
Multiple and subject-specific roles of uncertainty in reward-guided decision-making

Alexander Paunov^{*1,2,3}, Maeva L'hotellier , Zoe He , Dalin Guo , Angela Yu , and Florent Meyniel

¹Neuroimagerie cognitive - Psychologie cognitive expérimentale – Commissariat à l'énergie atomique et aux énergies alternatives, Institut National de la Santé et de la Recherche Médicale, Université Paris-Saclay – France

²Neuroimagerie cognitive - Psychologie cognitive expérimentale – NeuroSpin-CEA, Institute for Neuromodulation – France

³NeuroSpin, Neuroimagerie cognitive, Institute for Neuromodulation, Paris – CEA Saclay - DRF Joliot, Institute for Neuromodulation (GHU) – France

Résumé

Decision-making in noisy, changing, and partially observable environments entails a basic tradeoff between immediate reward and longer-term information gain, known as the exploration-exploitation dilemma. Computationally, an effective way to balance this tradeoff is by leveraging uncertainty to guide exploration. Yet, in humans, empirical findings are mixed, from suggesting uncertainty-seeking to indifference and avoidance. In a novel bandit task that better captures uncertainty-driven behavior, we find multiple roles for uncertainty in human choices. First, stable and psychologically meaningful individual differences in uncertainty preferences actually range from seeking to avoidance, which can manifest as null group-level effects. Second, uncertainty modulates the use of basic decision heuristics that imperfectly exploit immediate rewards: a repetition bias and win-stay-lose-shift heuristic. These heuristics interact with uncertainty, favoring heuristic choices under higher uncertainty. These results, highlighting the rich and varied structure of reward-based choice, are a step to understanding its functional basis and dysfunction in psychopathology.

*Intervenant