

Racial and Sex Differences in Pain Sensitivity to Inpatient Quantitative Sensory Testing in Traumatic Injury Patients

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INTRODUCTION

- Traumatic injuries account for over 30 million emergency department visits and 2.5 million hospitalizations each year in the United States¹.
- Two-thirds of patients who experience traumatic injury go onto develop chronic pain².
- **Definition of chronic pain:** constant or intermittent pain that persists beyond the expected healing period, usually for a minimum of three to six months².
- Past studies have looked at either race or sex differences on pain sensitivity with chronic low back pain³.
- **Limited studies have modeled the independent influence of race and sex on pain sensitivity in the immediate aftermath of traumatic injury.**

PURPOSE

- **Aims:**
Evaluate racial and sex differences in temporal summation of thermal pain among patients hospitalized for acute unilateral orthopedic trauma patients.
- **Hypothesis:**
Race and sex independently influence temporal summation of thermal pain, such that **non-Hispanic Black (NHB)** adults and women exhibit greater temporal summation compared to **non-Hispanic White (NHW)** adults and men, respectively.

METHODS

- **Inclusion criteria:**
 - Ages 18-60.
 - Traumatic unilateral orthopedic injury requiring operative treatment with fixation.
- **Exclusion Criteria:**
 - Hispanic patients.
 - Pre-existing chronic pain disorder or history of systemic illness or neurological disorder.
 - Daily opiate use prior to injury.
- **Data Analysis:**
 - 79 participants were administered a sequence of 10 heat pulses at 48°C by a thermode (image shown beside) attached to their non-dominant ventral forearm, after which participants rated their pain intensity on a scale of 0 (*no pain*) to 100 (*worst pain possible*).
 - Multilevel models were conducted in HLM to evaluate relations between race/sex and both linear and quadratic changes in pain ratings across the 10 heat pulses.
 - **Linear slopes** = degree of temporal summation of pain.
 - **Quadratic terms** = pain habituation or sensitization across the task.



RESULTS

Table 1: Sex and Race Differences in Participant Characteristics

	Male	Female	p-value	NHW	NHB	p-value
Gender						
Female				10 (32)	21 (68)	
Male				23 (48)	25 (52)	
Age	38.2 ± 12.8	35.7 ± 13.0	0.39 ¹	37.8 ± 12.5	36.8 ± 13.2	0.71 ¹
TSTP intensity rating	40.9 ± 27.1	50.5 ± 22.2	0.10 ¹	37.0 ± 26.5	50.1 ± 23.7	0.02 ²
TSTP unpleasantness rating	40.6 ± 26.8	49.5 ± 23.4	0.12 ¹	35.6 ± 26.8	50.1 ± 23.5	0.02 ¹

NOTE: Values are mean ± SD or n (%); TSTP = temporal summation of thermal pain; ¹ Mann-Whitney U Test; ² Independent samples t-test

