

The sight of two brains talking

By simultaneously scanning the brains of contestants playing a simple game, researchers aim to study how social interactions affect brain activity. Steve Nadis meets the scientists who think two heads are better than one.

At the crux of a difficult negotiation, have you ever wanted to peer inside your opponent's head to see what he or she is thinking? If so, you are not alone. Around two years ago, during a conversation in an ice cream shop in Houston, two neuroscientists speculated about the activity in the brains of contestants playing a simple game. Might the neural activity in the players' brains be linked, they wondered?

This summer, those researchers will take a step towards answering that question. Two subjects — one in Atlanta, the other in New Jersey — will play a strategic game over the Internet, while having their brains scanned. The team calls the technique 'hyperscanning'. "Virtually everything we do in real life is motivated by interactions with others," says Gregory Berns of Emory University in Atlanta, Georgia, one of the project's masterminds. "It makes sense to probe the biological circuits underlying these interactions."

Berns is interested in the brain activity of subjects playing the Prisoner's Dilemma, a two-person game that is often used as a simple model of real-world negotiations. He wants to see if there is a particular pattern of brain activation that precedes one player's decision to betray the other.

Head start

Berns has already used functional magnetic resonance imaging (fMRI), which tracks neural activity by monitoring blood flow in the brain, to study individual players. But monitoring them one at a time was of limited use. "You could study this with only one person in the scanner, but in this game you never know who will initiate such a move," he says. To study properly how patterns change during the contest, Berns says that simultaneous scanning is needed.

Together with Read Montague, a neuroscientist at Baylor College of Medicine in Houston, Berns carried out a proof-of-principle experiment in November 2000. Two subjects played a simple, computer-based guessing game, while fMRI scans were taken. Montague says that this "toy experiment" was not meant to produce hard results, but it did reveal evidence of synchronized activity in the one area of the players' brains — the inner prefrontal cortex.

The team is now preparing an experiment in which contestants at different locations will compete over the Internet. "Scanners are

expensive and no one owns a lot of them," explains Sam McClure, a graduate student in Montague's lab. "You have to rely on the Internet." One subject will be at Emory, the other at Princeton University in New Jersey, where cognitive scientist Jonathan Cohen is collaborating with the experiment.

Mind games

Months of effort have gone into developing the equipment needed to synchronize the scans and the game, in which the players will work together to guide a hunter to his prey. A hyperscanning control room is being built at Baylor's neuroimaging laboratory. "Initially, we'll run the experiments from Houston — just like a spaceshot," quips Montague.

He and Berns are confident that their technique will attract other users. Lane Strathearn, a developmental paediatrician at Baylor, has studied neural activity in mothers looking at pictures of their children and other infants, and now hopes to scan mothers and children simultaneously to see whether their brains show synchronous activity.

Economist Colin Camerer of the California Institute of Technology in Pasadena is also excited about the new technology. He says that understanding the brain activity underlying the Prisoner's Dilemma could shed light on the tactics used by stock-market traders.



Man with two brains: Read Montague aims to bring linked neural activity out of the shadows.

Other neuroscientists are less enthusiastic. Stanford researcher David Heeger uses fMRI to study visual perception, and is currently investigating strategy and decision-making. He says he will hook two scanners together if someone can convince him that the data need to be collected simultaneously. So far, he says, no one has made a compelling case.

But hyperscanning's advocates are confident that applications will become apparent. "We're hoping that all kinds of people will suggest worthwhile things to do," says McClure. "The same thing happened with conventional brain imaging. In the early days, no one imagined all the things it would be used for." For McClure and his colleagues, it's a case of 'if we build it, they will come'.

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