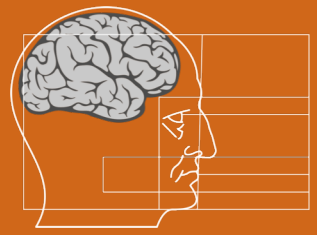

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Symposium and Advanced Course on Computational Psychiatry and Ageing Research

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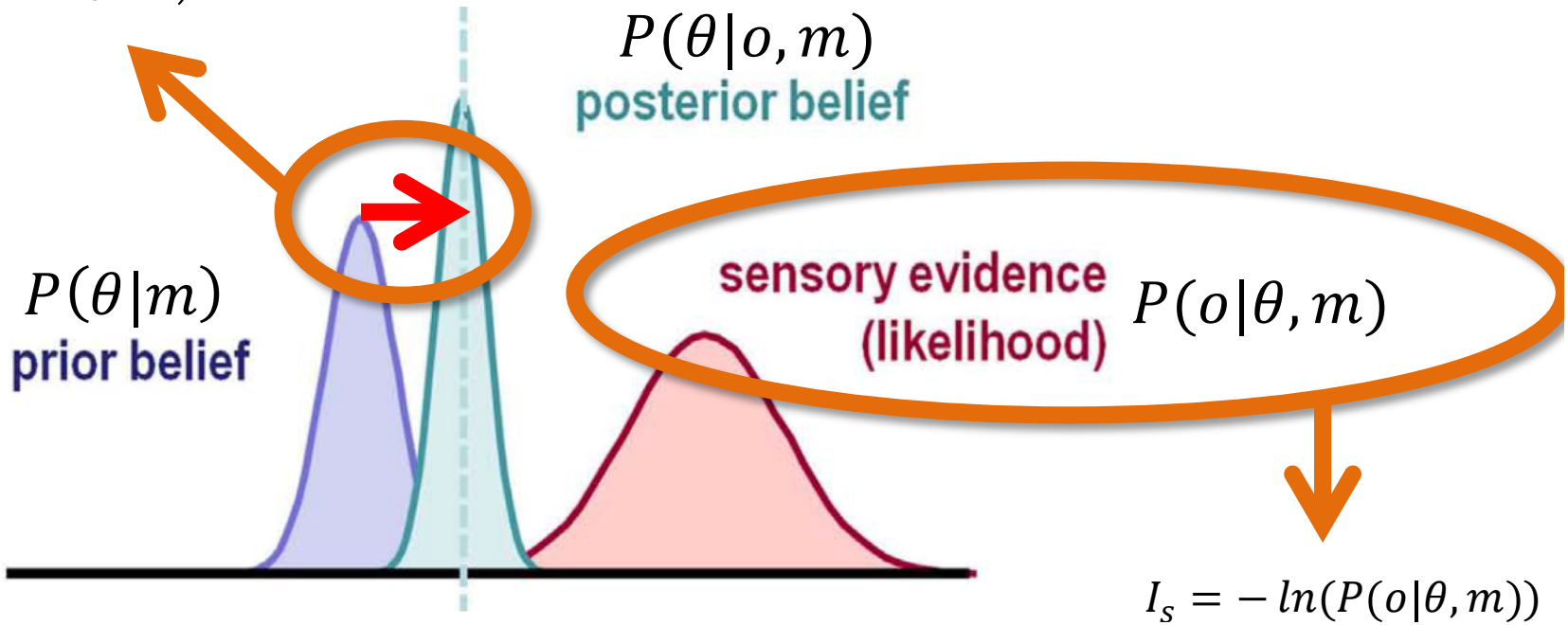
Dopaminergic basis for signalling belief updates, but not surprise, in midbrain and ventral striatum

Matthew Nour (Wellcome Trust PhD Fellow in Psychiatry)

Distinguishing two forms of sensory surprise

$$D_{KL} = \sum P(\theta|o,m) \cdot ln\left(\frac{P(\theta|o,m)}{P(\theta|m)}\right)$$

