

Prefrontally mediated inhibition of autobiographical memory in psychogenic amnesia.

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Background

Psychogenic amnesia describes the loss of autobiographical memory with a psychological rather than neurological cause. This can include situation-specific gaps (e.g. for traumatic events). It also includes more 'global' forms of psychogenic amnesia, including psychogenic fugue and psychogenic focal retrograde amnesia¹.

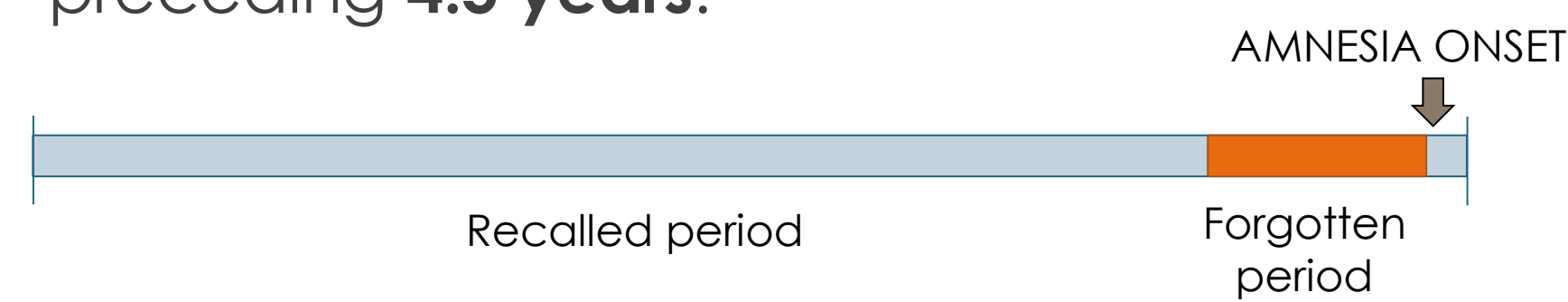
The neurocognitive mechanisms underlying the memory loss are not fully understood. It has been proposed that memory systems are inhibited by cognitive control mechanisms, triggered by severe ongoing stress².

A parallel body of experimental work has characterised a domain-general memory and motor control network which can be reflexively engaged to suppress memory retrieval^{3,4}.

We re-analysed data from a previously reported fMRI study of 2 cases⁵ to examine the role of memory control networks in psychogenic amnesia.

PATIENT 1

- 27 year old man
- 2 day **fugue**, persisting **focal retrograde amnesia** for preceding **4.5 years**.



PATIENT 2

- 52 year old man
- Psychogenic focal retrograde amnesia** for preceding **35 years**.



