AFFECTIVE MODULATION OF SPINAL NOCICEPTION AND PAIN: THE EFFECT OF PICTURE DURATION

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INTRODUCTION

Research suggests that emotion modulates pain, such that negative emotions are associated with increased pain outcomes, and positive emotions are associated with decreased pain outcomes. Our laboratory has conducted a series of studies examining modulation of the nociceptive flexion reflex (NFR) and subjective pain report via emotionally-laden pictures. Results suggest that emotion engages descending modulatory circuits that alters spinal nociception because pain ratings and NFR are modulated in parallel.

Research on the acoustic startle reflex has shown that pictures shown for as brief as 500 ms can engage motivational drives. The current study examined whether brief pictures can modulate nociceptive reactions (pain and NFR).

OBJECTIVE

- To examine the impact of picture duration (500 ms vs. 6 s) on modulation of nociceptive reactivity, as measured by the nociceptive flexion reflex (NFR) and pain report

HYPOTHESIS

- It was predicted that nociceptive reactions would be greatest during unpleasant pictures and smallest during pleasant pictures, regardless of picture duration

PARTICIPANTS

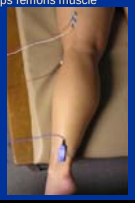
- 16 healthy students
  - Characteristics: Female (50%), White non-Hispanic (79%), single (93%), employed (50%) with an average age of 23 yrs (SD=7.54)
- Exclusion Criteria:
  - < 18 years of age
  - Current acute illness
  - Cardiovascular, neurological, and/or circulatory problems
  - Recent use of analgesic, antidepressant, anxiolytic, or antihypertensive medication
  - Recent psychological trauma
  - Specific phobia of snakes or spiders
  - Problems healing
  - Raynaud's disease
  - Medical problems exacerbated by stress
- 3 persons excluded for equipment problems (1 no shock felt, 2 recording errors)

NOCICEPTIVE FLEXION REFLEX (NFR): Overview

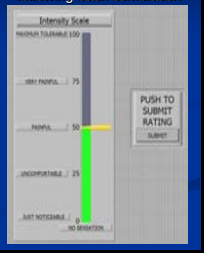
- Elicited by activation of primary nociceptors
- Spinal reflex - can be elicited in spinally-transected humans
- Stimulation intensity that reliably elicits reflex (NFR threshold) correlated with pain threshold
- NFR magnitude positively correlated with subjective pain ratings
- Used as a measure of spinal nociception

MEASUREMENT OF NFR AND PAIN

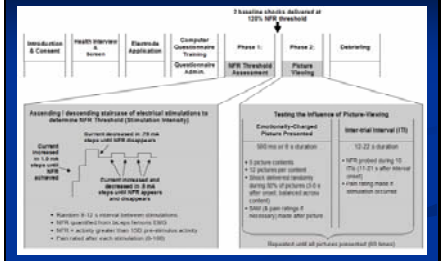
- **Stimulating electrodes** - over left sural nerve
  - **Stimulation:** train of 5 1-ms pulses with 3 ms ITI (250 Hz)
- **Recording electrodes** - left biceps femoris muscle



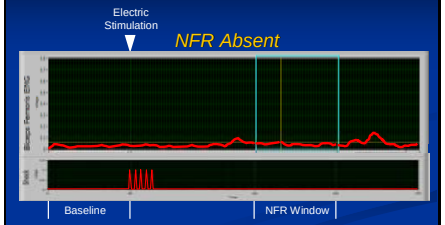
- Pain Ratings made following each stimulation



PROCEDURE



PHASE 1: NFR Threshold Assessment



NFR is absent when Biceps Femoris EMG in 90-150 ms poststimulation interval is not greater than 1 SD prestimulation baseline EMG

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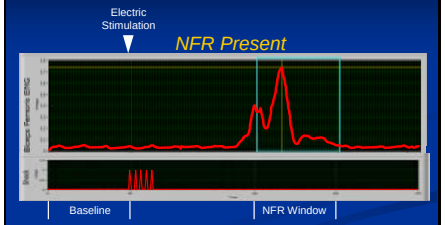