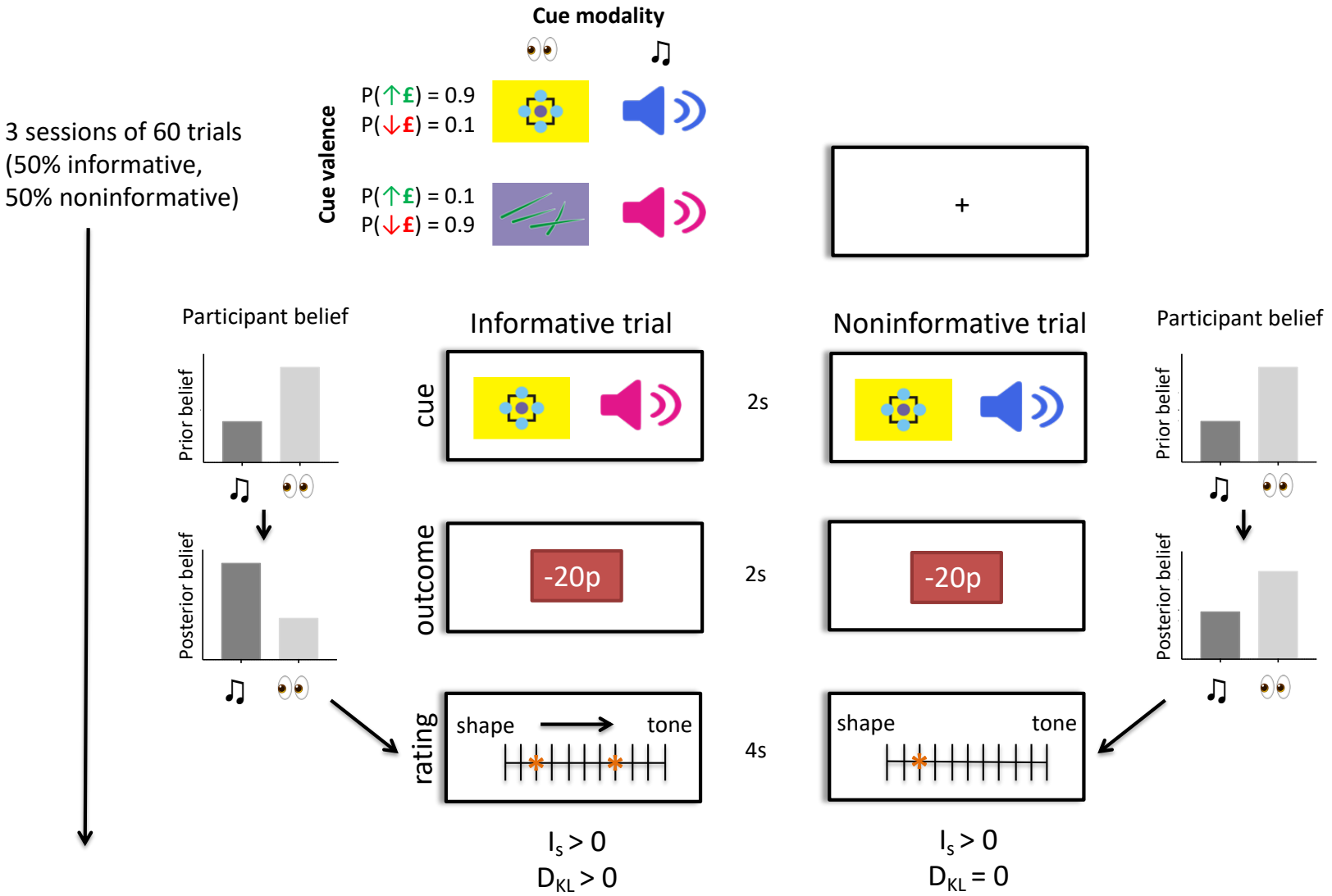
'Bayesian surprise'
'Belief update'



