Does State Pain Catastrophizing Mediate the Relationship between Trauma Exposure and Spinal Nociceptive Processing?


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Introduction

Many chronic pain states are associated with a history of trauma, however the current understanding of the mechanisms of this relationship is limited. Research suggests that a relationship between catastrophizing and pain is present, and separate research demonstrates that trauma and catastrophizing are associated. Central sensitization (the hyperexcitability of CNS neurons) could explain the observed relationship between trauma exposure and chronic pain. The nociceptive flexion reflex (NFR) is a spinally-mediated withdrawal response used as a physiological measure of spinal nociception. Unfortunately, the relationship between trauma exposure, catastrophizing, and a measure of spinal nociception within the same model has not been assessed. The presented results are preliminary findings, as data collection is still ongoing and is expected to complete in 2018.

Objective

To determine whether state catastrophizing mediates the relationship between traumatic life events and NFR threshold, the present study investigated the relationship between self-reported history of traumatic events, state pain catastrophizing during NFR threshold assessment, and NFR threshold.

Participants

- Healthy, pain-free men and women N= 217
- Characteristics: 126 Woman
- Average Age = 29.4 yrs (SD= 13)
- White/Caucasian Non-Hispanic 48.4%
- Married (16.8%)
- Average Amount of Education = Partial College (48.8%)
- Employed (64%)

- Exclusion criteria:
  - < 18 years of age
  - BMI > 35
  - Current acute illness, psychiatric symptoms, chronic pain condition, or inability to speak/read English
  - Cardiovascular, neurological, and/or circulatory problems
  - Recent use of analgesic, antidepressant, anxiolytic, antihypertensive medications

Procedure

- Overview, Informed Consent & Eligibility Determination (Health Status Screening)
  - Two testing sessions were completed on separate days
    - Testing session and tasks within days were counterbalanced or randomized
  - Participants provided informed consent after the procedures were explained

- Life Events Checklist Administered
  - Self-report measure that indicated the number of traumatic events an individual has experienced in their lifetime

- NFR Threshold Testing
  - Stimulation and testing electrode applied to the left ankle over the sural nerve
  - Measured from biceps femoris EMG activity
  - Stimulating axillary popliteal nerve 80.2%

- Pain Catastrophizing Scale
  - 13 item self-report measure for use in clinical and non-clinical samples; used for persons with and without pain
  - Participants asked if reporting pain to report on catastrophic thoughts that occurred during NFR threshold testing

- Pain Catastrophizing Scale (PCS)
  - Measured from biceps femoris EMG activity in the 90-100 ms post-stimulus window

- NFR Threshold: the stimulus intensity (in mA) that reliably elicits the reflex

Life Events Checklist and Trauma Demographics

- Trauma Demographics: Participants completed the Life Events Checklist (LEC) for the DSM-IV
  - Item report measure assessing the number of traumatic events a participant has been exposed to
  - Multiple items can be endorsed by the same participant
  - Items that happened to the participant personally were summed
  - Percentage of participants who endorsed at least 1 trauma = 82.2%

- Trauma Type
  - Accident or Environmental Disaster (e.g., Natural disaster, 186 (86.5%)
  - Interpersonal Violence (e.g., Physical assault, 107 (57.5%)
  - Combat or Captivity (e.g., Combat or exposure to a war zone), 63 (3.1%)
  - Threatened Death Or Serious Injury (e.g., Life-threatening illness or injury), 133 (69.3%)
  - Other Stressful Event 42 (21.9%)

Does State Pain Catastrophizing Mediate the Relationship between Trauma Exposure and Spinal Nociceptive Processing? Table 1: Summary of mean (SD) or N (%). 

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Pain Catastrophizing Scale

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  - 13 item self-report measure for use in clinical and non-clinical samples; used for persons with and without pain

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  - Measured from biceps femoris EMG activity in the 90-100 ms post-stimulus window

- Magnification (e.g., I can't stop thinking about the pain), Median (IQR)= .37 (26) .37

- Helplessness (e.g., There's nothing I can do), Median (IQR)= .60 (40) .51

- Rumination (e.g., I can't stop thinking about the pain), Median (IQR)= .37 (26) .26

- Somatization (e.g., My body is bothering me), Median (IQR)= .63 (45) .60

- Distraction (e.g., I'm trying to ignore the pain), Median (IQR)= .34 (26) .37

- Emotional Focus (e.g., I'm trying to feel better), Median (IQR)= .40 (28) .37

- Positive Reappraisal (e.g., I can see the good in the pain), Median (IQR)= .32 (26) .37

- Action (e.g., I feel like I need to do something), Median (IQR)= .37 (26) .37

- Pain Catastrophizing Scale (PCS)
  - Updated analyses indicate with a larger sample suggest this relationship may be weaker than previously reported (a*b path=.17, 95% CI=0, .56). Data collection is still ongoing, and the strength of this relationship may not be reflected in this current finding.

Conclusions

- Findings lend support for the relationship between trauma exposure and spinal nociception
- The positive and significant indirect effect suggests central sensitization may not be the mechanism involved within the observed relationship
- Instead, findings posit stress-induced hypoxia is present, and that survivors of traumatic events may catastrophize when experiencing nociceptive stimuli to evoke stress induced hypoxia. Over time, this may fatigue inhibitory processes and promote pain risk

Results

- Results indicated that the relationship between trauma exposure and NFR threshold was significantly mediated by PCS total score. However, no subscale of the PCS significantly mediated the relationship between trauma exposure and NFR threshold.

Does State Pain Catastrophizing Mediate the Relationship between Trauma Exposure and Spinal Nociceptive Processing? Table 2: A spinally-mediated protective withdrawal reflex elicited by A fiber activation (e.g., Life-threatening illness or injury, 133 (69.3%)

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Data Analysis

- Outlines on all variables were addressed through one of two methods: simulation or exact tests

- Simulation methods for use in: 1. Simulating Saturated Data

- Exact tests methods for use in: 2. Testing for Exactness

- Bootstrap methods are used in data analyses (at 2000 iterations) when state pain catastrophizing (PCS) mediates the relationship between number of traumas and NFR threshold. One model used a PCS total score as the mediator, and a separate model evaluated if any subscales were responsible for the indirect effect

- Analyses ran for abstract submission (based on an N=158) using mediation analyses with 2000 bootstrap samples found a significant indirect path between traumatic events and NFR via pain catastrophizing (a*b path=0.22, 95% CI= 0.02, 0.56). Updated analyses indicate with a larger sample suggest this relationship may be weaker than previously reported (a*b path=.17, 95% CI=0, .56). Data collection is still ongoing, and the strength of this relationship may not be reflected in this current finding.

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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 ($p = .03$).

There was also a significant main effect of Trial-Type ($F(1,1011) = 45.70, p < .001$), indicating that NFR magnitudes were greater during threat periods relative to safe periods.

There was a significant main effect of Stimulation Number ($B = -.02, p < .001$), indicating that NFR magnitudes habituated within each testing block.