Erasing Long-Term Neural Representations of Pain

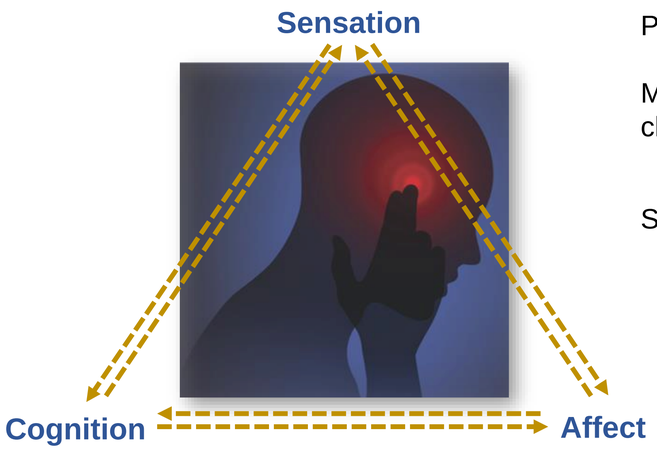
Louisa Gwynne,

lg497@kent.ac.uk, *School of Psychology*

SeNSS South East Network for Social Sciences

University of Kent

Learning and Plasticity in Chronic Pain



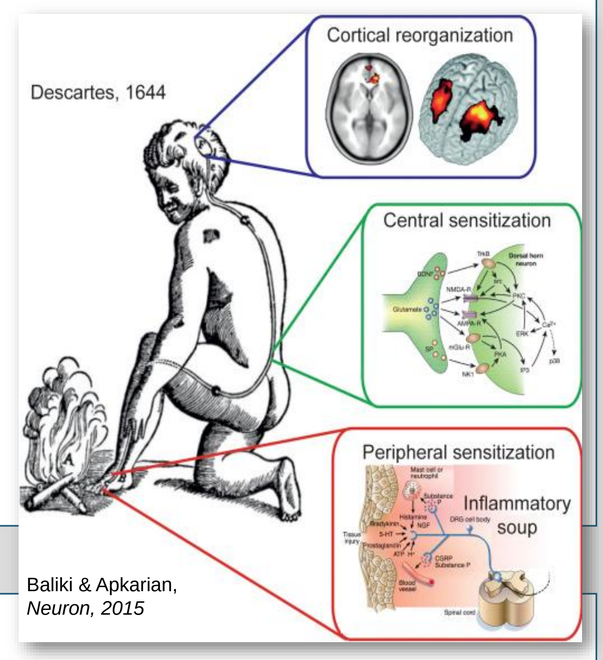
Pain is a conscious and subjective aversive (usually) experience, built up from an interaction of factors.

Memory and learning of pain guides future adaptative behaviours but, can become maladaptive as in chronic pain, pain-related anxiety and, pain trauma[1,2]

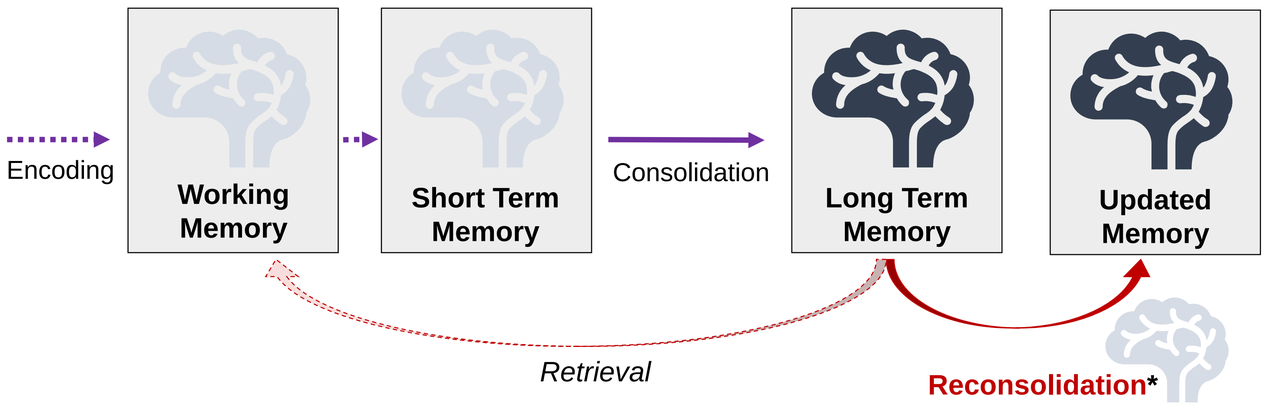
Structures associated with structural and functional plasticity in chronic pain:

- Medial PFC
- Amygdala
- Periaqueductal gray
- Anterior Cingulate Cortex
- Hippocampus
- Nucleus Accumbens

Implicated in emotion, learning and motivation.



