

The neural representation of subjective cost-benefit judgments

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Many human decisions and behaviors in daily life entail a cost-benefit analysis. From selecting what to eat for dinner to determining the career to pursue, we more or less assess the cost and benefit of each choice. Given the frequent occurrences of cost-benefit thinking in our minds, some intriguing questions arise: how do the cost-benefit thinking processes emerge? How does the brain function to generate such thoughts? Although these inquiries have yet to be thoroughly answered, scientists are adding new clues to our knowledge, such as the neural representation of our subjective cost-benefit judgments.

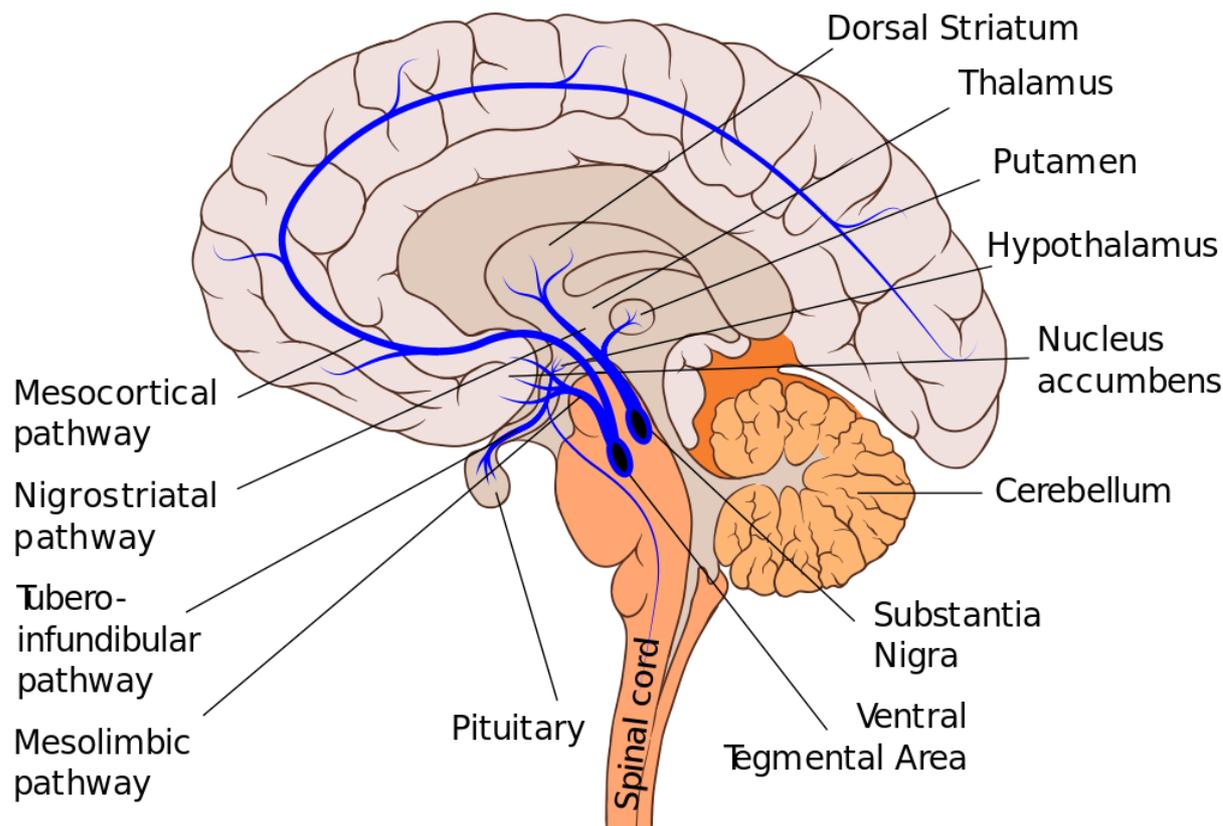
A recent study led by Michel-Pierre Coll (Université Laval) seeks to identify a distributed brain representation involved in the decisions to accept or reject prospective future pain and profit. In the experiment, the scientists asked 57 people to make an economic decision by accepting or rejecting offers connected with varying amounts of pain and money. The researchers next used functional magnetic resonance imaging (fMRI), which reflects changes in blood flow inside the brain, to monitor brain activity during the decision-making process. Based on the fMRI data, they discovered that, while numerous brain areas are engaged in decision-making processes involving future pain and profit, the ventral striatum is the specific region that is systematically activated or deactivated as a function of future pain or rewards [1].

The finding is published in the Proceedings of the National Academy of Sciences. Mathieu Roy, an Associate Professor in McGill's Psychology Department and senior author of the publication, reveals the discovery [2]:

“We found that when money was on offer, as expected, activity in the ventral striatum increased. But what was interesting was that activity in the same area of the brain decreased in proportion to the pain on offer. This suggests that there is a shared representation of pain and profit in the ventral striatum, almost a common currency involved in making decisions where you need to compare the two.”

The ventral striatum, a subcortical brain area innervated by dopaminergic neurons, has various activities connected to human cost-benefit assessments other from predicting participants' decisions to endure pain in return for economic reward. The ventral striatum also involves tracking the subjective value of stimuli and signaling the expectation of reward [3]. Moreover, the brain region involves not only rational cost-benefit judgments (e.g., monetary benefits) but also emotional ones. Scientists found that a person's

ventral striatum is significantly more active when viewing positive stimuli than negative and neutral stimuli [4].



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The subjective cost-benefit judgment is one of the fundamental features of the mindsponge mechanism [5]. With flourishing evidence from brain sciences, the functions of the ventral striatum will be interesting resources to explore further into the mindsponge mechanism.

References

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