NFR is present when Biceps Femoris EMG in 90-150 ms poststimulation interval is greater than 1 SD prestimulation baseline EMG

PHASE 2: Picture-Viewing

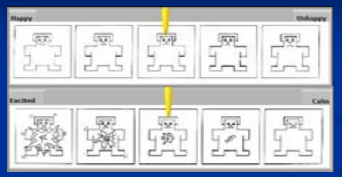
The International Affective Picture System (IAPS; Center for the Study of Emotion and Attention, 1999)

*Loss and food pictures (moderately arousing pictures) were also presented in this study but data were omitted for the present analyses

PHASE 2: Picture-Viewing

- 60 pictures presented in pseudorandom order
  - 5 contents: attack, loss, neutral, food, erotic (food & loss omitted in present analyses)
  - 12 pictures per content
  - Pictures presented for 6 s or 500 ms
- Noxious stimulations to sural nerve
  - Intensity = 1.2x NFR threshold
  - Delivered 3-5 s following picture onset during 50% of pictures (balanced across content) and 10 inter-picture intervals
  - Pain ratings made following each stimulation

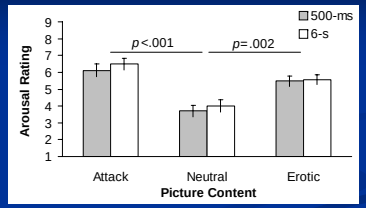
EMOTION-INDUCTION: Manipulation Checks



- Self-Assessment Manikin (Lang, 1980)
  - Valence (Pleasure) Ratings: 1 (unhappy) to 9 (happy)
  - Arousal ratings: 1 (calm) to 9 (excited)
  - Subjective emotional reactions assessed following presentation of each picture

RESULTS: Manipulation Checks

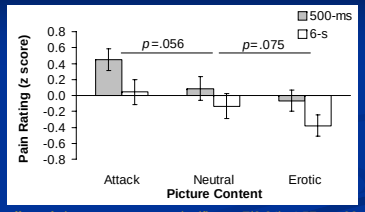
Pictures manipulated arousal, duration had no effect



Arousal Ratings. The effect of picture content was significant, $F(2,24)=17.10$, $p<.001$, $\eta^2=.59$. The Content x Duration interaction was non-significant ($p=.61$, $\eta^2=.04$).

RESULTS: Pain Rating

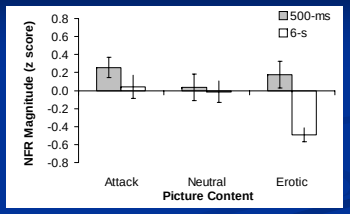
Brief and long pictures resulted in pain modulation



The effect of picture content was significant, $F(2,24)=4.57$, $p=.02$, $\eta^2=.28$. The Content x Duration interaction was non-significant ($p=.80$, $\eta^2=.019$). Duration main effect eluded significance ($p=.07$, $\eta^2=.25$).

RESULTS: NFR Magnitude

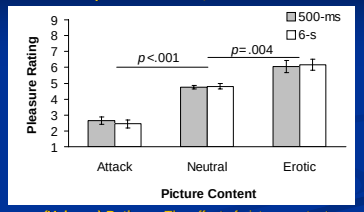
Only long pictures resulted in significant NFR modulation



The Content x Duration interaction was significant, $F(2,24)=3.67$, $p=.04$, $\eta^2=.23$. Duration main effect was significance ($p=.04$, $\eta^2=.30$).

RESULTS: Manipulation Checks

Pictures manipulated valence, duration had no effect



Pleasure (Valence) Ratings. The effect of picture content was significant, $F(2,24)=44.98$, $p<.001$, $\eta^2=.79$. The Content x Duration interaction was non-significant ($p=.49$, $\eta^2=.058$).

CONCLUSIONS

- Picture duration did not affect participants' emotional reaction to pictures
- Pain ratings were modulated by brief (500 ms) and long (6 s) pictures
- NFR was only significantly modulated by long (6 s) pictures
  - Longer picture durations may be necessary to engage descending modulation of spinal nociception
- Long pictures generally led to lower pain and NFR magnitudes