Disrupting Maladaptive Learning & Memory



***Reconsolidation*:**

A state of destabilisation and labile to modification through methods that alter/disrupt processes of reconsolidation.[3] These include:

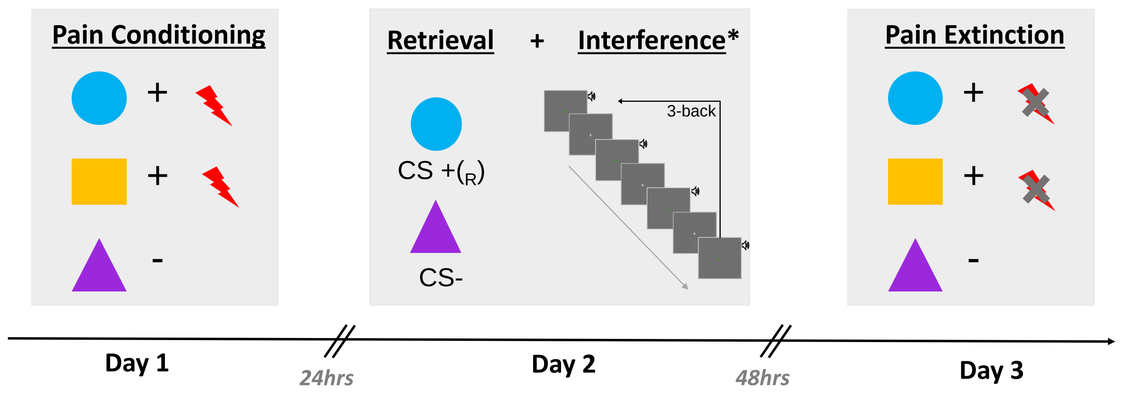
- Beta-blockers & NMDA antagonists
- Non-invasive brain stimulation (TMS, tDCS)
- Cognitive competition through tasks of working memory (taxing neural resources)

In the lab

Aim

Investigate the effects of an aversive working memory task administered at reconsolidation on the recall and extinction rate of learnt pain associations.

Method (*N=58*)



***Interference:**
auditory N-back task with aversive word stimuli used as working memory task of interference.

Measures

- Expectancy Ratings
"How much do you expect to receive a shock upon seeing this image from 1 *(Not at All)* to 10 *(Very Much)"*

- Skin Conductance Response (SCR)

Conclusion

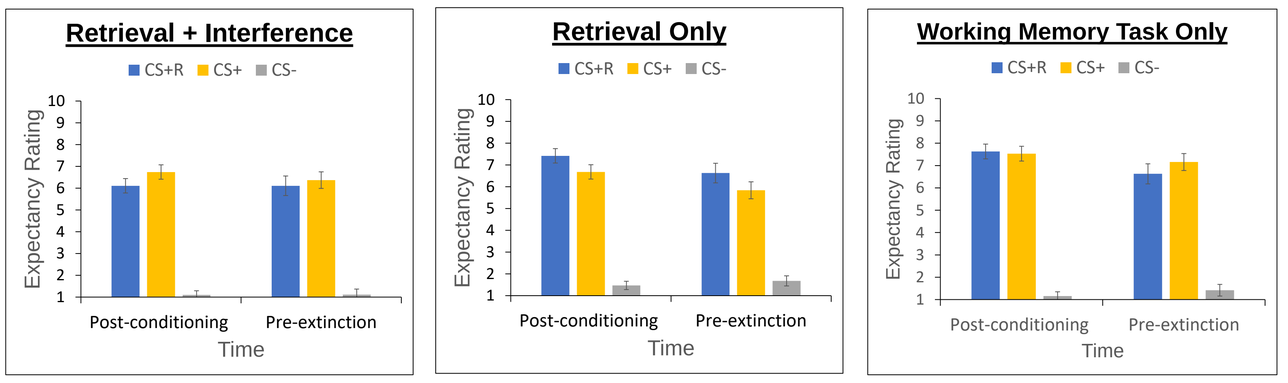
- No significant attenuation of explicit memory recall for conditioned pain associations.
- No significant attenuation of extinction rate for pain based on explicit expectancy alone.