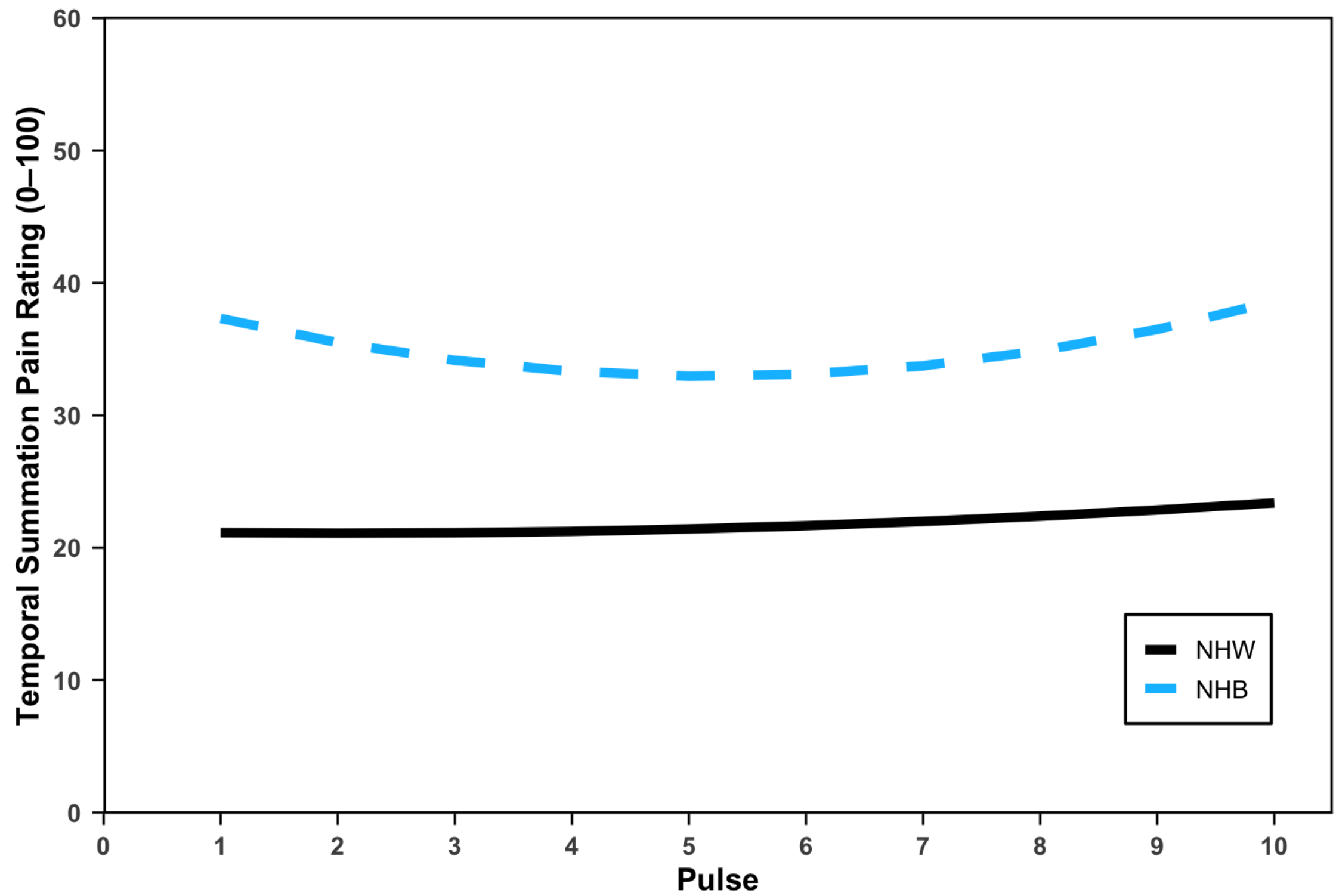


Figure 1: A multilevel model found significant race differences in quadratic change ($b = 0.17$, $SE = 0.06$, $p < .01$), but not linear change ($b = -1.03$, $SE = 0.56$, $p = .06$).

