Further Validation of the Emotional Controls (ECON) Paradigm: Emotional Carry-Over Effects Do Not Contaminate Modulation by Emotional Pictures

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Introduction
Our laboratory has shown that the Emotional Controls of Nociception (ECON) paradigm is a valid tool for studying supraspinal modulation of pain and corticospinal modulation of spinal nociception (assessed by the nociceptive flexion reflex, NFR). In this paradigm, a series of emotionally-charged pictures are presented, during which noxious, electrocutaneous stimuli are delivered to the sural nerve of the ankle. This research has consistently shown that negative pictures enhance, whereas pleasant pictures inhibit pain and spinal nociception. However, it is currently unclear whether emotional carry-over effects from a previous picture alter responses to pain/nociception evoked during later trials. To address this issue, participants viewed a series of pictures from 7 picture contents used (mutilation, attack, death/loss, neutral, adventure, erotica, nature). Pain ratings and the nociceptive flexion reflex (NFR) were recorded in response to each noxious electric stimulus.

Objective
Assess emotional carry-over effects by addressing the following:
1. Does the previous picture modulate pain/NFR evoked during the next picture?
2. Does the previous picture modulate pain/NFR evoked during the next interpicture interval (IPI)?

Participants
- Healthy Participants: N = 120
- White, non-Hispanic (76%), female (61%), single (57%), employed (76%), yrs of education=15 (SD = 2.66), avg age = 35 yrs (SD = 15)
- Exclusion Criteria:
  - 118 yrs of age
  - Cardiovascular, neurological, circulatory problems
  - Chronic pain condition (e.g., back pain)
  - Recent use of anxiolytic, antidepressant, and/or antihypertensive medication
  - Specific phobia of snakes or spiders (due to picture-viewing)
  - Recent psychological trauma

Experimental Procedure
Nociceptive Flexion Reflex and Pain Ratings
- Nociceptive Flexion Reflex (NFR) Magnitude: mean of biops femora BMG in 90-150 ms post-stimulus interval minus mean of 60 ms pre-stimulus interval, divided by the pooled standard deviation (Cohen’s d value)
- NFR is a spinally-mediated protective withdrawal reflex elicited by A fiber activation
- Electrocortaneous stimulations delivered randomly during 1/3 of pictures and 16 IPI’s
- Numerical Pain Rating Scale (NRS): scale ranging from 0 (no sensation) to 100 (maximum tolerable)
- Pain ratings made following each stimulation

Results: Carry-Over Effects into Subsequent Emotional Picture
- Picture-Viewing: Emotion Induction
- The International Affective Picture System (IAPS; Center for the Study of Emotion and Attention, 2006)
- 108 pictures presented in pseudorandom order
- 7 picture contents used (mutilation, attack, death/loss, neutral, adventure, erotica, nature)
- Pictures presented in 4 blocks of 27 pictures each

Data Analysis
- MIXED procedure in SPSS 14.02 used
- NFR Magnitudes and Pain Ratings were averaged by Picture Content and Inter-Picture Interval
- Analyses conducted to determine picture content prior to next picture content/IPI where noxious electric stimuli were delivered

Conclusions
- These results provide further validation for the ECON paradigm indicating that carry-over effects do not contaminate pain/NFR modulation by emotional pictures.
- However, corticospinal modulation of NFR may persist into the interpicture interval.