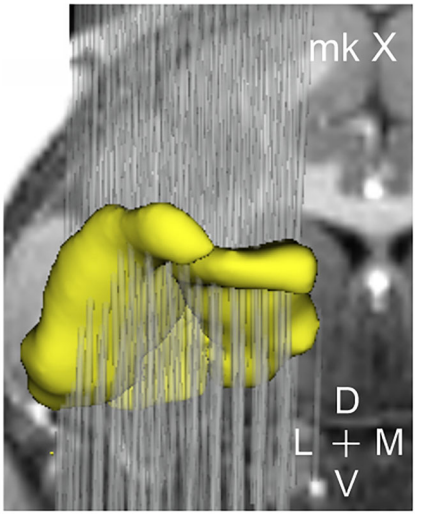
This Week in The Journal

Disentangling Ventral Frontal Cortex Subregion Roles in Behavior

Frederic Stoll and Peter Rudebeck

(see article e0464242024)

The ventral frontal cortex (VFC) plays key roles in flexible reward-based decision-making. But the VFC has anatomically distinct subregions and their contributions to flexibly making reward-based decisions is unclear. Furthermore, whether their roles are dissociable is unexplored. Stoll and Rudebeck explored these unknowns in male macaque monkeys. They recorded from neurons in eight anatomically defined VFC subregions as macaques chose between cues associated with distinct reward probabilities and flavors. The authors found much variation in how the eight subregions were activated during this reward-based decision-making task. Namely, area 12l seemed to represent decision-related variables, while area 12o seemed more closely related to reward. Areas 11m/l and 13m most closely represented the flavors of juices. This study is a breakthrough in our understanding of how the VFC plays such broad roles in flexible reward-based decision-making and may inform treatment development for diseases in which this flexibility is disrupted, such as addictions or depression.



This image depicts how well the recording electrodes (gray) and targeted areas (yellow) aligned on Monkey X during MRI. See Stoll and Rudebeck for more information.

Dopamine in the Nucleus Accumbens Core May Play a Specific Role in Reward

Masakazu Taira, Samuel Millard, Anna Verghese, Lauren DiFazio, Ivy Hoang et al.

(see article e0120242024)

Dopamine plays many roles in reward-based learning. But how the dopamine system targets distinct circuits to play these roles is unclear. Taira et al. explored one of these circuits. Typically, reward learning studies condition animals by pairing neutral cues with rewarding ones. However, the authors of this study exposed rats to the reward before they were presented with a neutral cue. This unique "backward conditioning" task was used because it allows for probing of distinct components of learning behavior. Taira et al. discovered that dopamine release in the nucleus accumbens core increased in response to the reward and decreased in response to the neutral cue across learning, similarly to what occurs in forward conditioning. The authors further revealed that this signal reflected general excitatory learning, and not information about the specific relationships between the reward and cue. This study supports the idea that dopamine release in different circuits provides different functions in reinforcement learning. Looking at the roles different dopamine circuits play in this kind of learning may be critical in identifying more discrete treatment options for diseases like addiction, where reward learning goes awry and impacts quality of life.

This Week in The Journal was written by Paige McKeon
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