

Brain's action center is all talk

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Neuroscience is tackling a problem that obsessed Hamlet: What is the difference in our minds between talk and action? Less than you would expect, an international research group reports in the Sept. 19 issue of *Current Biology*.

The brain's premotor cortex shows the same activity pattern when subjects observe an action as when they hear words describing the same action, the study's authors said.

"If you hear the word 'grasp,' it's actually the premotor cortex that's active, not just a separate, abstract semantic area in the brain," said lead investigator Lisa Aziz-Zadeh, assistant professor of occupational sciences with a joint appointment in the Brain and Creativity Institute of

the USC College of Letters, Arts and Sciences.

The premotor cortex has long been identified as a center of activity for actions. The notion that it could also process verbal descriptions of those actions has met some resistance.

"Neuroscience is coming around to this idea, but there hasn't been much data supporting it," Aziz-Zadeh said.

To change that, Aziz-Zadeh recruited 12 volunteers and used functional magnetic resonance imaging (fMRI) to compare the same areas of the premotor cortex in the same subject as the person observed an action and heard language describing the action.

The premotor area involved during observation of a specific action, such as kicking, also lit up when the subject heard the corresponding word. This was the first study to make such a direct comparison, Aziz-Zadeh said.

Other studies found activity in the same areas during execution of an action, Aziz-Zadeh added, offering indirect evidence for the existence of "mirror neuron" systems that activate both when a person performs a task and when the person watches someone else perform the task.

"The study does demonstrate the intimate linkage between the way we talk about actions and the neural machinery that supports those actions. That's very intriguing," said USC University Professor Michael Arbib.

Arbib also noted the sharp difference between the subjects' responses to literal action statements (such as "biting the peach") and metaphorical actions ("biting off more than you can chew" or "kicking off").

"Metaphor seems not to activate the action areas as much as a direct

action statement," he said, predicting that in future studies the premotor cortex will respond more strongly to novel images than to "frozen metaphors," otherwise known as clichés – a finding unlikely to floor anyone, knock their socks off or cause their jaw to drop.

Arbib carried out one of the first studies of mirror neurons in humans with Giacomo Rizzolatti of the Universita di Parma in Italy.

In 1998, he and Rizzolatti co-wrote "Language Within Our Grasp," a frequently cited article that proposed mirror neurons are involved in language. (Arbib also edited "From Action to Language Via the Mirror System," an upcoming book from Cambridge University Press.)

Rizzolatti, who discovered mirror neurons in 1996, collaborated with Aziz-Zadeh on her current study. The other co-authors are Stephen Wilson and Marco Iacoboni from UCLA.

Source: University of Southern California

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