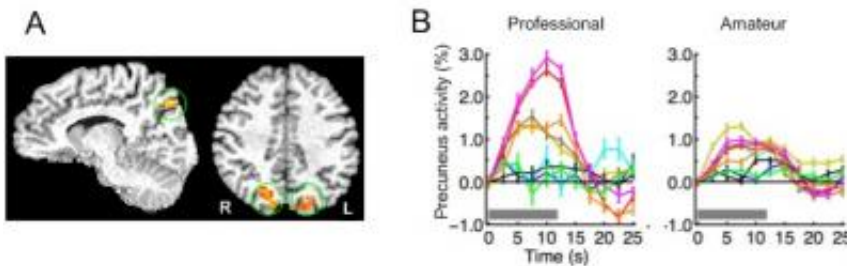


Researchers uncover neural origins of expert intuition

January 24 2011



Specific activation of the posterior precuneus associated with perception of shogi patterns. Left: Activations in the posterior part of the precuneus in a professional player. Right: Time courses of fMRI responses to stimuli of different categories in the posterior precuneus of single subjects representing two subject groups, respectively. Gray bars indicate the stimulus presentation period, and error bars indicate SEM across blocks.

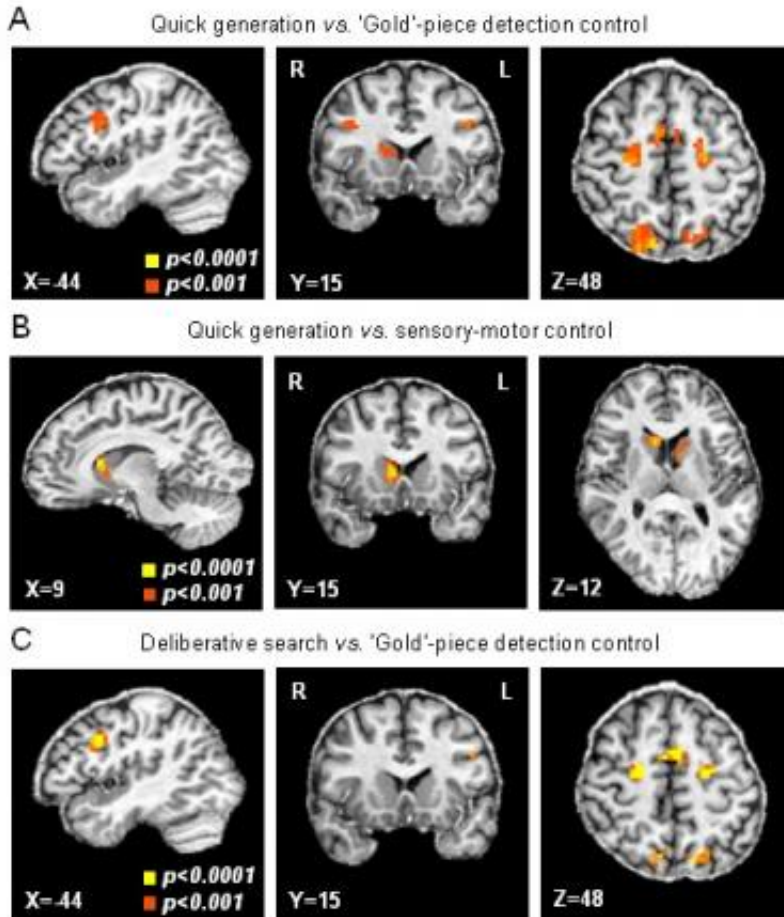
(PhysOrg.com) -- New findings reported last week in *Science* by Japanese researchers at the RIKEN Brain Science Institute (BSI) shed first-ever light on the neural mechanisms that enable board game experts to quickly generate optimal moves.

Results identify specific brain regions involved in granting shogi masters their superior skill, offering insights into the neural origins of expert intuition.

What makes [experts different from the rest of us](#)? Over the past century,

this question has prompted a range of studies on various aspects of human cognition, revealing clues about the psychological and neurological origins of intelligence, perception and memory. While board games such as chess have provided the most productive setting for such studies, the neural mechanisms underlying cognitive expertise in board game play nonetheless remain poorly understood.

