Threat-dependent modulation of anterior insula connectivity predicts pain

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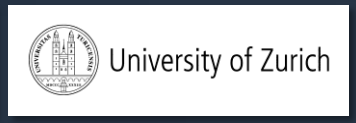


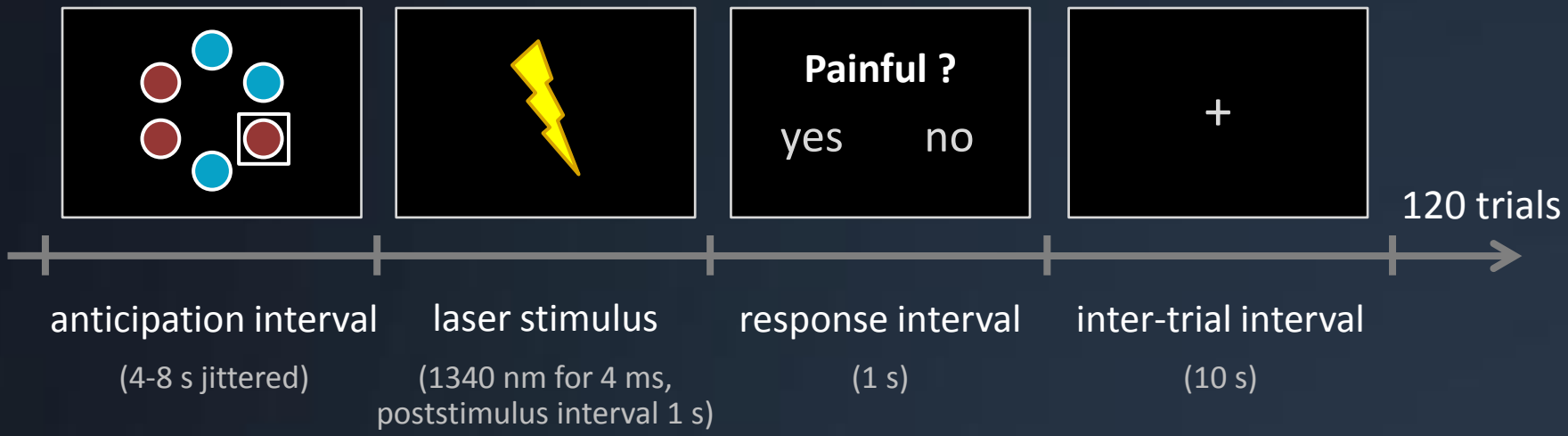
What determines the perception of pain?

