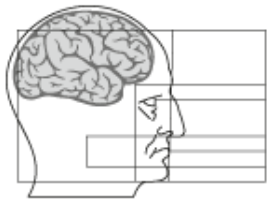


MAX PLANCK UCL CENTRE
for Computational Psychiatry and Ageing Research

Endogenous Fluctuations in the Dopaminergic Midbrain Drive Choice Variability

Benjamin Chew | Max Planck UCL Centre

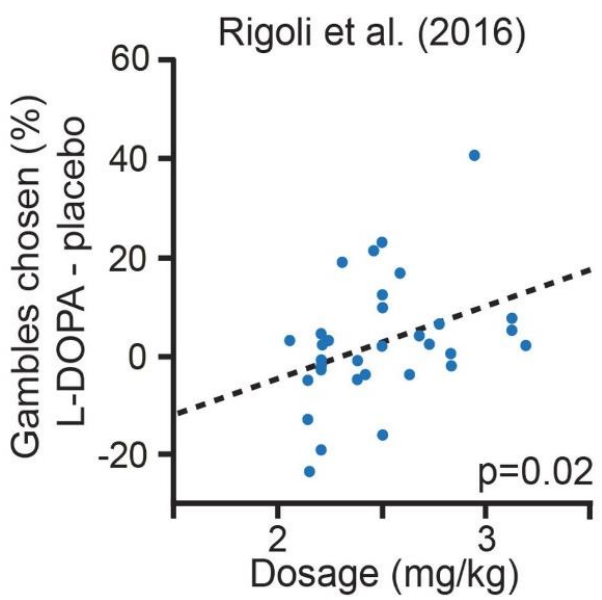
4th Symposium and Advanced Course on Computational Psychiatry and Ageing Research

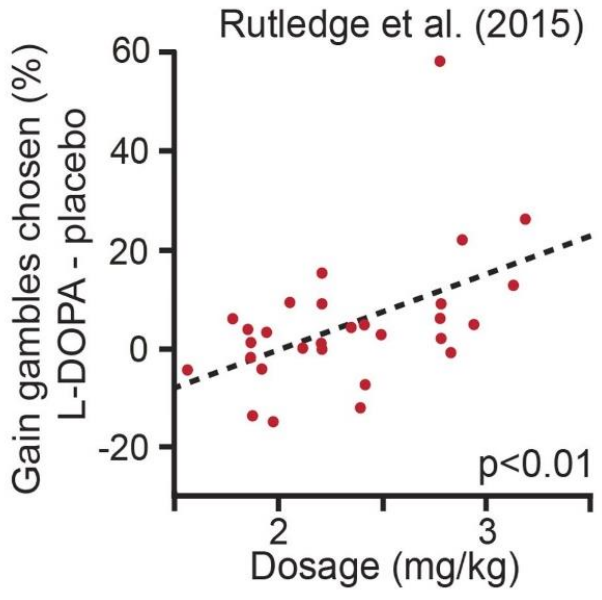
safe

or

risky

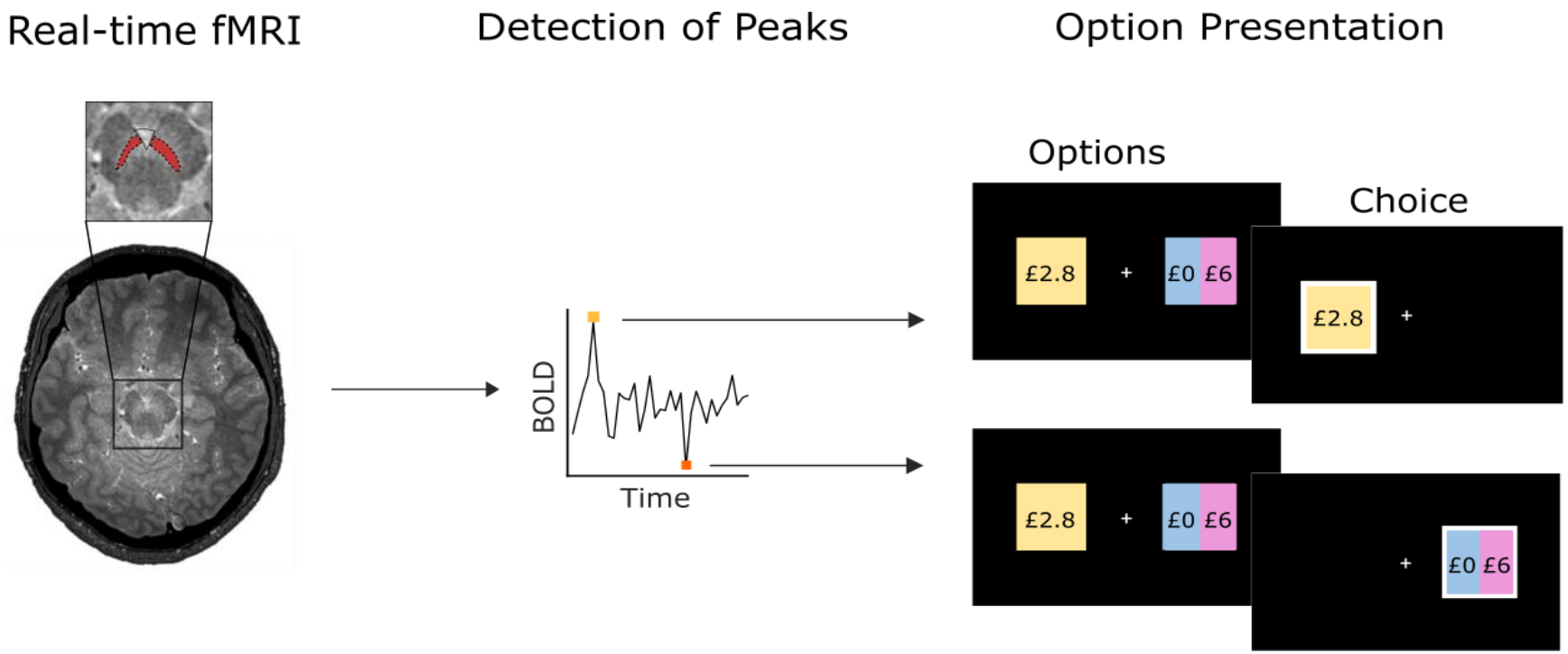
- Boosting dopamine pharmacologically increases risk-taking behavior (Rigoli et al., 2016; Rutledge et al., 2015)



