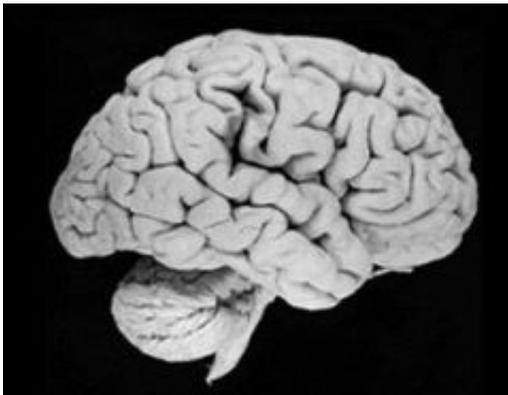


Creativity and human reasoning during decision-making

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Modern human brain. Credit: Univ. of Wisconsin-Madison Brain Collection.

A hallmark of human intelligence is the ability to efficiently adapt to uncertain, changing and open-ended environments. In such environments, efficient adaptive behavior often requires considering multiple alternative behavioral strategies, adjusting them, and possibly inventing new ones. These reasoning, learning and creative abilities involve the frontal lobes, which are especially well developed in humans compared to other primates. However, how the frontal function decides to create new strategies and how multiple strategies can be monitored concurrently remain largely unknown.

In a new study, published March 27 in the online, open-access journal [PLoS Biology](#), Anne Collins and Etienne Koechlin of Ecole Normale

Supérieure and Institut National de la Santé et de la Recherche Médicale, France, examine [frontal lobe](#) function using behavioral experiments and computational models of human decision-making. They find that human frontal function concurrently monitors no more than three/four strategies but favors creativity, i.e. the exploration and creation of new strategies whenever no monitored strategies appear to be reliable enough.

The researchers asked one hundred participants to find "3-digit pin codes" by a method of trial and error, under a variety of conditions. They then developed a computational model that predicted the responses produced by participants, which also revealed that participants made their choices by mentally constructing and concurrently monitoring up to three distinct behavioral strategies; flexibly associating digits, motor responses and expected auditory feedbacks.

"This is a remarkable result, because the actual number of correct codes varied across sessions. This suggests that this capacity limit is a hard constraint of human higher cognition," said Dr. Koechlin. Consistently, the performance was significantly better in sessions including no more than three repeated codes.

Furthermore, the researchers found that the pattern of participants' responses derived from a decision system that strongly favors the exploration of new behavioral strategies: "The results provide evidence that the human executive system favors creativity for compensating its limited monitoring capacity" explained Dr. Koechlin. "It favors the exploration of new strategies but restrains the monitoring and storage of uncompetitive ones. Interestingly, this ability to regulate creativity varied across participants and critically explains individual variations in performances. We believe our study may also help to understand the biological foundations of individual differences in decision-making and [adaptive behavior](#)".

More information: Collins A, Koechlin E (2012) Reasoning, Learning, and Creativity: Frontal Lobe Function and Human Decision-Making. *PLoS Biol* 10(3): e1001293. [doi:10.1371/journal.pbio.1001293](https://doi.org/10.1371/journal.pbio.1001293)

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