http://www.cuteandweird.com/2009/08/most-painful-stunts-weirdest-of-all/

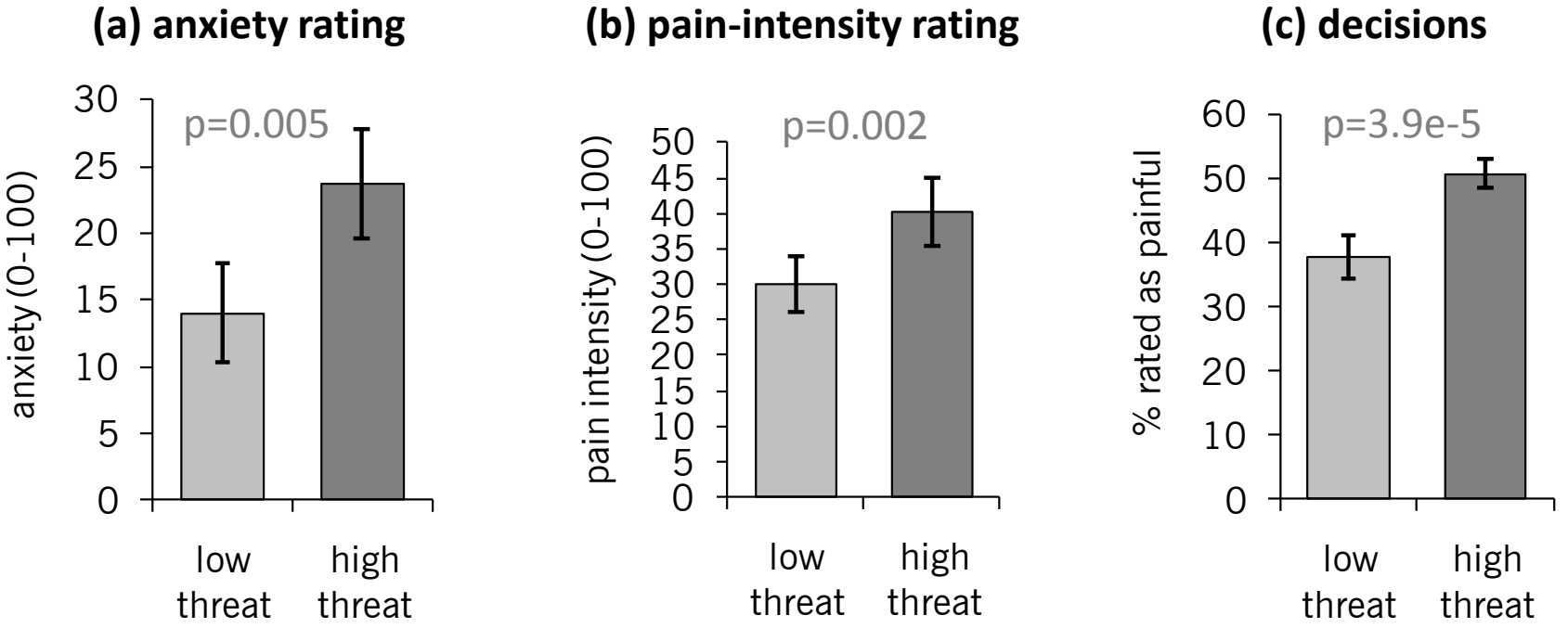
Inducing anxiety through threat

We investigated the anticipation and perception of pain in the context of different levels of threat-induced anxiety.

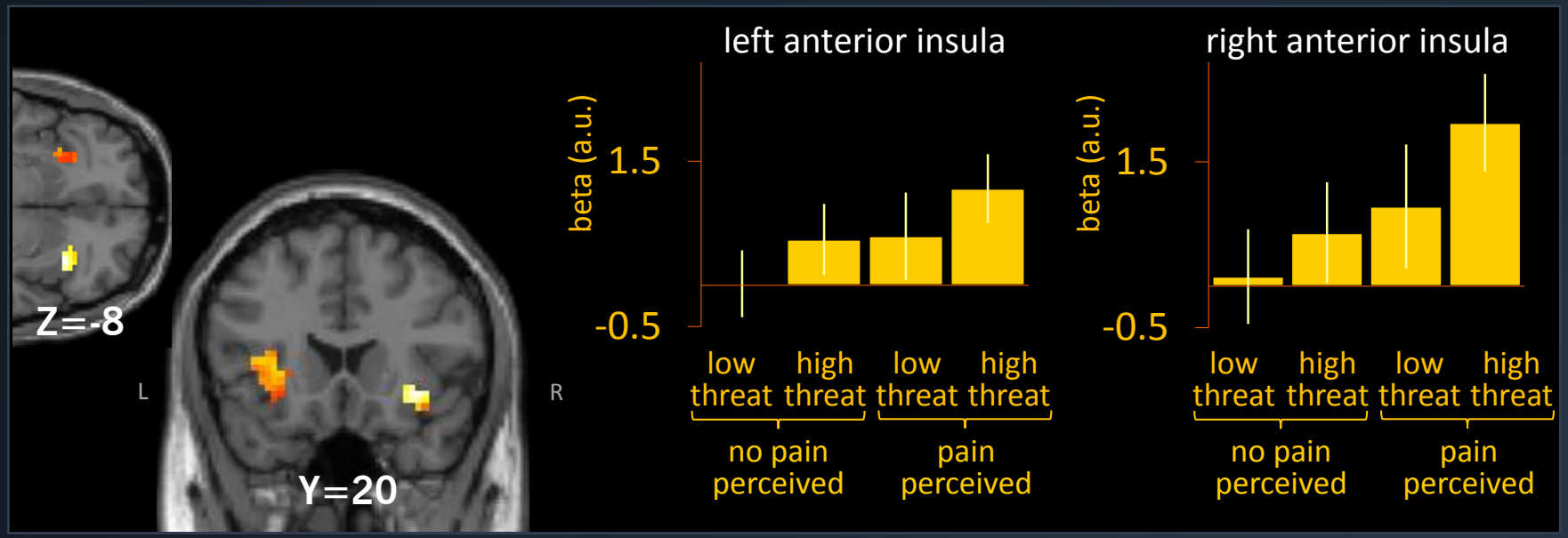
- low-threat condition: “application of laser fully approved”
- high-threat condition: “application of laser approved with reservations”



