Positive Affect and Distraction Improve, while Negative Affect Impairs Pain Modulatory Mechanisms in Recurrent Low Back Pain Patients and Controls

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Introduction

- Pathophysiological causes of low back pain (LBP) are often difficult to determine.
- In recent decades, focus has shifted to understanding the contribution of psychosocial factors and central pain processing mechanisms (inhibitory and facilitatory) to the experience and persistence of LBP [1].
- It is clear that affect and attention can influence pain intensity and/or unpleasantness. However, little is known about the interaction between affect, attention and central pain processing measures in people with and without pain.

Aim

To understand if attention and affective manipulation influences central pain processing, as measured by Conditioned Pain Modulation (CPM) and facilitation of conditioning pain perception, within and between individuals with and without LBP.

Methods

- 29 Participants with recurrent low back pain (RLBP) and 30 age- and sex-matched controls attended 2 experimental sessions approximately 1 month apart.
- Participants with RLBP had a painful clinical episode (mean pain intensity 3/10) in session 1 and had recovered to no/minimal pain by session 2 [2].

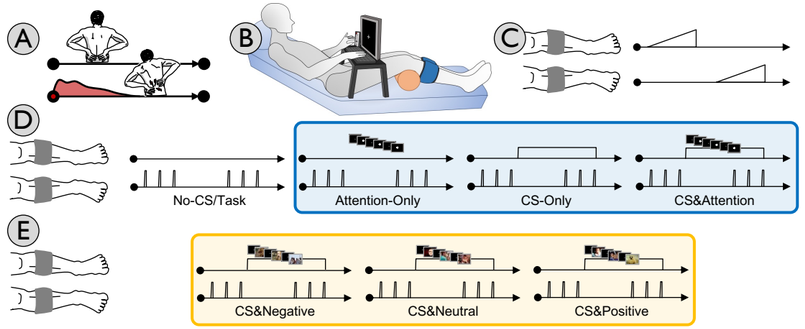

Figure 1: Setup and design for each study session.
A: Parallel study design (top: controls, bottom: RLBP), B: Participant positioning, C: Baseline assessment of cuff pain tolerance thresholds, D: Test stimuli (TS, 3 x 1s inflations at cPTT intensity, verbally rated intensity on a Numerical Rating Scale /100, NRS) and conditioning stimuli (CS, 100s at 70% cPTT, rated on electronic visual analogue scale /10, eVAS) for attentional manipulations (blue box, randomized), E: Identical TS & CS used for affective manipulations (yellow box, randomized).

Methods (cont.)

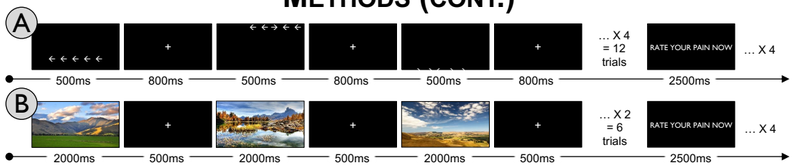

Figure 2: Design and timing of (A) attention and (B) affective manipulation tasks.
A: Flanker attention task; participants were asked to respond to the direction of the middle arrow as quickly and accurately as possible, B: Affective manipulations using photos from the International Affective Picture System [3]; normative ratings were matched for arousal between conditions and valence between sessions.

Results

Distraction using the Flanker restored CPM in people with RLBP in the first session where normal CPM was otherwise not demonstrated.

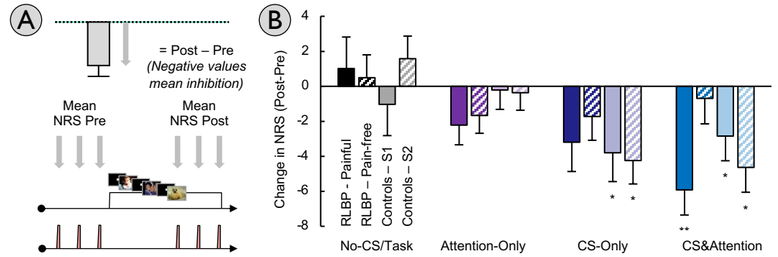

Figure 3: Mean +SEM CPM as change in TS ratings from Pre to Post CS and/or Task
A: Verbal ratings of TS on NRS and change calculated. B: Greater CPM seen in healthy controls during the CS-only (*P<0.05) and CS&Attention paradigms (*P<0.05) compared to No-CS/Task and Attention-Only. RLBP patients only showed significant CPM during the CS&Attention paradigm in the painful-session (**P< 0.05) compared to No-CS/Task, Attention-Only and the pain-free session.

Significant CPM was present in both control and RLBP groups for both positive and neutral affective manipulations, but not negative.

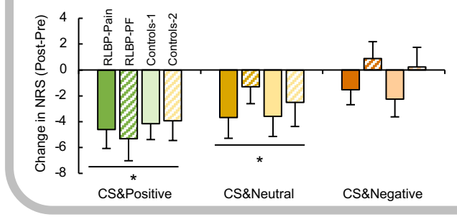

Figure 4: Mean +SEM CPM as change in TS for Affective Manipulations
CPM was greater during CS&Positive (*P< 0.05) and CS&Neutral (*P< 0.05) paradigms, compared to the CS&Negative paradigm in both sessions and groups, with generally greater CPM in session 1 than 2 (P<0.05).

Results (cont.)

Facilitation of CS pain perception was reduced by positive affective manipulation in both groups, and by distraction in controls only.

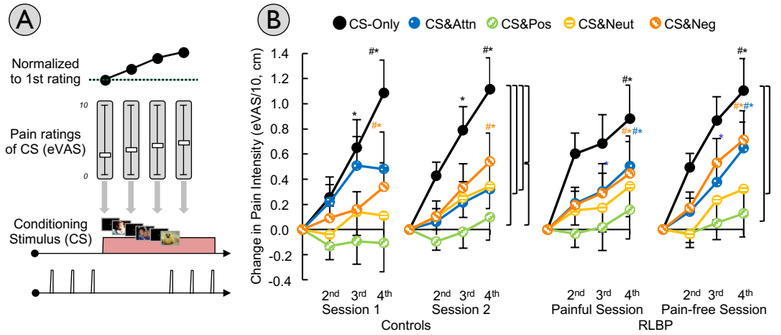

Figure 5: Mean +SEM pain intensity ratings throughout each condition
A: Perception of tonic cuff pain was rated on the electronic VAS at 4 timepoints and normalized to the first rating, B: Ratings increased throughout the CS-only (P<0.05) and CS&Negative (P 0.05) paradigms for both groups/sessions, and also during CS&Attention (P<0.05) for patients, with positive manipulation reducing this facilitation in both groups. In B: *denotes increase from 2nd rating, #denotes significant increase from 3rd rating and brackets indicate differences between manipulations (at least at 4th rating) within-groups.

- Participants reported directing most of their attention toward the task.
- Pain from the CS slowed reaction times in the attention task in both groups.
- All affective manipulations were effective in inducing the desired shift in affect.

Conclusions

Impaired CPM could be restored in RLBP patients both by moving attention away from the painful CS and by inducing positive affect. Negative affect impaired CPM in controls. Positive affect induction generally reduced facilitation of pain perception during the conditioning stimulus in both RLBP patients and controls.

References

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