The Influence of Emotion and Habituation on Pain Responsivity

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Results: Habituation and Emotional Modulation of Pain Ratings

• Valence: Wilk’s Λ = .71, F(2,106) = 21.62, p < .001, η² = .29
  Linear trend: F = 43.46, p = .001, η² = .29
  Block: Wilk’s Λ = .98, F(3,105) = 6.29, p = .001, η² = .02
  Valence x Block: Wilk’s Λ = .92, F(6,102) = 1.54, p = .17, η² = .08

• Pain was modulated by emotion: unpleasant pictures enhanced pain and pleasant pictures inhibited pain.
• Pain did not habituate
• Pain was modulated similarly across blocks (not influenced by habituation).

Introduction

In our laboratory we are interested in psychological factors that lead to pain modulation. In particular, we are interested in the ways that emotion can regulate pain and physiological pain responses. Three independent experiments from our lab have found that emotional picture viewing reliably modulates pain and its associated reflexes.

Consistent with the Motivational Priming Theory, we find that pain and pain-related reflexes are modulated like other defensive responses (e.g., the startle reflex). Specifically, pain responses are inhibited during pleasant pictures and enhanced during unpleasant pictures. Given the consistency of this finding, we have argued that the picture-viewing paradigm is a reliable way to study pain modulation. However, the validity of this paradigm depends on the notion that affective modulation does not interact with habituation (or sensitization) processes.

Measurement of Subjective Pain

NFR recording electrodes:
left biceps femoris muscle

Stimulating electrodes:
over left sural nerve

Picture-Viewing: Emotion Induction

The International Affective Picture System

(IAPS; Center for the Study of Emotion and Attention, 2006)

Unpleasant

Neutral

Pleasant

Attack

Erotic

Mutilation

Sports / Adventure

Death / Loss

Family

Valence x Block

NFR Magnitude (Mean of 90-150 ms post-stimulus interval minus mean of 60 ms pre-stimulus interval, divided by the pooled standard deviation (Cohen’s d value)

Participants

108 Healthy Participants
Characteristics: 44 Men, 64 Women; White non-Hispanic (77%), single (57%), employed (78%), average yrs education = 15 yrs (SD=2.48), average age = 34 yrs (SD=15.08)

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 (picture-viewing)
• Any chronic pain Raynaud’s disease

108 pictures presented in pseudorandom order
36 pictures per valence (9 per block)
Pictures presented for 6 s (12-22 s ITI)
Noxious stimulations to sural nerve

NFR Magnitude (Mean of 90-150 ms post-stimulus interval minus mean of 60 ms pre-stimulus interval, divided by the pooled standard deviation (Cohen's d value)

Data Analysis

• NFR and pain ratings were averaged by Picture Valence and Picture Block, then analyzed using a 3 (Picture Valence) x 4 (Picture Block) repeated measures ANOVA

• Multivariate statistics (Wilk's Lambda) were interpreted to overcome sphericity problems

• Analyses were conducted separately for NFR magnitude and pain ratings

• Linear and quadratic trends were examined as follow-up tests for Picture Valence and Bonferroni mean comparisons were used to compare means of the main effect of Picture Block

Conclusions

• This study replicates previous reports of affective modulation of pain and nociception: unpleasant pictures enhanced pain responses and pleasant pictures inhibited pain responses

• NFR, but not pain ratings, showed significant habituation across testing

• Habituation processes did not interact with emotional modulation, suggesting affective modulation can be observed despite habituation processes

• These findings underscore the importance of carefully designing the procedure such that picture valence is equally distributed across the testing session to avoid confounding affective modulation with habituation processes.