Threat influences both anxiety and pain



Anterior insula responds to both threat and pain

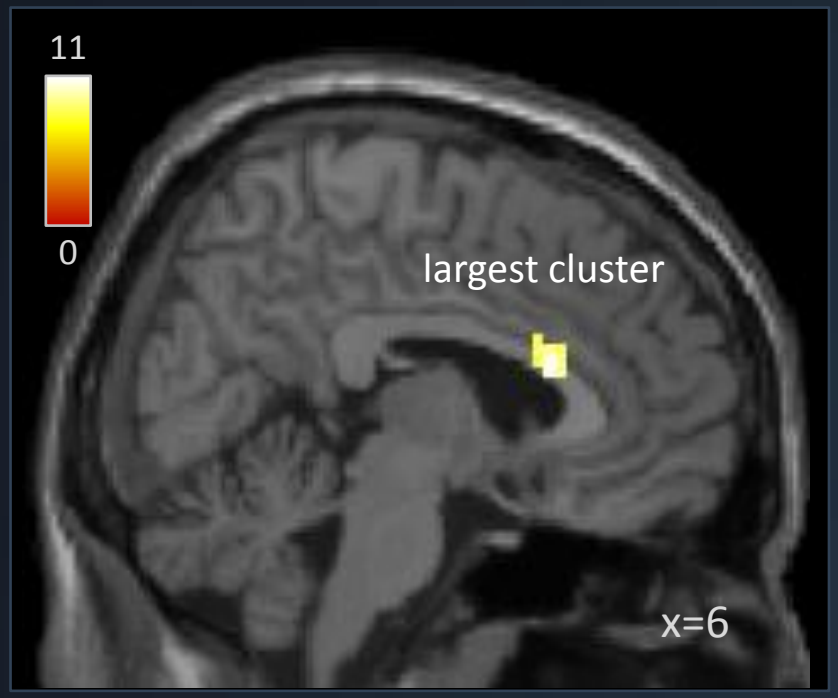


Prestimulus activity, conjunctive contrast

Pain anticipation modulates connectivity with MCC

Psychophysiological interaction analysis (PPI)

- psychological variable: ‘pain versus no pain’
- physiological variable: activity in the right and left anterior insula



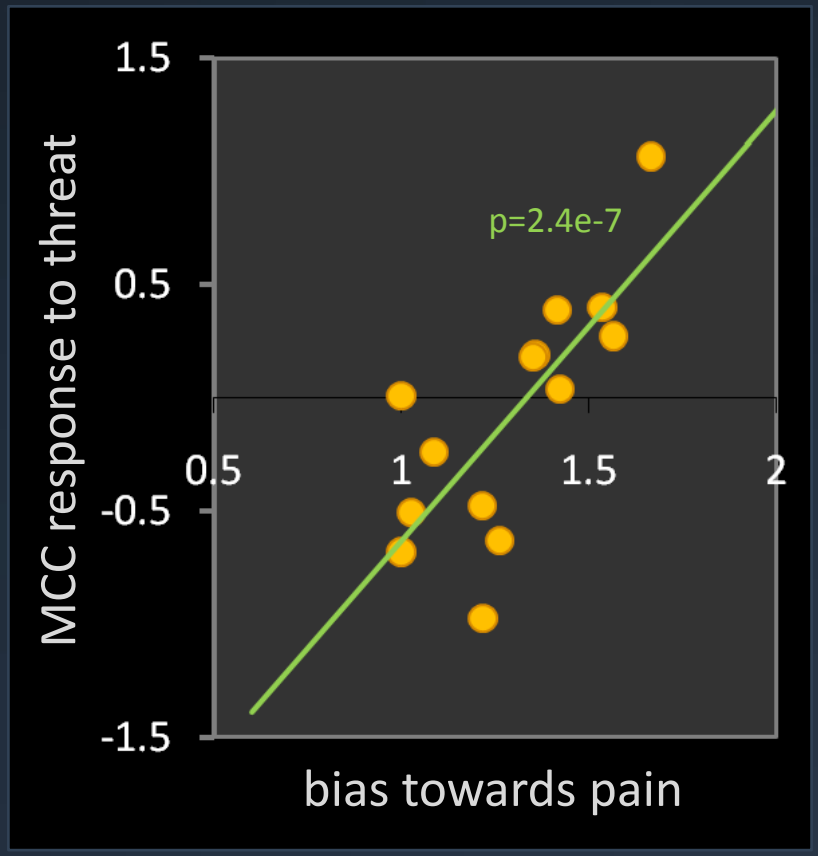
The functional connectivity between the left anterior insula and the mid cingulate cortex (MCC) is increased by the anticipation of pain.

