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MEETING ABSTRACT

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Role of dopamine D2 receptors in human reinforcement learning
Christoph Eisenegger1,*, Michael Naeef2, Anke Linsen3, Luke Clark4, Ulrich Müller5 and Trevor W. Robbins6
1Department of Basic Psychological Research and Research Methods, University of Vienna, Austria; 2Department of Economics, Royal Holloway, University of London, Egham, United Kingdom; 3Department of Neuropsychology and Psychopharmacology, University of Maastricht, The Netherlands; 4Centre for Gambling Research at UBC, Department of Psychology, University of British Columbia, Vancouver, BC, Canada; 5Cambridgeshire and Peterborough NHS Foundation Trust, Adult ADHD Service, Cambridge, United Kingdom; 6Behavioural and Clinical Neuroscience Institute and Department of Psychology, University of Cambridge, United Kingdom

Influential neurocomputational models emphasize dopamine (DA) as an electrophysiological and neurochemical correlate of reinforcement learning. However, evidence of a specific causal role of DA receptors in learning has been less forthcoming, especially in humans. Here, we combine, in a between-subjects design, administration of a high dose of the selective DA D2 receptor antagonist sulpiride with genetic analysis of the DA D2 receptor in a behavioral study of reinforcement learning in a sample of 78 healthy male volunteers. In contrast to predictions of prevailing models emphasizing DA’s pivotal role in learning via prediction errors, we found that sulpiride did not disrupt learning, but rather induced profound impairments in choice performance. The disruption was selective for stimuli indicating reward, whereas loss avoidance performance was unaffected. Effects were driven by volunteers with higher serum levels of the drug, and in those with genetically determined lower density of striatal DA D2 receptors. This is the clearest demonstration to date for a causal modulatory role of the DA D2 receptor in choice performance that might be distinct from learning. Our findings challenge current reward prediction error models of reinforcement learning, and suggest that classical animal models emphasizing a role of postsynaptic DA D2 receptors in motivational aspects of reinforcement learning may apply to humans as well.

*Submitting author e-mail: christoph.eisenegger@univie.ac.at