fMRI task

Recognised high school friends
12 Names, 12 faces

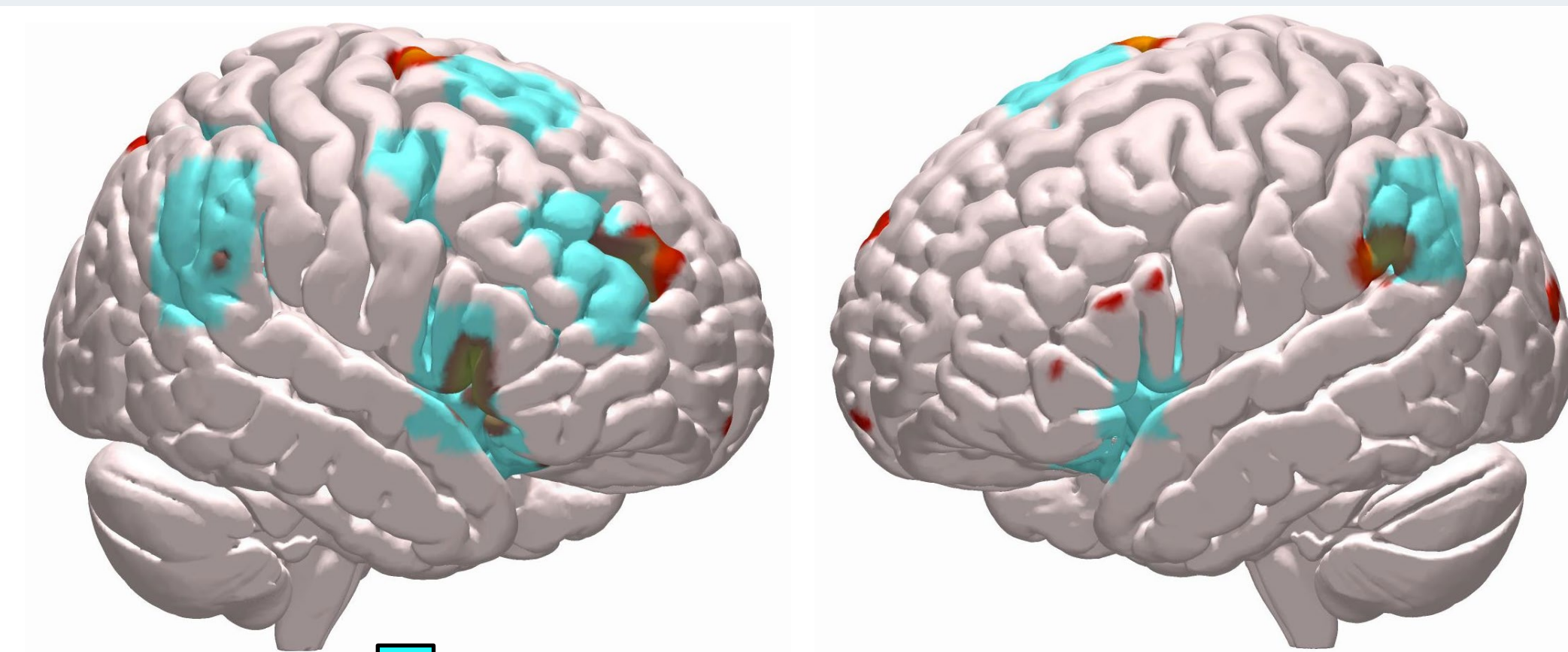
Unrecognised current colleagues
12 Names, 12 faces