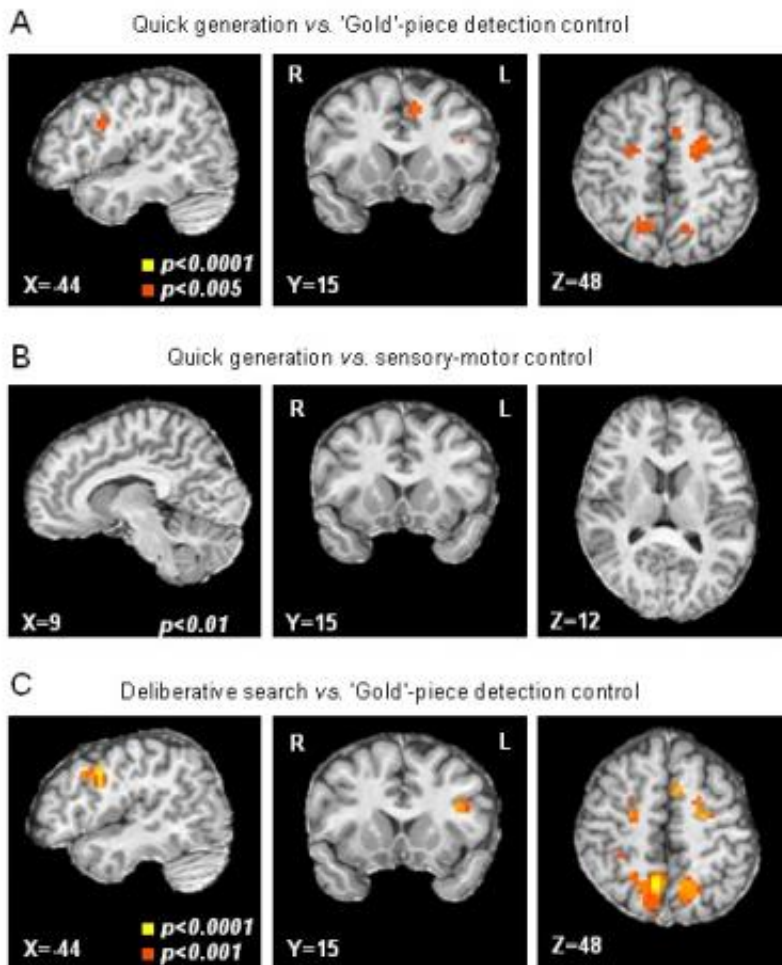
To clarify these mechanisms, the researchers used fMRI to study the brain activity of professional and amateur players of shogi, a Japanese board game. Unlike amateurs, professional shogi players are able to quickly perceive board patterns and generate moves without conscious thought, a unique intuitive capacity which grants them their superior skill. Imaging studies have identified processes specific to the brains of chess experts, but no research has yet clarified the neural substrates for expert intuition.



Activations associated with quick generation of the best next-move and deliberative search in professional players. (A) Activations associated with quick generation of the best next-move. (B) Only the activations in the head of the caudate remained when the activations during the quick generation of the best next-move were contrasted to the activity during the sensory-motor control task. (C) Activations associated with the deliberative search.

Using spot games of shogi, the researchers have now pinpointed for the first time two brain regions involved in specific aspects of such intuition. Activity in the precuneus of the parietal lobe, a brain region responsible for integrating sensory information, was observed when professional players perceived and recognized realistic board patterns. Rapid

generation of next-moves, in contrast, was identified with activity in the caudate nucleus of the basal ganglia. Among professional players, the results moreover highlight a strong correlation between these regions during next-move generation, suggesting that the precuneus-caudate circuit in their brains has been honed to this specific task.



Activations associated with quick generation of the best next-move and deliberative search in amateur players. (A) Activations associated with quick generation of the best next-move. There was no significant activation in the caudate head. (B) There was no activation when the activations during the quick generation of the best next-move were contrasted to the activity during the sensory-motor control task ($p > 0.01$). (C) Activations associated with deliberative search.

By shedding first-ever light on the elusive origins of expert intuition, these findings establish a crucial link between brain science and cognitive psychology research, opening the door to fundamental insights on [brain](#) function and applications in the design of new types of expert systems.

Provided by RIKEN

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