Introduction

Emotion modulates pain and spinal nociception processes. As evidence of this, viewing arousing pleasant pictures inhibits pain and the nociceptive flexion reflex (NFR; a physiological correlate of spinal nociception), whereas viewing aversive or unpleasant pictures evokes pain and NFR. Prior research has established links between serotonin (5-HT) transporter gene (SLC6A4) polymorphisms and emotional-cognitive processes. For example, individuals with the short allele (SS or SL genotypes) have a greater propensity for negative affectivity (depression) and demonstrate enhanced fear responsivity relative to individuals with the higher activity 44-bp promoter insertion polymorphism (LL genotype, two long alleles).

Given that SLC6A4 is associated with emotional processing, and that emotion influences pain processing, then SLC6A4 may influence pain via emotional processes.

Objective

The present study examined the association between SLC6A4 genotypic polymorphisms and emotional modulation of pain and NFR.

Participants

- 144 healthy participants
- Characteristics: 65 Men, 79 Women, White non-Hispanic: (n=122, 85%), average age = 27.3 years (SD=13.9)
- Exclusion Criteria:
  - < 18 years of age
  - Current acute illness
  - Cardiovascular, neurological, and/or circulatory problems
  - Recent use of antidepressants, anxiolytics, or antihypertensive medication
  - Recent psychological trauma, specific photos of snakes or spiders
  - Any chronic pain, migraine disease

Procedure

- Consent + Health Screening + Electrode application
- NFR Threshold Assessment: 3 ascending/descending series of electric stimulations. NFR threshold = stimulus intensity (in mA) that reliably elicited NFR
- Pain Threshold: Ascending series of stimulations, pain threshold = first stimulus (in mA) rated 250 on rating scale
- Pain Tolerance: Ascending series continued until pain rating of 100 achieved or maximal intensity (40 mA) reached
- Emotional Controls of Nociception (ECON)
  - Participants watched series of emotionally-charged pictures while receiving painful stimulations to the ankle
  - After each picture, participants rated emotional reaction to picture on visual analogue of pleasure and arousal scales

Results: Emotional Modulation of Pain & NFR

- There was a main effect of picture content (p<.001, η² = .31). This main effect qualified by a Content X Genotype interaction (p=.04, η² = .08).
- Emotional modulation was stronger in those with an “S” allele.
- Specifically, "S" allele carriers exhibited greater pain inhibition during erotic pictures and greater pain facilitation during attack pictures.

Data Analysis

- Pain ratings and NFR magnitudes were converted to within-subjects z-scores (z = (raw score - participant’s overall mean response) / participant’s overall standard deviation)
- Pain z-scores and NFR z-scores were analyzed using 2 (Genotype) x 2 (Participant Sex) x 3 (Picture Content: erotic, neutral, attack) ANOVAs.

Conclusions

- S-HT transporter gene polymorphisms may influence nociceptive processing indirectly via emotional processes.
- Because emotional modulation of NFR was unassociated with S-HT transporter gene polymorphisms, it appears any influence of the "S" allele is exerted supraordinarily rather than spinally.

The present study extends this prior work to show that "S" allele carriers have altered supraspinal pain processing which might put them at risk for developing chronic pain.