Control conditions:
Novel 12 Names, 12 faces
Scrambled (rest block) 12 Names, 12 faces

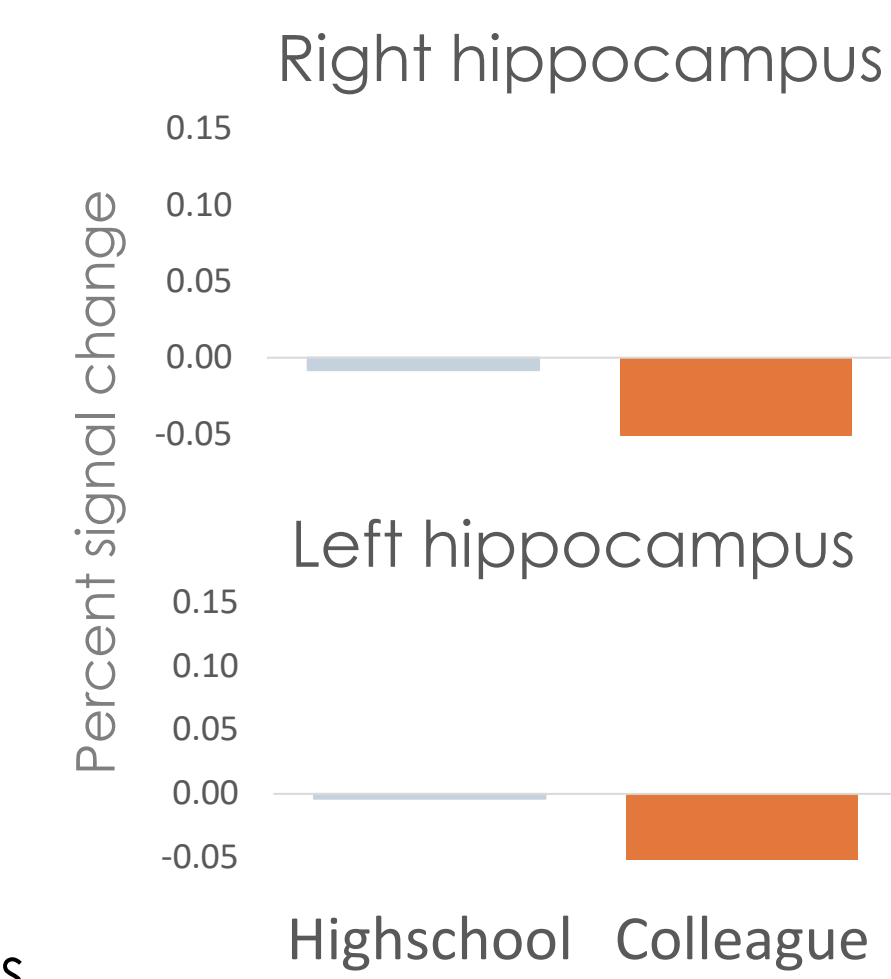
Are you acquainted with this person?