Future work…

1) Analyse SCR data (implicit learning)
2) Test somatosensory based interference task

Preliminary Results (Explicit Expectancy)

Memory Interference

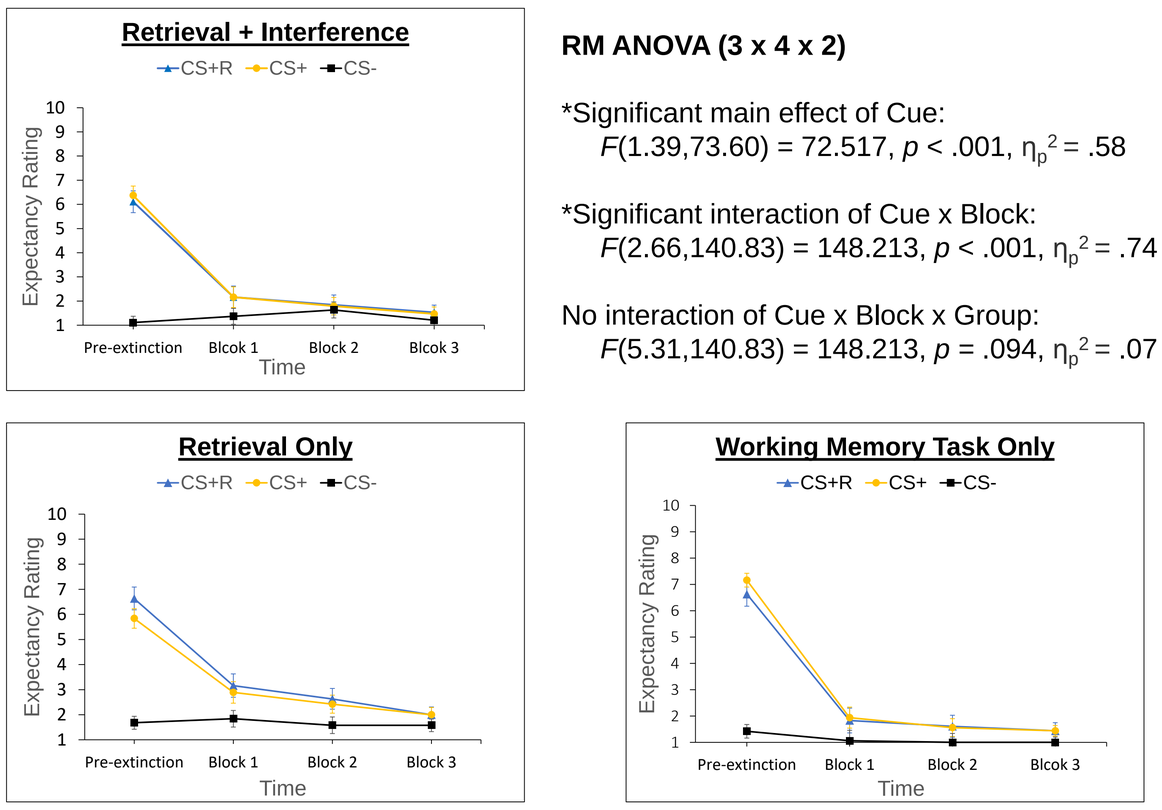


Plotted are marginal Means. Error bars represent standard error.

RM ANOVA (3 x 2 x 3)

*Significant main effect of Cue: $F(2,108) = 415.564$, $p < .001$, $\eta_p^2 = .89$
*Significant interaction of Cue x Time: $F(2,108) = 6.107$, $p = .003$, $\eta_p^2 = .10$
No interaction of Cue x Time x Group: $F(4,108) = 1.278$, $p = .283$, $\eta_p^2 = .05$

Extinction Learning



Plotted are marginal Means. Error bars represent standard error.

RM ANOVA (3 x 4 x 2)

*Significant main effect of Cue:
$F(1.39,73.60) = 72.517$, $p < .001$, $\eta_p^2 = .58$

*Significant interaction of Cue x Block:
$F(2.66,140.83) = 148.213$, $p < .001$, $\eta_p^2 = .74$

No interaction of Cue x Block x Group:
$F(5.31,140.83) = 148.213$, $p = .094$, $\eta_p^2 = .07$

References
1. Apkarian, A., Baliki, M., & Geha, P. (2009). Towards a theory of chronic pain. Progress in Neurobiology, 87(2), 81-97. doi:10.1016/j.pneurobio.2008.09.018
2. Price, T., & Inyang, K. (2015). Commonalities between pain and memory mechanisms and their meaning for understanding chronic pain. Progress in Molecular Biology and Translational Science, 409-434. doi:10.1016/bs.pmbts.2014.11.010
3. Beckers, T., & Kindt, M. (2017). Memory reconsolidation interference as an emerging treatment for emotional disorders: strengths, limitations, challenges, and opportunities. Annual Review of Clinical Psychology, 13(1), 99-121. doi:10.1146/annurev-clinpsy-032816-045209