] = 45.70, p < .001), indicating that NFR magnitudes were greater during threat periods relative to safe periods
- A significant Group X Phase interaction (F[1, 449] = 17.56, p < .001), indicated both groups showed statistically significant reductions in NFR magnitudes, however, NFR magnitudes were smaller for the PE group relative to the CR group at post-test (p < .003)

- There was no significant Group X Trial-Type interaction (F[1, 1035] = 12.22, p < .001), therefore threat-evoked NFR was not affected by the intervention.

Conclusions

- An expected, a brief CB intervention successfully reduced pain catastrophizing. Specifically, pain intensity, pain unpleasantness, and NFRs were greater during threat than safe periods
- However, threat-evoked pain/NFR facilitation was not attenuated by the catastrophizing reduction intervention, even though the intervention generally led to reduced pain.
- This suggests the mechanisms that mediate catastrophizing-related pain facilitation and catastrophizing reduction interventions are dissociated

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