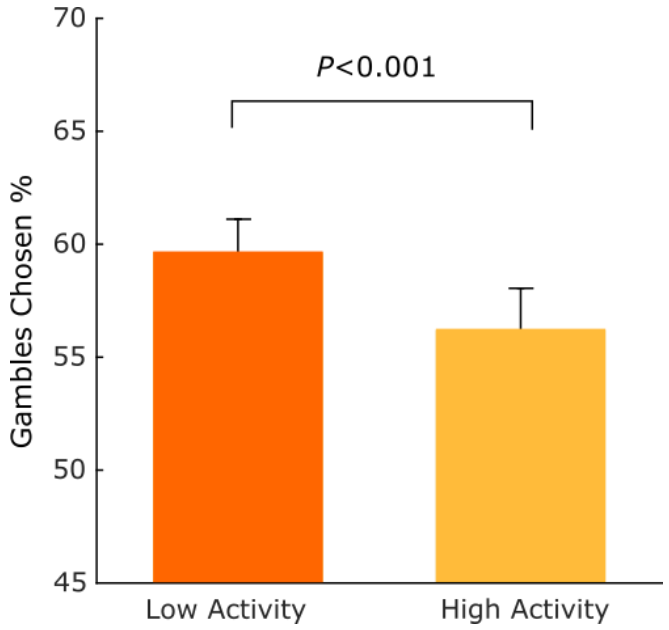


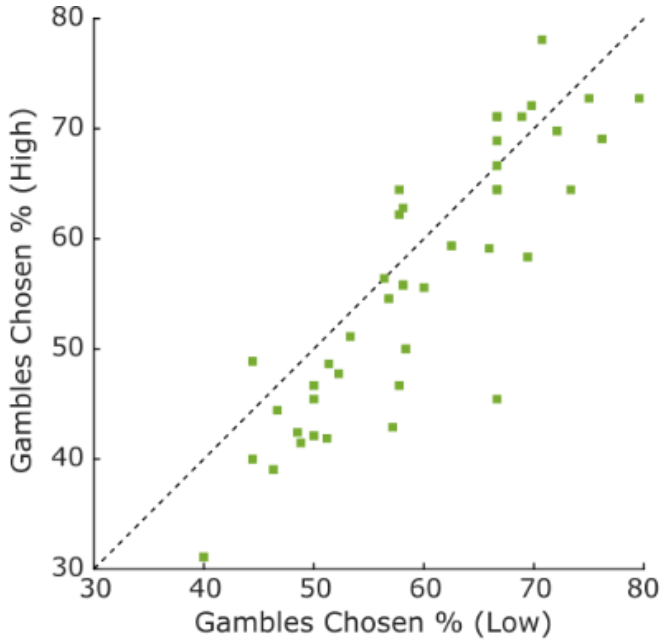
- Many brain regions display marked fluctuations in endogenous activity
- **Do endogenous fluctuations in the dopaminergic midbrain influence risk?**

- Day 1: Probabilistic Gambling Task + Structural Scan
- Day 2: Probabilistic Gambling Task with real-time fMRI