Results

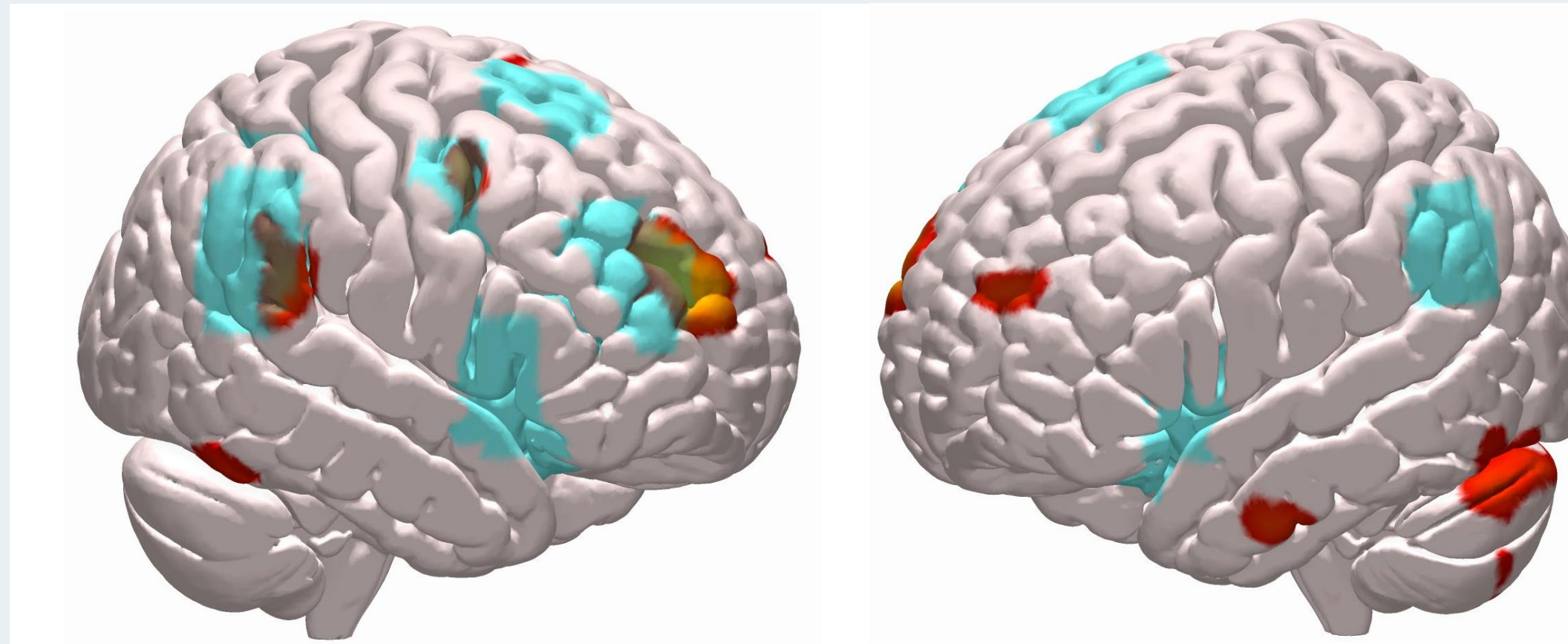
PATIENT 1



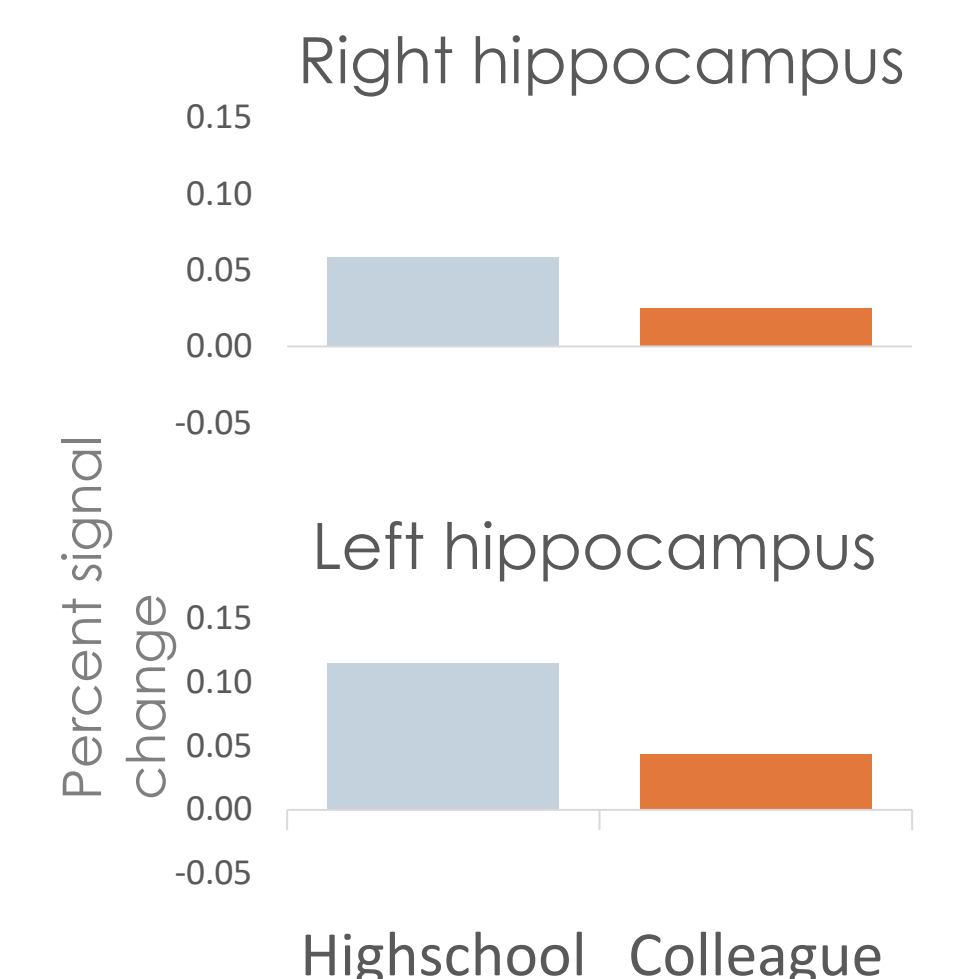
Memory control network (meta-analysis⁴)
Forgotten colleagues > recognised school friends



