Emotional modulation of pain and nociception in fibromyalgia and rheumatoid arthritis: Preliminary findings

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Introduction

Fibromyalgia syndrome (FM) is a chronic pain disorder of unclear etiology characterized by widespread musculoskeletal pain and hyperalgesia. Recent functional imaging research has shown that FM patients exhibit differing patterns of brain activation during anticipation of and experience of experimental pain, as compared with rheumatoid arthritis (RA) patients and healthy controls (HC). Thus, FM-related hyperalgesia may be due to an amplification of the nociceptive signal via cognitive-emotional mechanisms at the supraspinal level. Indeed, individuals with FM tend to report increased negative affect and reduced positive affect; a finding consistent with their higher rates of anxiety and depressive disorders. Given that emotion has been shown to modulate pain and nociception, such that negative emotion enhances pain and positive emotion inhibits it; FM may be associated with disrupted emotional modulation of pain.

Objective

To examine whether FM patients would exhibit augmented pain responses to electrocutaneous stimulations and show abnormal emotional modulation of pain relative to RA patients and pain-free controls.

Participants

- 14 pain-free controls
- 8 RA patients and 10 FM patients with physician-verified diagnoses and no comorbid chronic pain condition
- Participants were excluded for current use of analgesics or other centrally-acting medications (except low dose tricyclics and muscle relaxants were allowed for FM)

Group	Age (yrs) *M*	*SD*	% Female	% Caucasian	% Married	% Employed
FM	40.8	9.6	91%	89%	46%	55%
RA	40.4	8.8	75%	88%	38%	76%
Controls	47.7	11.9	71%	86%	50%	65%

Procedure

- ACR tender point exam administered
- Electrode applied to the ankle over the sural nerve, EMG sensors applied to the biceps femoris muscle
- Level of stimulation intensity set at nociceptive flexion reflex threshold
- Participants watched a series of emotionally-charged pictures while randomly receiving electric stimulations to the ankle

Methods: Picture Viewing

Unpleasant

Neutral

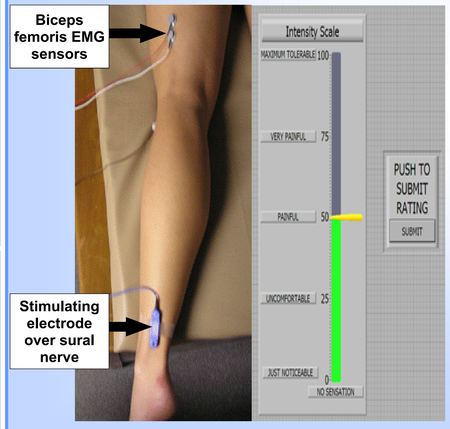
Pleasant

- Pictures from the International Affective Picture System (IAPS, 2006) were chosen that evoke reliable modulation of pain and spinal nociception in healthy individuals
- Pictures were presented in a pseudorandom order and resorted for each participant

Methods: Nociceptive Flexion Reflex & Pain Ratings

Stimulation

NFR Window
90-150 ms post-stimulation

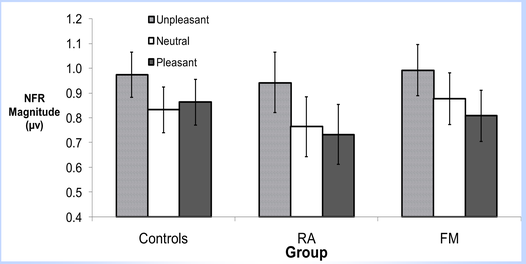


- The nociceptive flexion reflex (NFR) is a spinally-mediated withdrawal reflex elicited by A-delta fiber activation
- To elicit NFR, stimulations were sent to the sural nerve of the ankle
- NFR magnitude recorded from biceps femoris EMG (90-150 ms post-stimulus)
- NFR magnitude significantly correlates with stimulation intensity and pain ratings
- Participants rated each electric stimulation from 0 (no sensation) to 100 (maximum tolerable)

Data Analysis

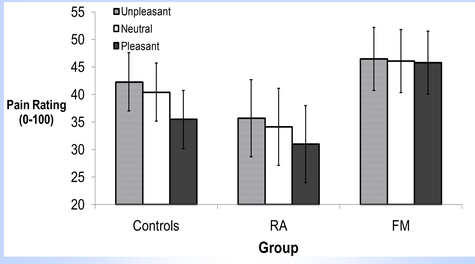
A linear mixed model analysis was used to determine the influence of pictures on spinal nociception (NFR) and pain ratings.

Results: NFR



- All groups showed the expected pattern of emotional modulation of NFR (Picture Content main effect, $p < .001$); NFRs were larger during unpleasant pictures than during pleasant pictures
- There were no group differences in emotional modulation of NFR (Picture Content x Diagnosis interaction, $p = .63$)

Results: Pain Ratings



- There were group differences in emotional modulation of pain (Picture Content x Diagnosis interaction, $p < .01$):
  - FM patients did not show emotional modulation of pain (Picture Content simple effect, $p = .97$)
  - Controls and RA patients did show emotional modulation of pain (Picture Content simple effect, $p <. 001$ and $p <. 01$, respectively); pain was higher during unpleasant pictures than pleasant pictures.

Conclusions

- Results suggested that all groups exhibited emotional modulation of the NFR; thus, cerebrospinal mechanisms that modulate spinal nociception appear intact.
- Controls and RA patients exhibited emotional modulation of pain while FM patients did not exhibit emotional modulation of pain ratings.
- These data support prior research indicating disrupted supraspinal processing of pain in FM.

Directions for Future Research

Use emotional modulation paradigm to:

1. Examine structural/functional differences in brain structures that contribute to disrupted modulation of pain in FM
2. Explore pathophysiology of subgroups of FM (e.g., depressed vs. non-depressed)
3. Explore changes in pain modulation that occur with successful treatment of FM symptoms

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