

Investigating short-term habituation to pain with fMRI - a protocol integrating self-report, block and trial-by-trial analyses

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Introduction

Habituation to pain is a generally known phenomenon that involves a decrease in response after repeated painful stimulation¹. A variety of methods is available to measure short-term habituation to pain, including subjective ratings and fMRI. Nevertheless, the neural correlates of short-term habituation are not well understood and trial-by-trial ratings during fMRI have not been studied before in this context. Therefore, we developed a protocol investigating habituation to pain and thereby integrating psychophysical and neural measures.

Methods

We developed and tested a protocol for short-term habituation to pain. Participants received three blocks of 25 brief painful electric stimuli while fMRI data was collected. After each stimulus, participants rated their pain on a visual analogue scale (VAS). The protocol was designed in a way to include ratings, allow for habituation and limit the influence of the motor response on the pain response. Analysis of habituation includes multilevel models for pain ratings and brain activity over blocks and on a trial-by-trial basis.

Results

Preliminary results (n=5) indicated a decrease in pain ratings over blocks, with large individual differences. Furthermore, we found brain activity in areas involved in pain processing in general (i.e., insula, cingulate cortex), which decreased over blocks of painful stimulation. In more refined analyses (trial-by-trial), we expect to find a linear decrease in activity in the anterior/midcingulate cortex, reflecting the decrease in subjective pain perception.

Discussion

Our developed protocol allows for the investigation of short-term habituation with fMRI, integrating self-report, block and trial-by-trial analyses, and increases our understanding of individual differences in habituation to pain.

References

1. Rankin CH, Abrams T, Barry RJ, et al. Habituation revisited: an updated and revised description of the behavioral characteristics of habituation. *Neurobiology of learning and memory* 2009; 92(2): 135-138.

Keywords

Habituation, pain, fMRI