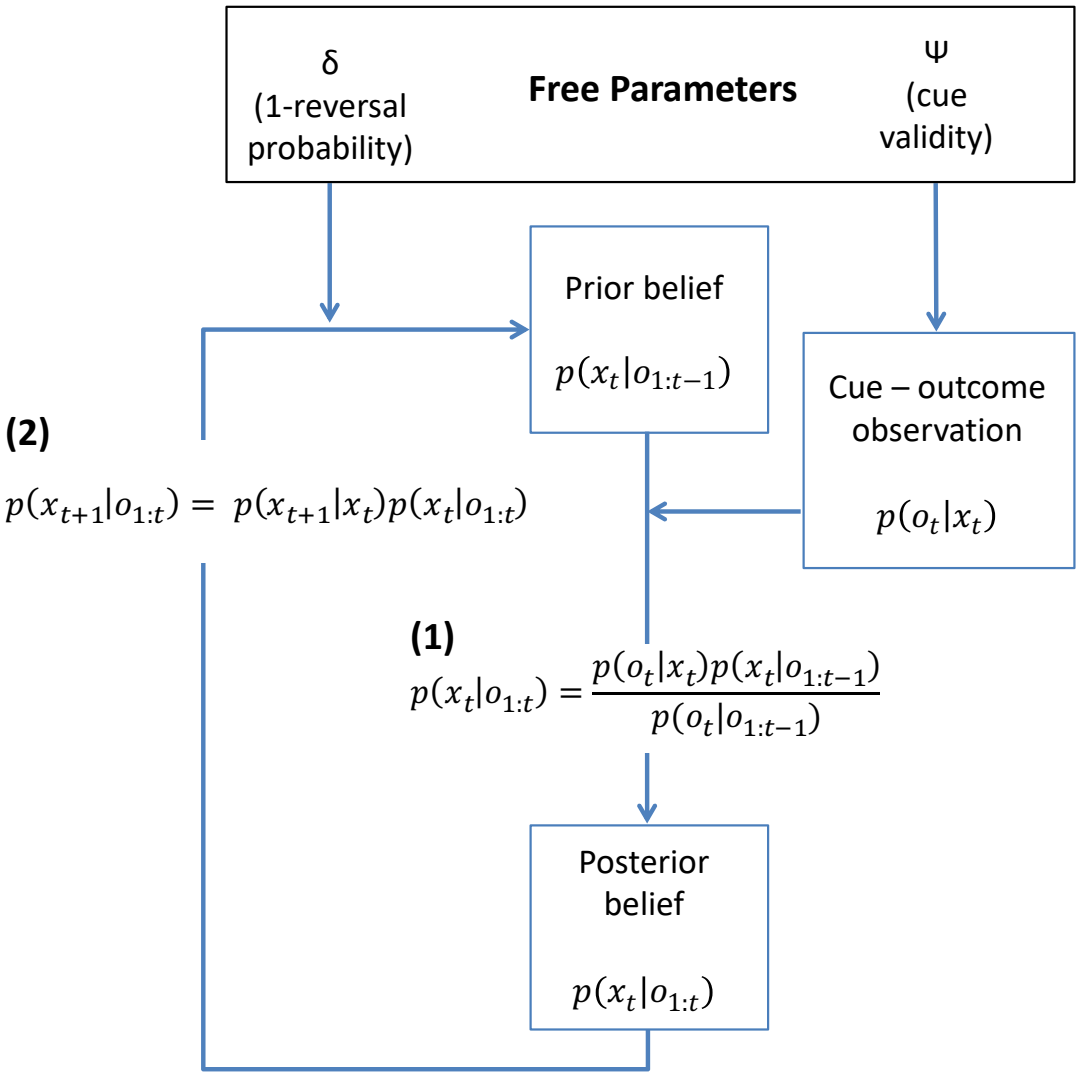
$$I_s = -ln(P(o|\theta,m))$$

'Information-theoretic surprise'
'Surprisal'

