

Amygdala drives value and exploration signals in striatum and orbitofrontal cortex

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Presentation Abstract Summary The explore-exploit trade-off describes the choice to forego immediate rewards to explore an unknown option and learn if it is better than something already experienced. This trade-off is important in dynamic environments, where reward uncertainty increases the value of exploration. While motivational circuits aid learning, how they enable explore-exploit decisions remains unknown. We recorded neural activity in the amygdala, ventral striatum (VS), and orbitofrontal cortex (OFC) in rhesus macaques, as they solved a multi-arm bandit task. The task required the monkeys balance exploration of novel choice options with exploitation of previously learned option values. We used a Partially Observable Markov Decision Process (POMDP) model to quantify the immediate expected value (IEV) and exploration bonus value (BON) of the monkeys' choices. The IEV indicated how often each choice was rewarded. The BON described the relative gain or loss of future rewards when choosing to explore or exploit. The chosen IEV was represented in each area, but it was encoded earlier in the amygdala, compared to the VS or OFC. The chosen BON was also encoded earlier and represented more in the amygdala than in the VS or OFC. Thus, the amygdala appears to drive value and exploration signals in frontostriatal circuits.

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