Is anxiety sensitivity associated with temporal summation of pain and nociception?

Kara L. Kerr, B.A., Ellen L. Terry, B.A., Emily J. Bartley, M.S., Jennifer L. DeVentura, B.S., Ashley L. Vincent, B.S. & Jamie L. Rhudy, Ph.D

Department of Psychology, The University of Tulsa, 800 South Tucker Drive, Tulsa, OK 74104

Introduction
Anxiety sensitivity refers to a general fear of anxiety-related symptoms (e.g., rapid heart beat, sweating, stomach upset, trembling). Studies have shown anxiety sensitivity to be positively correlated with pain experience; however, these studies have focused on static measures of pain (e.g., pain threshold, pain tolerance) rather than dynamic measures of pain modulation (e.g., temporal summation). Temporal summation of pain is a phenomenon in humans in which the last stimulus in a train of noxious stimuli elicits enhanced pain relative to the first stimulus in the train. Temporal summation is believed to correspond to wind-up in animals, which results from the hyperexcitability of spinal cord neurons in response to a train of stimuli. However, most studies of temporal summation have used subjective pain ratings rather than measures of spinal nociceptive processes. The nociceptive flexion reflex (NFR) is a physiological correlate of spinal nociceptive processing that can be used to assess temporal summation. The present study examines the relationship between anxiety sensitivity and temporal summation of NFR and pain.

Objective
To determine the relationships between anxiety sensitivity and temporal summation of NFR and temporal summation of pain.

Participants
- Healthy participants: N = 31
  - Participant Characteristics: White, non-Hispanic (87%), female (68%), single (94%), employed part-time (52%), average years of education = 14 (SD = 1.27), average age = 20.26 yrs (SD = 1.88)
- Exclusion Criteria:
  - <18 years of age
  - Current acute illness
  - Chronic pain condition (e.g., back pain)
  - Current use of anxiolytic and/or hypertensive medication
  - Recent use of analgesic medication
  - Prior analyses determined NFR magnitude asymptotes after 3rd stimulation; therefore, increase in NFR magnitude believed to result from hyperexcitability of dorsal horn neurons (wind-up)
  - Pain data logarithm transformed due to positive skew

Temporal Summation Procedure
- Trains consisted of 5 constant-intensity stimulations with short inter-stimulus intervals
- Blocks with 5 trains each
- No variation in stimulus intensity during entire procedure
- Interstimulus interval varied for each train in a Block (order randomized within Block): 0.5 s (2.0 Hz), 1.0 s (1.0 Hz), 2.0 s (0.5 Hz), 3.0 s (0.33 Hz), variable
- 36 item self-report questionnaire
- Measures of anxiety-related symptoms based on belief in harmful consequences
- Total score is the mean of all items (rated 0-4, higher numbers reflect greater anxiety sensitivity)

Temporal Summation of NFR
- Temporal summation of NFR indicated by progressively larger reflex magnitudes
- Increase in NFR magnitude believed to result from hyperexcitability of dorsal horn neurons (wind-up)
- Prior analyses determined NFR magnitude asymptotes after 3rd stimulation; therefore, temporal summation of NFR = 3rd stimulation NFR minus 1st stimulation NFR

Temporal Summation of Pain
- Pain ratings assessed after each train of stimuli on a scale of 0 (no pain) -100 (most intense pain imaginable)
- Temporal summation of pain indicated by higher ratings for each subsequent stimulus
- To be consistent with NFR scoring, temporal summation of pain = rating of 3rd stimulus minus rating of 1st stimulus

Data Analysis
- Pearson's r correlations used to examine the relationships between anxiety sensitivity and temporal summation of NFR and pain
- 20% trimming of NFR data used to remove influence of outliers
- Pain data logarithm transformed due to positive skew

Results: Temporal Summation of NFR and Anxiety Sensitivity
- NFR magnitude positively correlates with pain ratings

Results: Temporal Summation of Pain and Anxiety Sensitivity
- Temporal summation of pain was positively correlated with anxiety sensitivity (r = .41, p = .025).

Conclusions
- Anxiety sensitivity affects temporal summation of pain ratings but not temporal summation of NFR (a physiological measure of spinal nociception). This suggests supraspinal mechanisms are involved in the relationship between anxiety sensitivity and pain.
- Because pain ratings, but not NFR, were associated with anxiety sensitivity, care should be taken when using pain ratings to infer changes in spinal nociception.
- Researchers should use more direct measures of spinal mechanisms when studying changes in spinal nociceptive processes.

Anxiety Sensitivity Index - Revised

Nociceptive Flexion Reflex (NFR)

Temporal Summation of Pain

Anxiety Sensitivity Index

Participants

Data Analysis

Results

Conclusions

References

Additional Information

Note

Figure Legends

Table Legends

Appendix

Supplementary Material