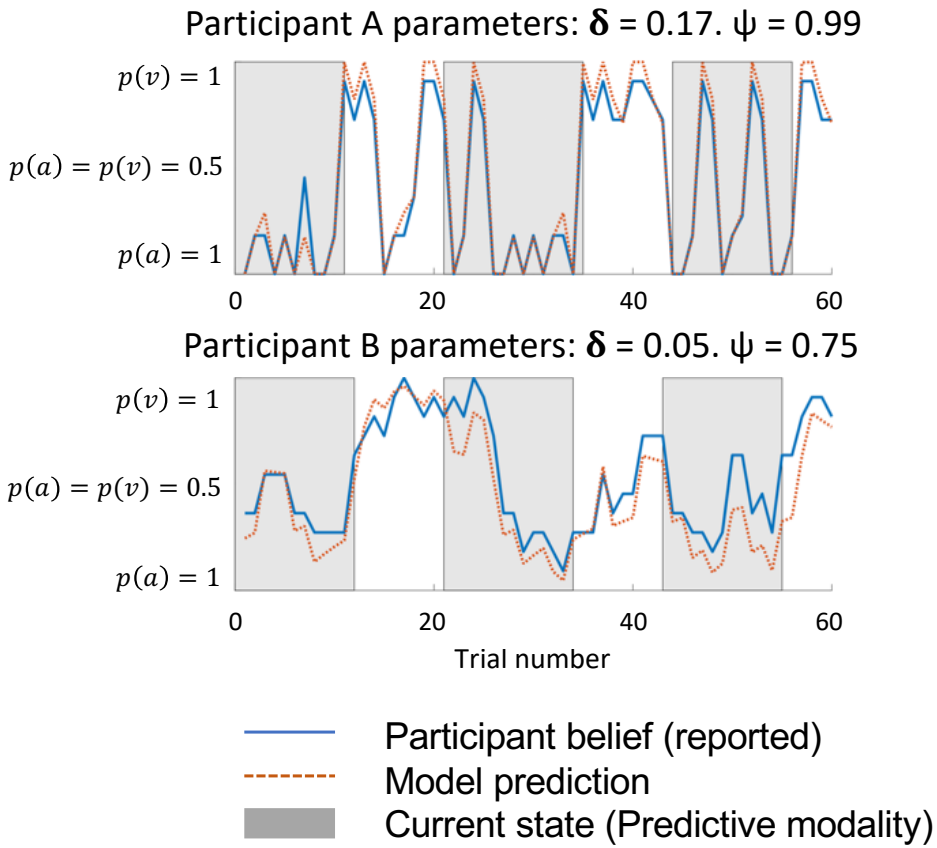
Decorrelating Bayesian- vs information-theoretic surprise