PATIENT 2

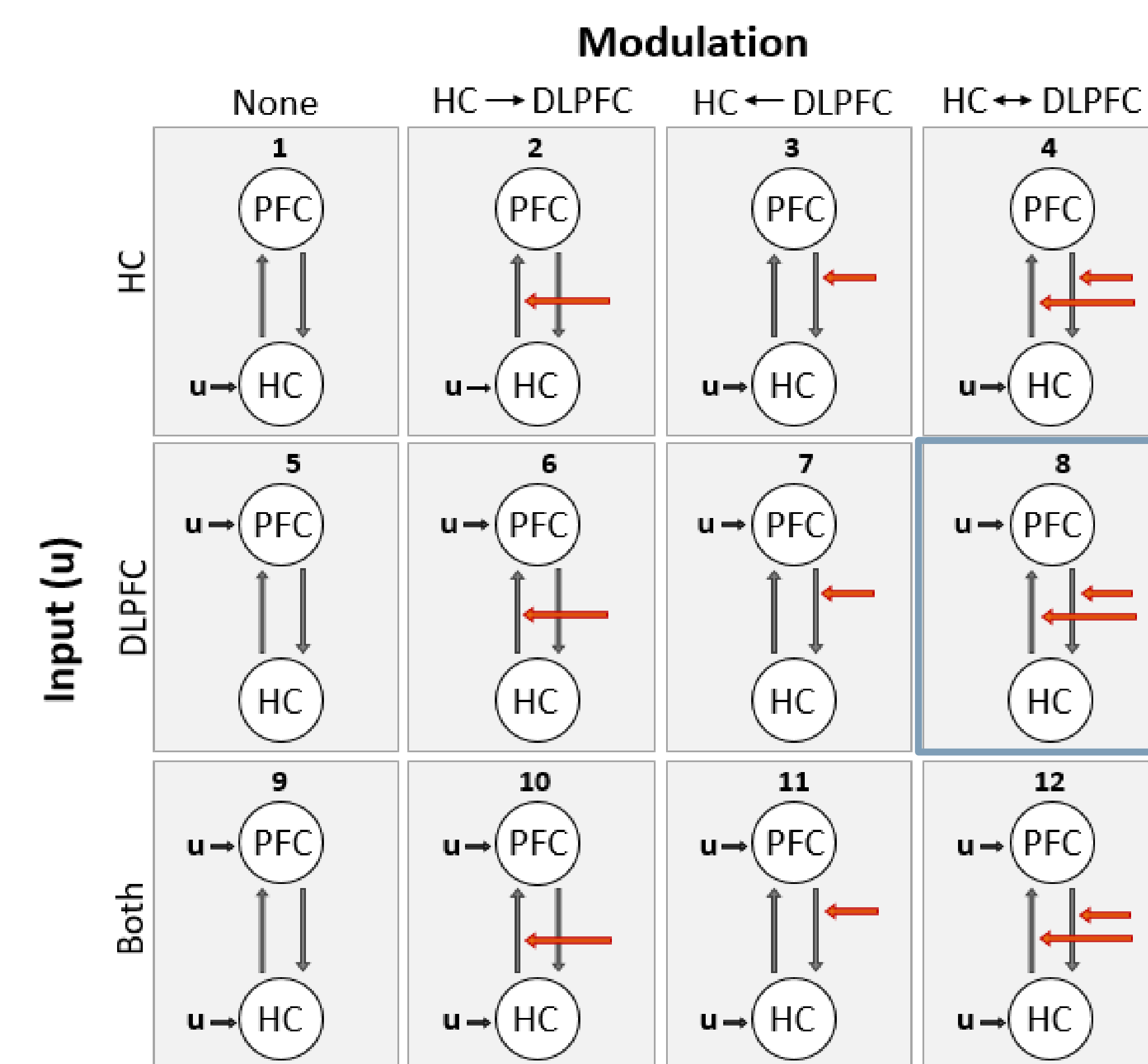


Memory control network (meta-analysis⁴)
Forgotten colleagues > recognised school friends