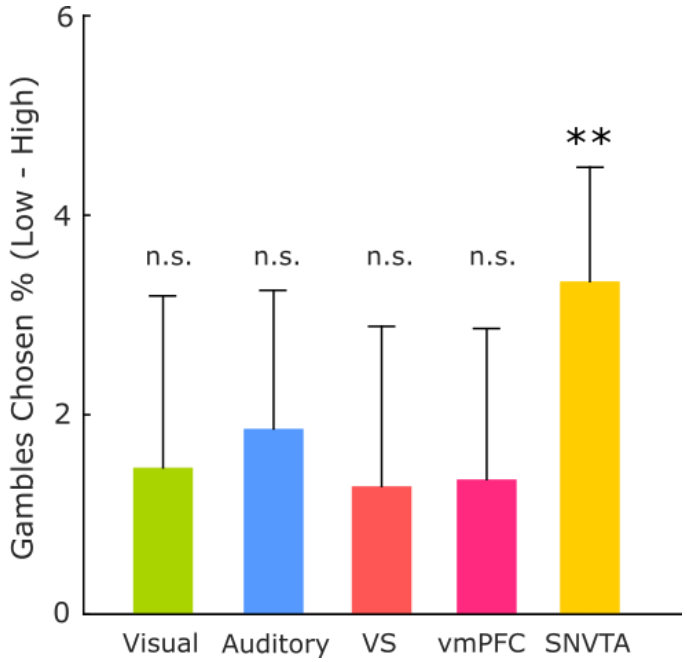
(n=43)

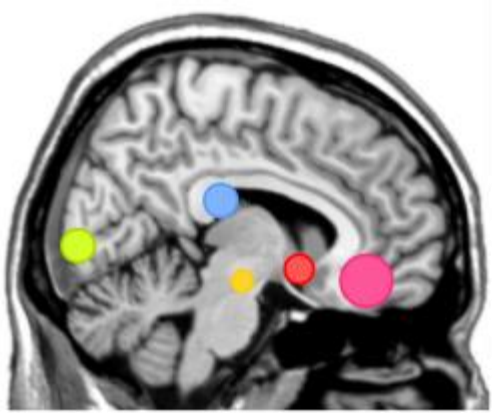

70
65
60
55
50
45
Gambles Chosen %
P<0.001
Low Activity
High Activity


80
70
60
50
40
30
Gambles Chosen % (High)
30
40
50
60
70
80
Gambles Chosen % (Low)

Effect of endogenous fluctuations on risk taking is specific to the dopaminergic midbrain

- Control regions included sensory areas as well as areas typically implicated in value-based decision making





(Illustration only)

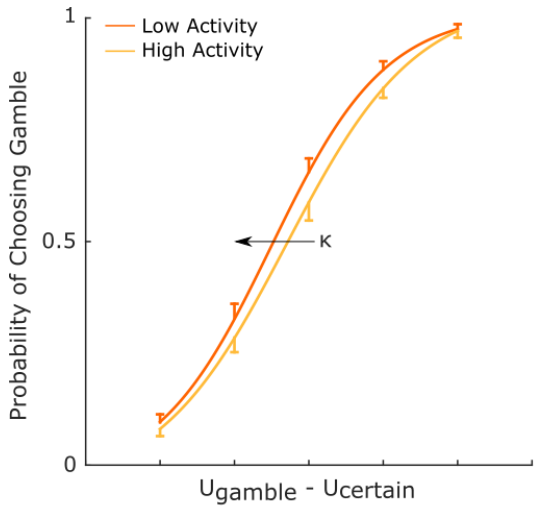
- Parametric prospect theory model provided a good description of choice behaviour (pseudo-R^2 = 0.44)

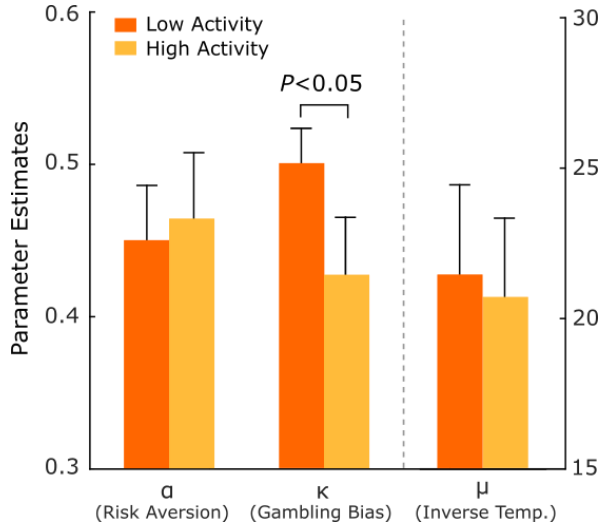
$$U_{gamble} = 0.5(V_{gain})^{\alpha}$$
$$U_{certain} = (V_{certain})^{\alpha}$$

$$P_{gamble} = \frac{1}{1+e^{-\mu(Ugamble-Ucertain)}}$$

- Model with an additional gambling bias term outperforms this (pseudo-R^2 = 0.55)

$$P_{gamble} = \frac{1}{1+e^{-\mu(Ugamble-Ucertain+\kappa)}}$$





- People take **more risks** when choice options are presented against a background of **low dopaminergic midbrain activity**
- Endogenous midbrain activity influences the decision process in a **value-independent** manner

Acknowledgements

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RAY DOLAN

ROBB RUTLEDGE

TOBIAS HAUSER

MARINA PAPOUTSI

JOERG MAGERKURTH