

AFFECTIVE MODULATION OF SPINAL NOCICEPTION AND PAIN: VALENCE AND AROUSAL CONTRIBUTE

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INTRODUCTION

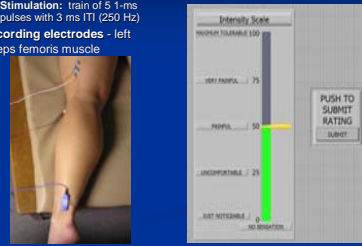
Consistent with motivational priming theory (MPT), research from our laboratory has shown that affective valence modulates subjective pain and spinal nociception. Specifically, negatively valenced affect enhances pain and nociception, whereas positively valenced affect inhibits them. MPT also posits that affective arousal (affective intensity) should contribute to modulation, with greater arousal leading to greater modulation. Although this has been demonstrated in reactions to non-nociceptive stimuli (i.e., acoustic startle reflex), the independent modulatory influences of valence and arousal have yet to be demonstrated in nociceptive reactions.

The present study examined the independent effects of valence and arousal on spinal nociception (assessed by nociceptive flexion reflex) and subjective pain by randomly delivering noxious electric stimulations to the sural nerve while participants viewed IAPS pictures. Pictures were chosen to independently manipulate affective valence and arousal.

- Valence: unpleasant (loss, attack), neutral (household objects, mushrooms), pleasant (food, erotica)
- Arousal: low (neutral), medium (loss, food), high (attack, erotica)

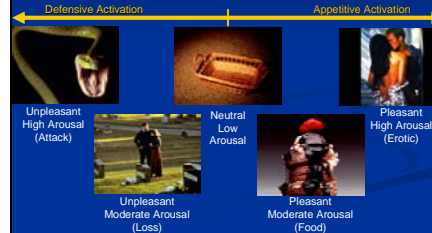
MEASUREMENT OF NFR AND PAIN

- Stimulating electrodes - over left sural nerve
- Pain Ratings made following each stimulation



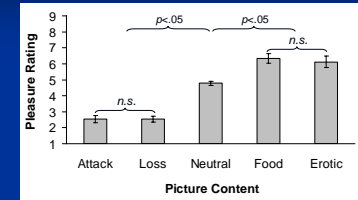
PHASE 2: Picture-Viewing

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



RESULTS: Manipulation Checks

Pictures independently manipulated valence

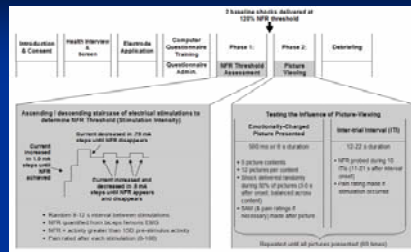


Pleasure (Valence) Ratings. The effect of picture content was significant, $F(4,9)=26.04$, $p < .001$, $\eta^2 = .92$

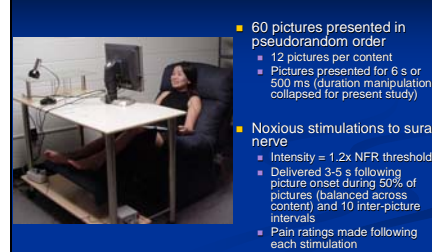
OBJECTIVES

- To determine the independent effects of affective valence and arousal on subjective pain and spinal nociception (nociceptive flexion reflex)
- To replicate previous findings suggesting MPT extends to modulation of pain and spinal nociception

PROCEDURE



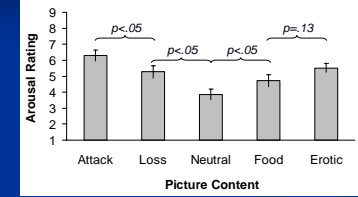
PHASE 2: Picture-Viewing



- 60 pictures presented in pseudorandom order
 - 12 pictures per content
 - Pictures presented for 6 s or 500 ms (duration manipulation collapsed for present study)
- 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

RESULTS: Manipulation Checks

Pictures independently manipulated arousal

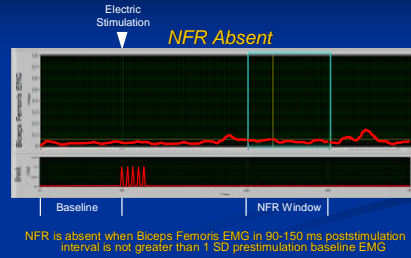


Arousal Ratings. The effect of picture content was significant, $F(4,9)=7.15$, $p < .007$, $\eta^2 = .76$

PARTICIPANTS

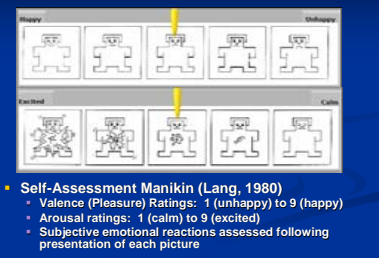
- 16 healthy students
 - Characteristics: Female (50%), White non-Hispanic (79%), single (93%), employed (50%) with an average age of 23 yrs ($SD = 7.54$)
- Exclusion Criteria:
 - < 18 years of age
 - Current acute illness
 - Cardiovascular, neurological, and/or circulatory problems
 - Recent use of 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)

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

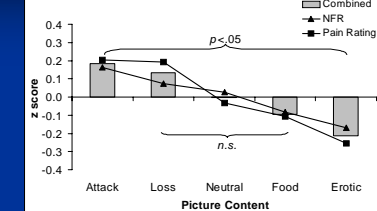
EMOTION-INDUCTION: Manipulation Checks



- 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: Pain and NFR

Valence and arousal contributed to pain modulation

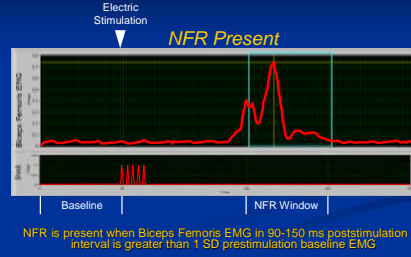


- Only the effect of picture content was significant, $F(4,9)=12.93$, $p < .001$, $\eta^2 = .85$ (Reaction Type x Picture Content = $n.s.$)
- Linear trend explained 72% of the variance ($p < .001$)

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

PHASE 1: NFR Threshold Assessment



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

DATA REDUCTION

- NFR magnitude = mean of 90-150 ms post-stimulus interval minus mean of 60 ms pre-stimulus interval
- Pain and NFR reactions standardized within individuals (z score) & averaged by picture content

ANALYSES

- Valence and Arousal Analyses: individual 1-way (Picture Content) ANOVAs
- Pain ratings and NFR Analysis: simultaneously analyzed using 2 (Reaction Type) x 5 (Picture Content) ANOVA
- Wilks's Lambda interpreted to overcome sphericity
- a priori comparisons made using Fisher's LSD tests
- Partial eta-squared (η^2) reported as effect size

CONCLUSIONS

- Pictures effectively manipulated affective valence and arousal
- Affective valence and arousal independently contributed to the modulation of nociceptive reactions
 - Generally, pleasant pictures led to inhibition of pain and NFR, whereas unpleasant pictures led to enhancement of pain and NFR
 - The most arousing pictures led to the greatest modulation
- Emotion has a powerful coordinating effect on nociceptive reactions – explaining 72% of their combined variance