



PREDICTING VALUE OF PAIN AND ANALGESIA: NUCLEUS ACCUMBENS RESPONSE TO NOXIOUS STIMULI CHANGES IN THE PRESENCE OF CHRONIC PAIN

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INTRODUCTION

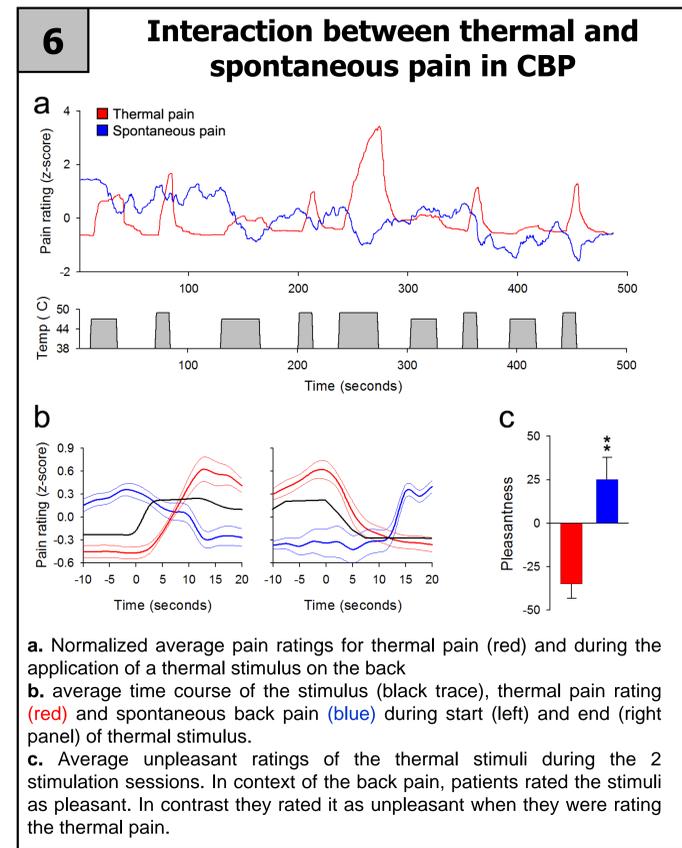
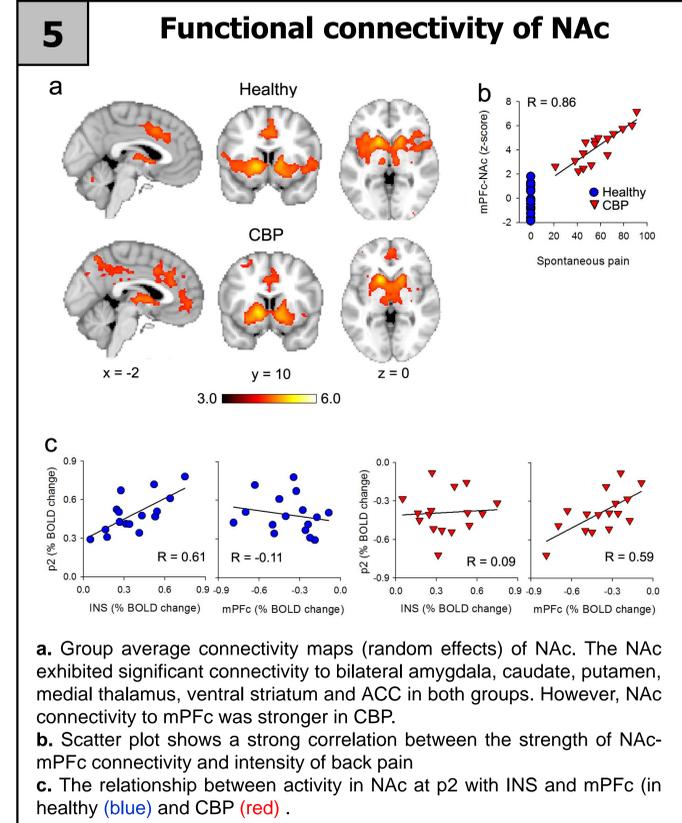
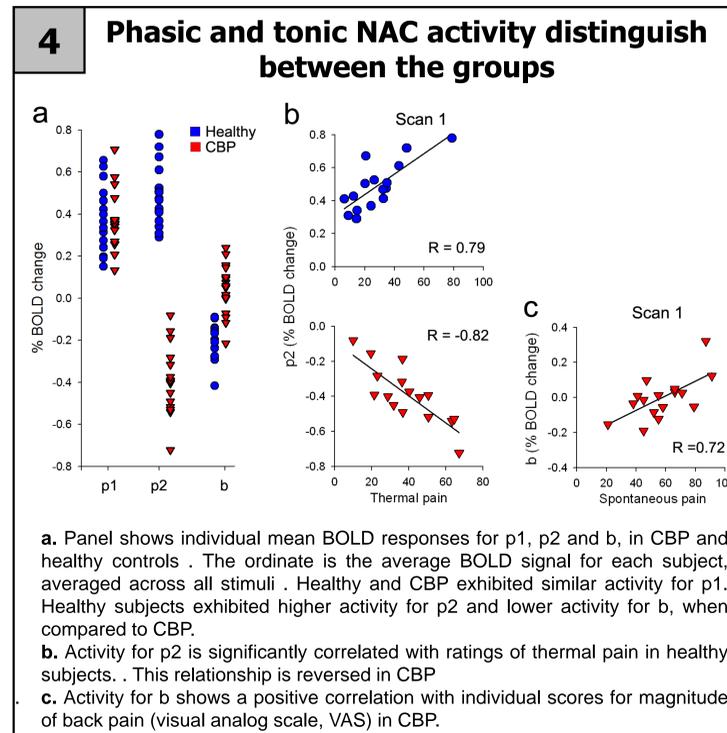
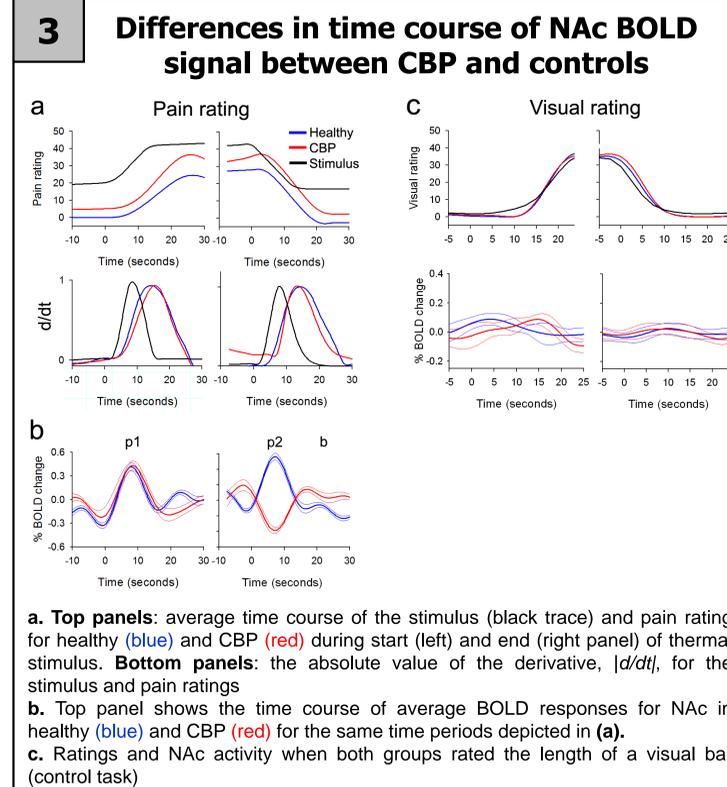
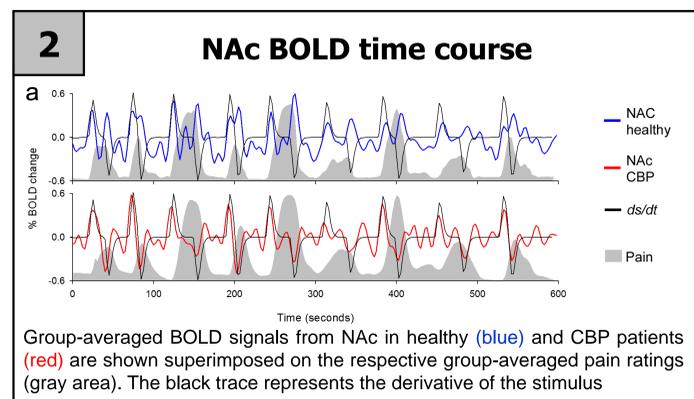
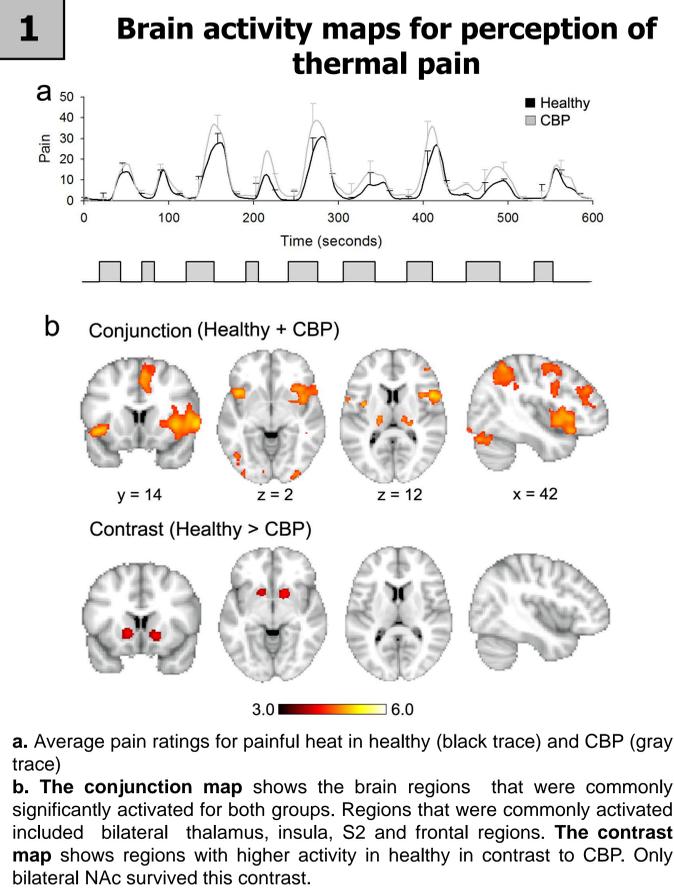
- There is growing evidence that neurons in the circuitry classically associated with reward and reward prediction can encode aversive signals and elicit aversive behaviors.
- Here we use fMRI to examine brain activity in healthy humans and in chronic back pain (CBP) patients to acute thermal painful stimuli within the context of reward/aversion valuation circuitry.
- We also investigate the interaction between acute thermal pain and chronic pain in CBP patients, and their contribution to future action selection and pain relief