MCC predicts susceptibility to pain

Subject-specific indicator of susceptibility to pain under threat

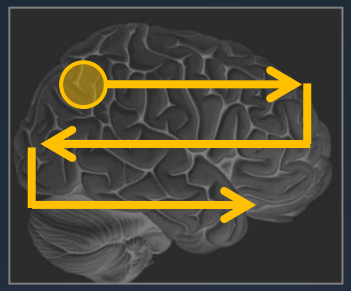
$$= \frac{\text{\#pain trials in 'high threat' condition}}{\text{\#pain trials in 'low threat' condition}}$$

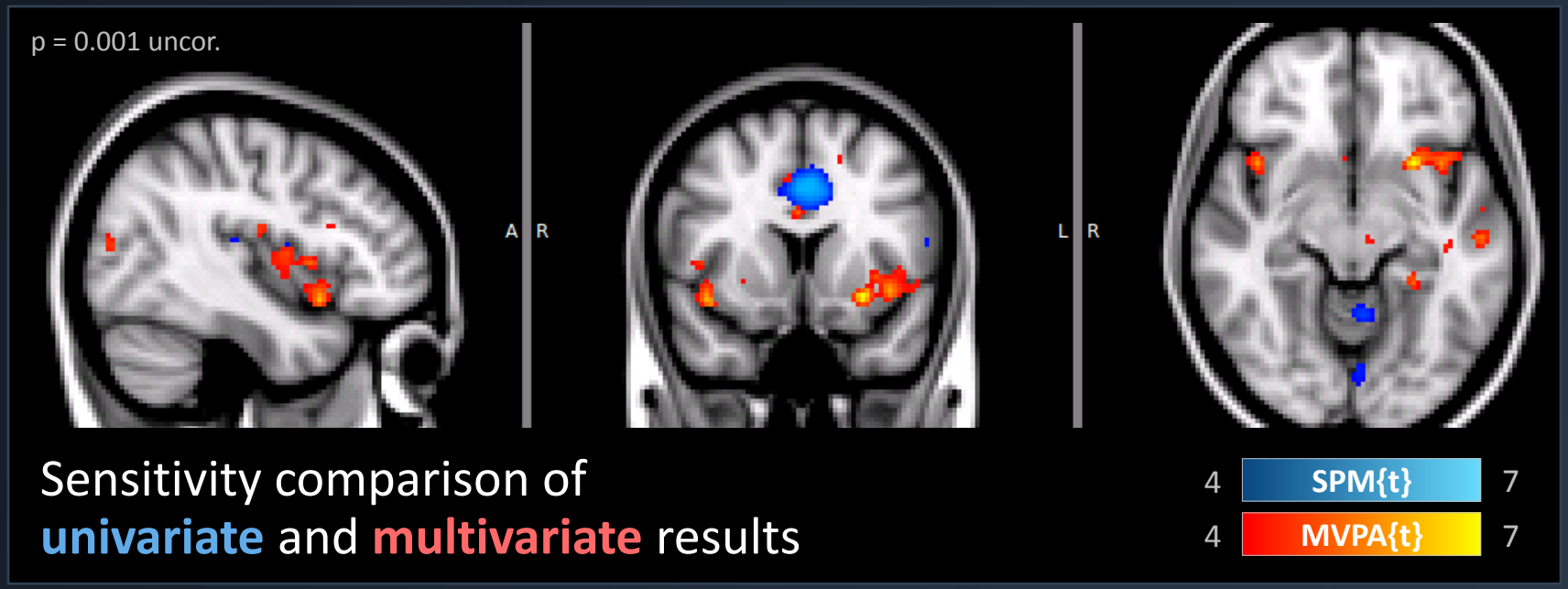
A bias towards pain is reflected by increased activity in MCC.



Decoding the perception of pain

Is pain perception encoded in terms of **smooth activations**, or should we also consider **fine-grained local patterns** of activity?





Sensitivity comparison of **univariate** and **multivariate** results

Conclusions

prestimulus
functional connectivity
is modulated
by pain anticipation

mid cingulate cortex

poststimulus activity
- reflects pain perception
- reflects threat bias

anterior insula

prestimulus activity
- reflects anxiety
- reflects pain anticipation

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