Is a history of traumatic events associated with nociceptive flexion reflex (NFR) threshold?

Introduction

Many chronic pain states are associated with a history of trauma, however the current understanding of this relationship is limited. A higher number of adverse events experienced in childhood is associated with greater chronic pain severity in later life. The nociceptive flexion reflex (NFR) is a spinally mediated protective withdrawal reflex elicited by Aδ fiber activation. Recent evidence suggests that NFR can be used to assess spinal cord hyperexcitability (i.e., central sensitization) because chronic pain is associated with lower NFR thresholds. Unfortunately, the relationship between trauma exposure and pain has not been assessed using measures of spinal nociception. The presented results are preliminary and are expected to complete in 2018.

Objectives

To determine whether a history of traumatic events promotes central sensitization, the present study investigated the relationship between self-reported history of traumatic events and 1) NFR threshold, 2) heat pain threshold, and 3) heat pain tolerance.

Participants

- Healthy, pain-free men and women N= 190
- Characteristics: 84 Women; Average Age = 29.3 yrs (SD= 13); White/Caucasian non-Hispanic (41.7%), married (15.8%); Average Amount of Education = Partial College (49.5%), and Employed (65.9%)
- Exclusion criteria: 18 years of age; BMI > 35; Current acute illness or chronic pain condition; Cardiovascular, neurological, and/or circulatory problems; Recent use of anesthetics, antidepressants, anxiolytics, antihypertensive medications

Procedure

- Overview, Informed Consent & Eligibility Determination (Health Status Screening)
  - Two testing sessions were completed on separate days
  - Testing session and test order were counterbalanced
- Heat Pain Testing
  - Self-report measure that indicated the number of traumatic events an individual has experienced in their lifetime
- NFR Threshold Testing
  - Sensory and stimulating electrode applied to the left ankle over the sural nerve
  - Suprathreshold intensity assessed using during NFR magnitude testing
- Heat Pain Testing
  - Heat probe placed on the left volar forearm
  - Pain threshold was defined as the temperature (in °C) at which point the individual reported they first felt the probe become painful (the average temperature of 4 trials)
- Heat Pain Tolerance Testing
  - Heat probe placed on left volar forearm
  - Pain tolerance was defined as the temperature (in °C) at which point the individual reported they could no longer tolerate the pain from the heat (the average temperature of 4 trials)

Outcome: NFR Threshold Testing

- NFR Threshold: biceps femoris EMG activity in the 90-150 ms post-stimulus window
- NFR threshold correlates highly with pain threshold

Outcome: Heat Pain Threshold/Tolerance

- Heat Pain Threshold
  - Thermal probe is attached to volar surface of participant’s left forearm
  - Probe temperature starts at 32°C and increases at a rate of 0.5°C per second until participant indicates heat is painful (4 trials)
- Heat Pain Tolerance
  - Thermal probe is attached to volar surface of participant’s left forearm
  - Probe temperature starts at 32°C and increases at a rate of 0.5°C per second until participant indicates heat is intolerable (4 trials)

Data Analysis

- Non-normality was addressed through log transformation on NFR Threshold and Heat Threshold
- Linear regression for variables between trauma exposure and NFR threshold, Heat Pain Threshold and Heat Pain Tolerance assessed relationships between variables

Results

NFR Threshold and Trauma Exposure

Results show trauma exposure holds a marginally significant relationship with NFR threshold (p= .02, β = .16, p=.08)

Heat Tolerance and Trauma Exposure

Results show trauma exposure is not significantly related to heat threshold (p= .11, β = .10, p=.25)

Updated Analyses

Analyses ran for abstract submission (based on an N=105) found a significant relationship between number of traumatic events and experienced and NFR threshold (p=.08, β=.25, p=.51). Updated analyses with a larger sample suggest this relationship may be weaker than previously reported. Data collection is still ongoing, and the strength of this relationship may not be reflected in this current finding.

Conclusions

- Trauma exposure appears to be associated with hypoalgesia (pain dampening), however the association may be stronger at the suprachoroidal level (based upon the heat tolerance finding) than at the spinal level (based upon the NFR finding).
- Although speculative, this tonic dampening may result from stress-induced hypoalgesia that could fatigue inhibitory resources over time, ultimately promoting chronic pain. However, longitudinal studies are needed to confirm this finding.

Funding Sources

This study was supported by National Institute on Minority Health and Health Disparities (Award Number R01MD007807). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.