METHODS

- Sixteen CBP patients and twelve healthy subjects participated in the fMRI study.
- During fMRI, subjects rated their pain perception to thermal stimuli applied to their lower back using a finger-span. In CBP patients the stimulus was applied on the skin overlying their most painful spot on the back. (Panel 1).
- The individual subjective ratings were used to assess brain activity associated with acute pain perception, using GLM model (FSL software; fmrib, Smith et al. 2001) (Panel 1)
- Percent BOLD change was extracted from nucleus accumbens (NAc) and submitted for time course and correlation (Panels 2-4)
- Functional networks were produced by computing the correlation coefficient of the NAc BOLD with all other brain voxels (Panel 5).
- An additional 8 CBP patients rated either their spontaneous back pain or thermal in response to thermal stimulation (Panel 6).

CONCLUSION

- CBP patients and healthy controls show similar acute pain cortical representation, however the motivational/valuation related NAc activity differentiates the two groups at 100% sensitivity.
- Phasic NAc activity at stimulus onset reflects stimulus salience, while at stimulus offset predicted reward of pain relief in healthy subjects. In CBP, however, phasic NAc activity **negatively** correlated with reported stimulus pain, and was driven by mPFC activity, implying that it is reflecting relief of CBP with the stimulus.
- Therefore, NAc activity in humans encodes **1) motivational features of acute pain, 2) prediction of relief from acute pain in controls, and 3) prediction of recurrence of back pain at stimulus offset in CBP patients.**



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