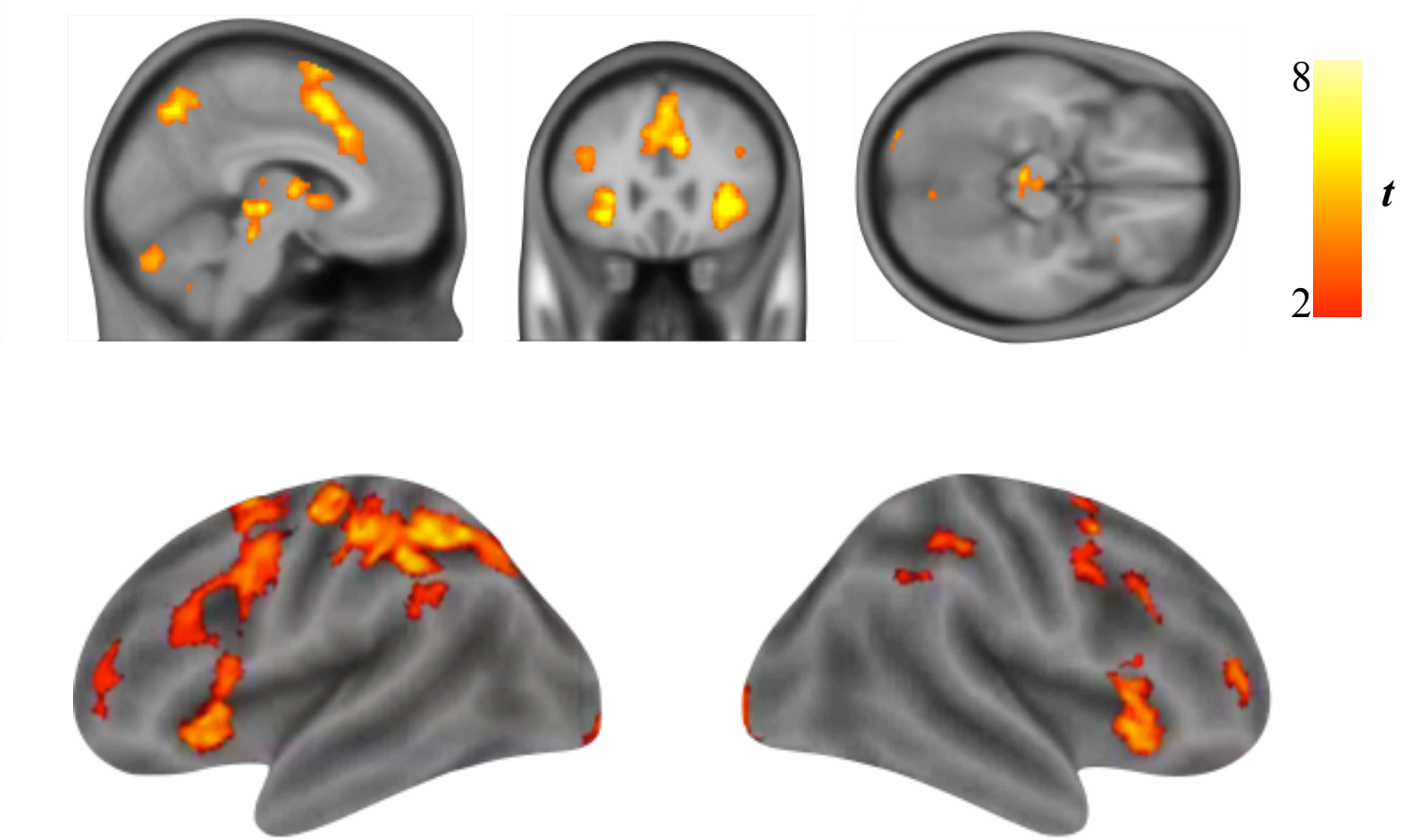
Behavioural results



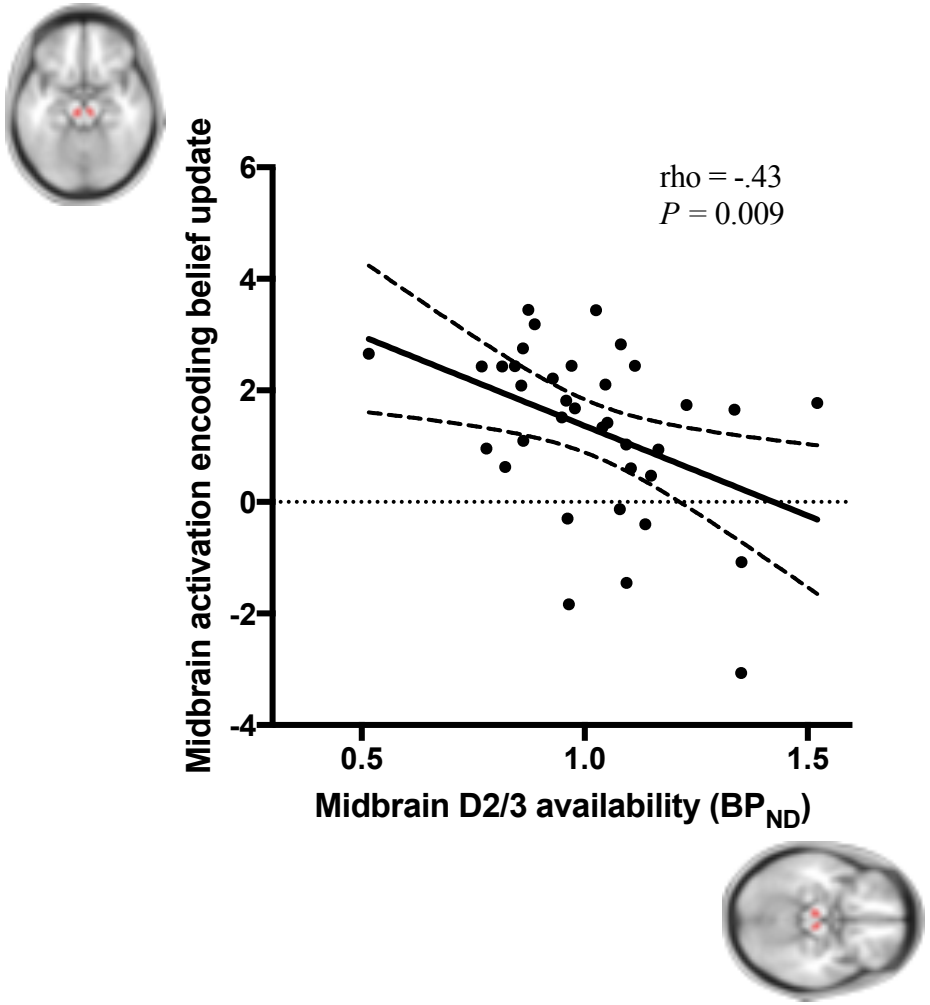
Two exemplar participant sessions with model fits



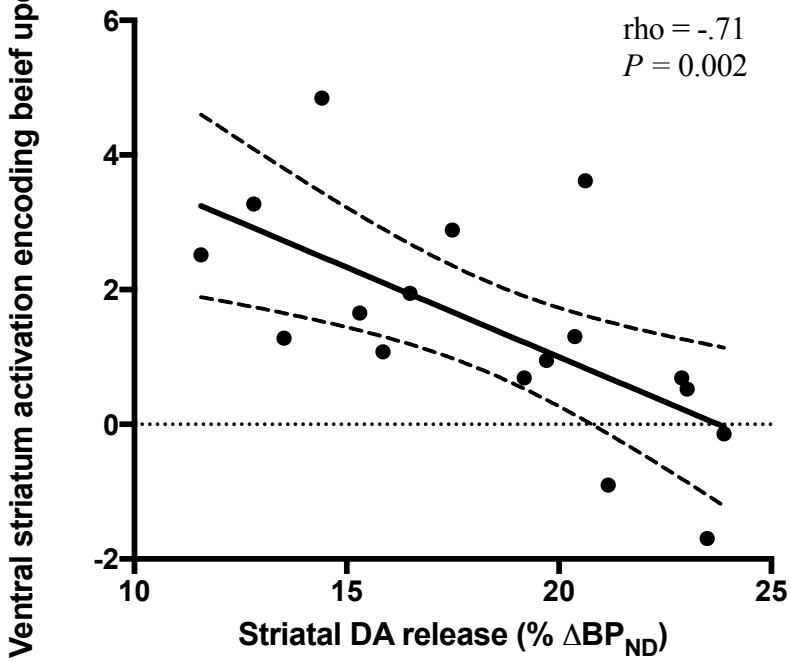
fMRI results (Bayesian surprise)



Dopamine 2/3 receptor availability negatively predicts belief update signal in midbrain



Dopamine release capacity negatively predicts belief update signal in ventral striatum



Conclusions and future directions

- Add to growing evidence implicating phasic mesolimbic dopamine signals in model-based belief updating and behavioural control.

- Relationship between dopaminergic surprise / prediction error signals and neural correlates of state construction and representation in OFC and hippocampus.