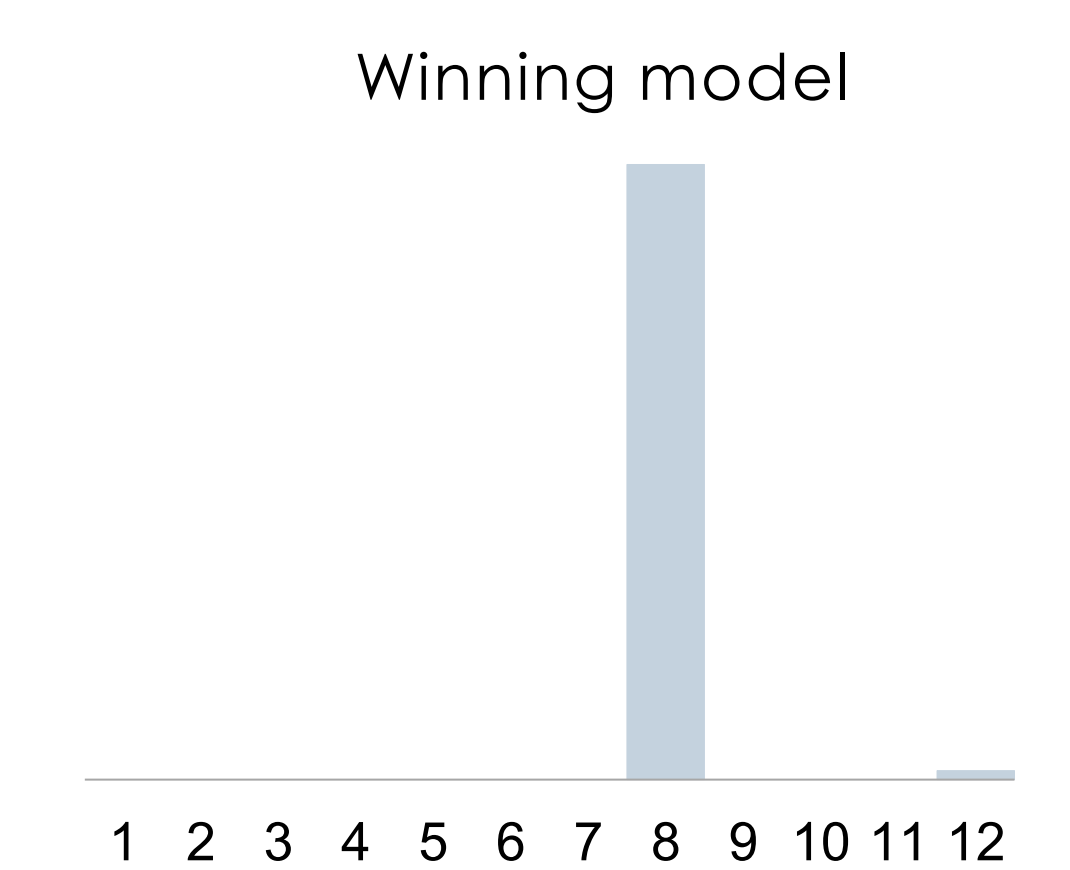
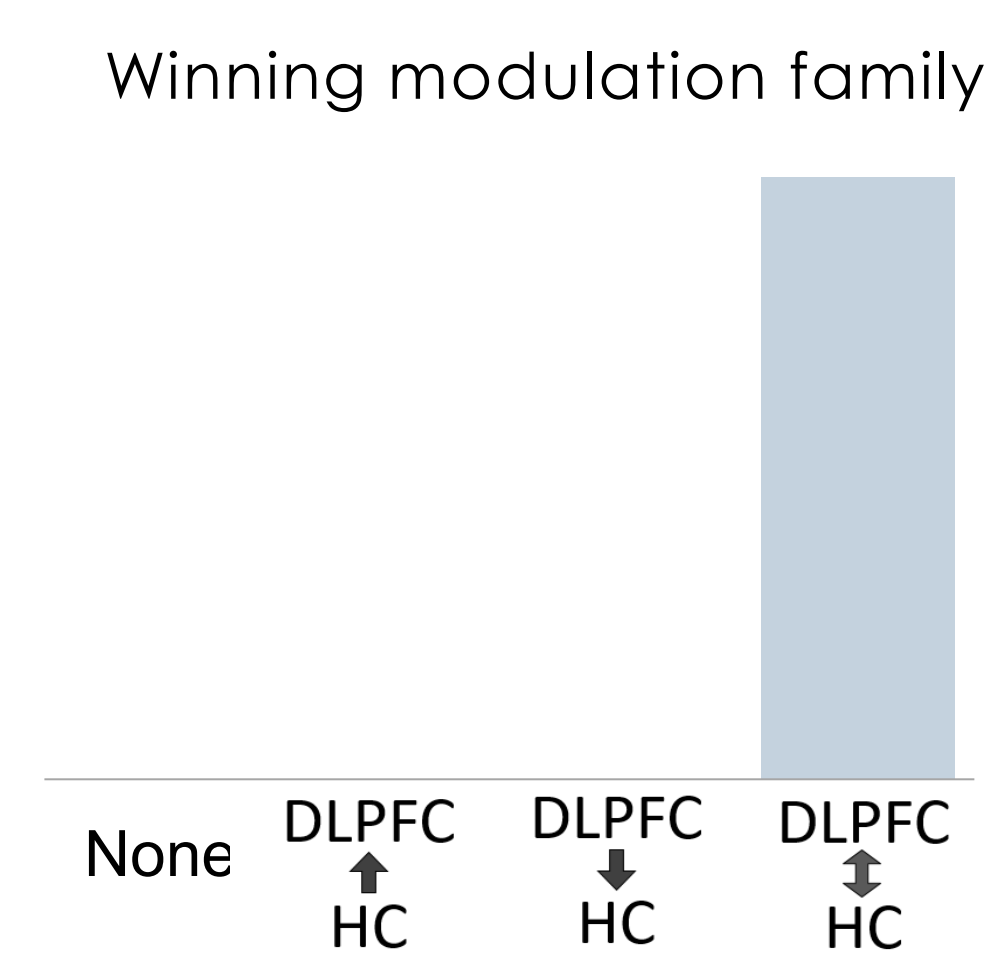
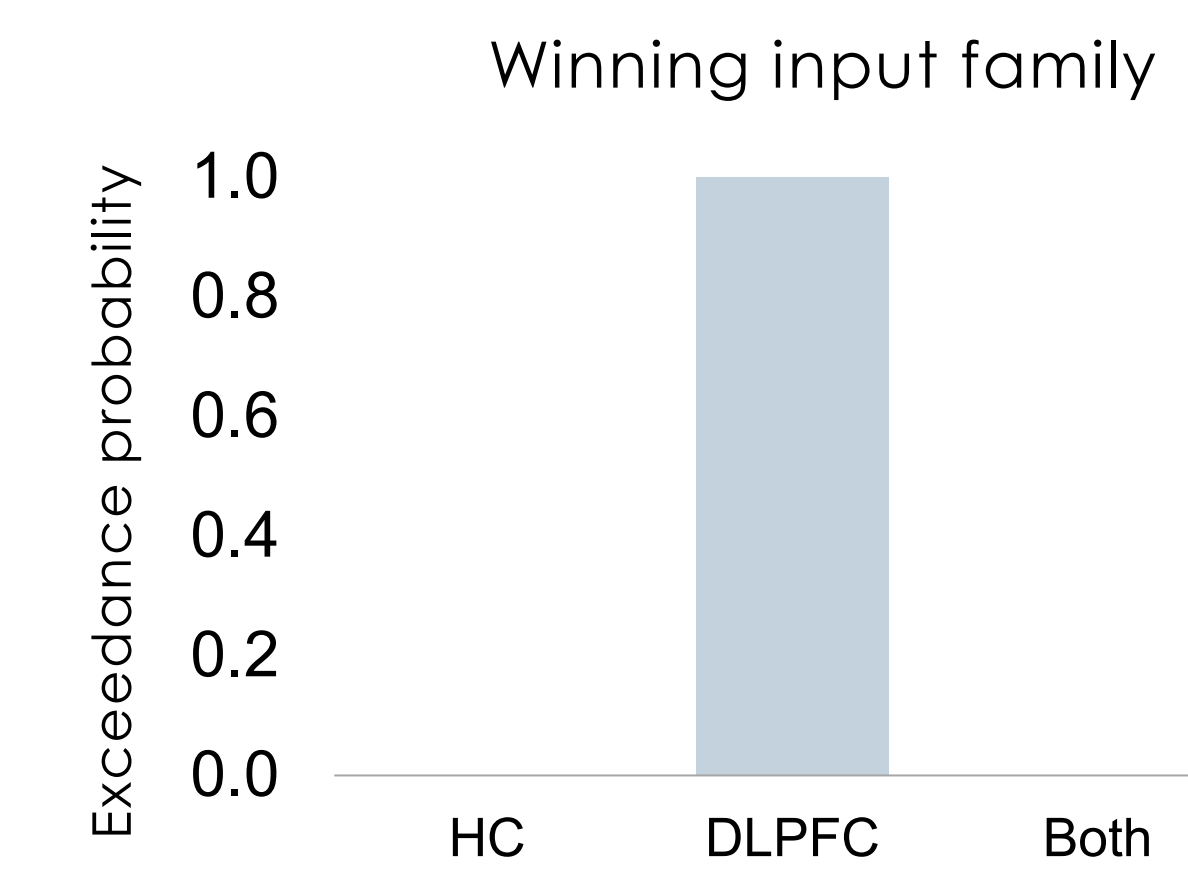
Engagement of the HC memory control network and reduced hippocampal activation when patients were reminded of people they could not remember.

