基礎研究

N6 脳情報科学

Metacognition and Adaptive Behaviour

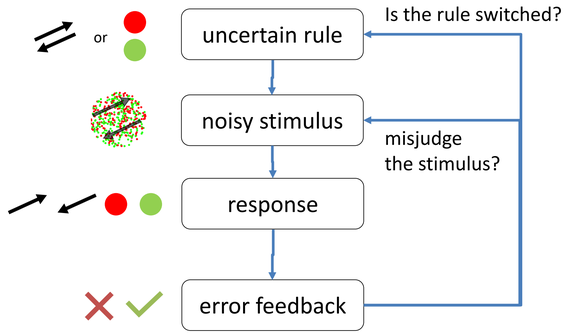
～The Role of Self-Evaluation in Dynamic Environments～

概要

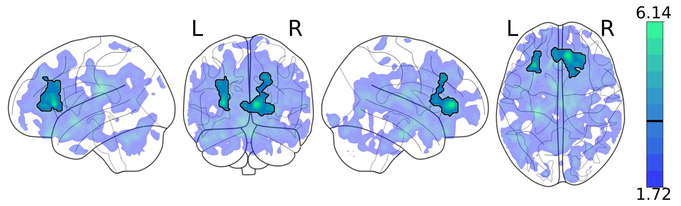
Metacognition is defined as “cognition of cognition”, the ability to monitor and regulate cognitive processes, such as decision-making. We hypothesize that metacognition facilitates humans' learning processes and adaptation to real-world's dynamic contexts. Our aim is to investigate the neural and computational mechanisms involved in metacognition through behavioural and neuroimaging studies.

特徴

- Confidence reports are behavioural responses used to measure metacognitive processes. They're associated with uncertainty levels of both stimuli and performance.
- Confidence tracks task accuracy and reacts to changes in the environment, eventually deriving in strategy adaptation.
- We hypothesize that changes in confidence reflect credit assignment to sources of prediction errors and modulate decision-making flexibility (individuals with better metacognitive ability should adapt better/faster).



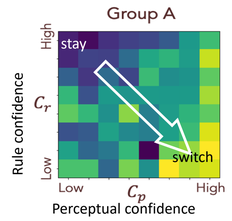
Metacognition evaluates current performance and helps an agent adjust future actions



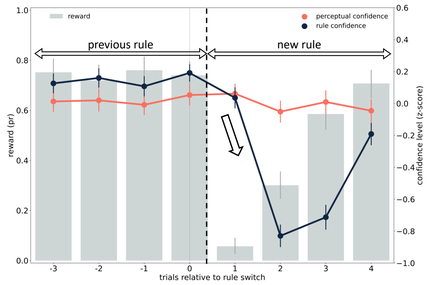
fMRI analysis showed neural activity in prefrontal and cingulate cortexes during a discrimination/detection task, regions previously reported as related to metacognition.

今後の展開

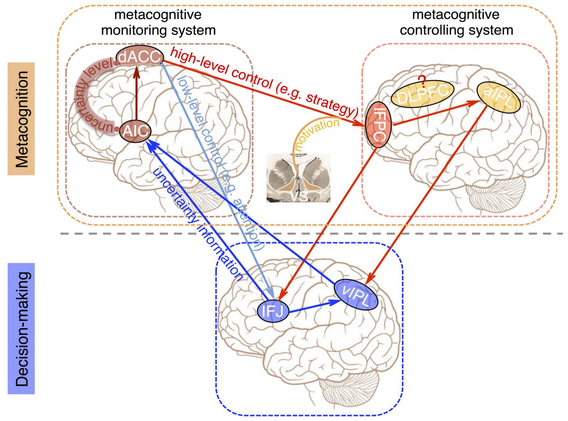
- Investigate the mechanism of how metacognition regulates decision-making processes and enables humans to adapt behaviour efficiently with computational modelling and fMRI analysis.



Different metacognitive signals combine to change behaviour



Confidence is updated by changes in environment



Source : Qiu L, Su J, Ni Y, Bai Y, Zhang X, et al. (2018)
Metacognition-related brain regions are said to regulate the activity of decision-making related regions.

テーマ「万博、そしてその先へ ～科学技術が描く未来～」との関連

- Metacognitive abilities involve accessing and regulating a conscious state of our cognition. Further understanding of neural mechanisms of metacognition can improve therapeutic treatments such as using decoded neuro-feedback techniques.

連絡先：脳情報研究所　担当　岡本尚之　E-Mail: naoyuki_okamoto@atr.jp

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