Targeted Project / AY 2023 -2024

Computational modelling of individual differences in the potency of expectations on pain perception

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Research area: Computational neuroscience

Project outline:

Our understanding of perception has changed in recent years. Computational neuroscience now considers perception to be co-determined by prior, top-down expectations about the environment and a noisy representation of ascending sensory input. The relative impact of expectations and stimulation on the eventual percept is thought to be a function of the precision of each construct. This theoretical model is generally referred to as 'predictive processing'. Emerging behavioural and neural evidence now support a predictive processing model of pain perception, although detailed understanding of the underlying computational and neural mechanism is still lacking.

This project aims to predict how potent expectations and prior beliefs are at the level of the individual. This is an important goal because it can help understand individual differences in pain perception as well as placebo effects, with clinical relevance.

The proposed methodology builds on previous work where we developed non-invasive laboratory procedures and probabilistic computational models to extract relevant computational parameters for study participants.

In year 1, the student will extract a profile of computational parameters in research volunteers, based on their performance in behavioural tasks. Studies in years 2-3 will improve the procedure, develop the models, and examine its ability to predict neural response to pain using EEG. The project will deliver a laboratory procedure with high predictive validity and translational potential, which quantifies individual differences in the potency of expectations and prior belief on pain perception.

BBSRC DTP main strategic theme: Understanding the rules of life

BBSRC DTP secondary strategic theme: Transformative technologies