

Multiple threat learning systems in the brain

2020-01/Area: neuropsychology/neuroscience

Background

Circumstantial evidence suggests the existence of parallel threat learning (aka fear conditioning) systems in the human brain, with possible contributions from amygdala, hippocampus, and cerebellum. Yet, conflicting data mean that we cannot unambiguously map behavioural readouts onto these different learning systems ¹.

Urbach-Wiethe syndrome is a rare genetic condition that leads to specific calcification of the human amygdala. We have collected data from patients with this condition in several threat learning tasks, as well as control groups. The lab has substantial experience with analysing and interpreting cognitive test data from these patients ²⁻⁶.

You will analyse psychophysiological and self-report data from these patients to find out what behavioural readouts are influenced by amygdala lesions. This includes pupillometry, ECG, respiration, electrodermal activity, and fear-potentiated startle.

What you can learn

- Model-based analysis of biophysical signals with the Matlab-based software PsPM (bachlab.org/pspm)
- Background knowledge on the measurement of fear conditioning in humans

Your profile

(1) Your background is in psychology, neuroscience, biology, or related fields, and you want to acquire data analysis skills.

(2) You have a background in any engineering or science field, and a strong interest in understanding neuroscience.

Supervision

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Literature

1. Ojala, K. & Bach, D.R. Measuring learning in human classical threat conditioning: a review of translational, cognitive and methodological considerations. *Pre-Print* <https://psyarxiv.com/2dzkj/> (2019).
2. Bach, D.R., Talmi, D., Hurlemann, R., Patin, A. & Dolan, R.J. Automatic relevance detection in the absence of a functional amygdala. *Neuropsychologia* **49**, 1302-1305 (2011).
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6. Bach, D.R., Hoffmann, M., Finke, C., Hurlemann, R. & Ploner, C.J. Disentangling Hippocampal and Amygdala Contribution to Human Anxiety-Like Behavior. *J Neurosci* **39**, 8517-8526 (2019).