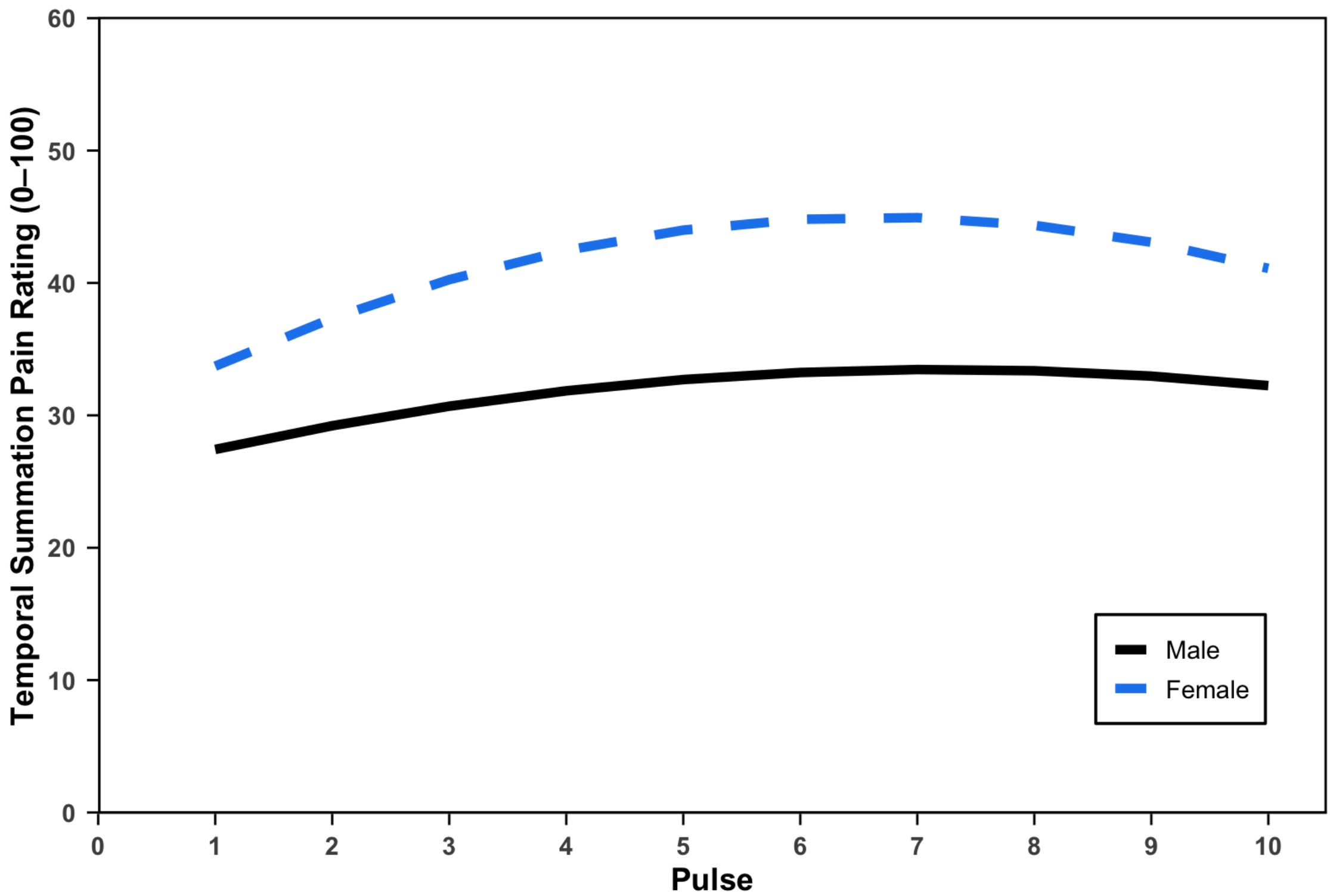


Figure 2: A multilevel model found significant sex differences in linear change ($b = 1.11$, $SE = 0.56$, $p < .05$) and quadratic change ($b = -0.15$, $SE = 0.06$, $p = 0.01$).

DISCUSSION

- Significant racial – but not sex - differences in overall pain intensity and unpleasantness during the temporal summation task suggest that **race may play a larger role in the perception of sensory and affective components of pain.**
- **Females experience greater temporal summation and pain habituation than males**, supporting prior work that also found a similar response pattern to temporal summation of pain among females compared to males ^{4,5}.
- **NHB participants exhibited a pattern of decreasing initial pain ratings followed by pain sensitization**, which contrasted with NHW participants who showed modest linear increases in pain ratings across the task.
- **This suggests for the first time that NHB injury patients may exhibit elevated heat pain sensitization during hospitalization, which could represent an early risk marker for subsequent transition to chronic pain.**

CONCLUSION

- **Importance:** The results of this study could help identify patients who may be at greater risk of developing chronic pain after acute traumatic injury, thereby allowing physicians to initiate preventative treatments and therapies to impede this development and mitigate racial and sex disparities in post-injury pain persistence.
- **Limitations:** This study had a small sample size that was not powered to detect interactions between race and gender taken together.
- **Future directions:** Future studies can evaluate whether similar temporal summation patterns are observed for other pain modalities and if these predict post-injury chronic pain.

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