Effective connectivity: Does the right DLPFC exert a causal modulatory influence on the right hippocampus during the colleague condition?

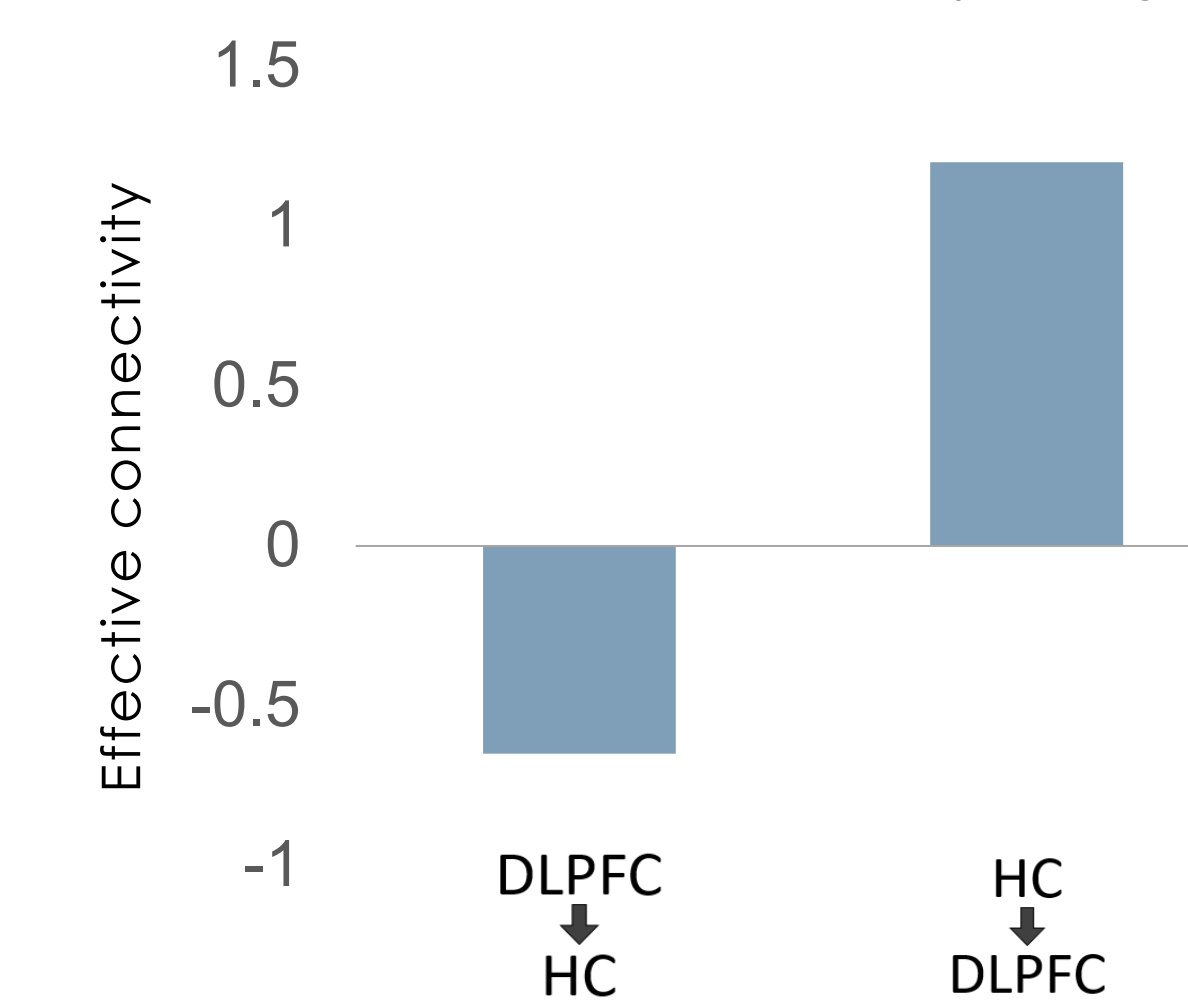


Model space from Benoit & Anderson, *Neuron*, 2012

→ Input (u) = High school & colleague conditions
→ Modulatory input = Colleague condition



Parameter estimates (winning input family)



Consistent with lab-based memory control tasks⁴, we see:

- Bi-directional modulation between DLPFC and HC
- Driving input originates from DLPFC
- Negative coupling between the right DLPFC and right hippocampus.
- Positive coupling between the right hippocampus and right DLPFC

Conclusion

- Evidence for pre-frontally mediated downregulation of the hippocampus when patients were reminded of people they could not remember.
- Results support the theory that cognitive control mechanisms inhibit memory retrieval in psychogenic amnesia.