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Watching with intent to repeat ignites key learning area of brain

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Tapping the region may prove important in rehabilitation
Watch and learn. Experience says it works, but how? University of Oregon researchers have seen the light, by imaging the brain, while test subjects watched films of others building objects with Tinker Toys.

As detailed in the Dec. 20 issue of the Journal of Neuroscience, researchers, using functional magnetic resonance imaging, found that when a person watches someone else perform a task with the intention of later replicating the observed performance, motor areas of the brain are activated in a fashion similar to that with accompanies actual movement.

"We've been looking at the process of motor learning through observation in the context of procedures," said principal investigator Scott H. Frey, professor of psychology and director of the Lewis Center for Neuroimaging at the University of Oregon. Frey's interest is geared toward improvements in rehabilitation for individuals suffering brain or bodily injury.

"Teaching a physical skill often involves someone demonstrating the essential action components after which the learner tries to reproduce what has been observed. This is true for behaviors ranging from learning to eat with utensils, playing an instrument or performing surgery. We wanted to know how the brain takes what is seen and translates it into a motor program for guiding skilled movements," he said.

In the experiment, 19 college-aged, healthy adults watched a series of

digital videos of another person putting together or disassembling objects using six toy parts. In one condition, participants simply watched the activity; in another, they observed clips with the intention to be able to reproduce the actions in the correct sequential order minutes later.

Despite lying completely still during these tasks, observing with the intention to learn actions and subsequently reproduce them engages areas of the brain known to contribute to motor learning thorough actual physical practice. In particular, Frey said, the amount of activity occurring in the intraparietal sulcus -- when watching to learn accurately -- predicts how well these actions are reproduced minutes later.

Frey's group and others have previously implicated that this region is involved in organizing goal-directed manual actions. In effect, Frey said, the activity in intraparietal cortex may act as a thermometer that shows how well a person is translating what they are observing into a motor program for later performance.

"What appears vital is the intention of the observer rather than simply the visual stimulus that is being viewed," Frey said. "If the goal is to be able to do what you are seeing, then it appears that activity through your motor system is up-regulated substantially."

Using fMRI, researchers are able to monitor changes in activity throughout the entire brain while people think by taking advantage of differences in the magnetic properties of oxygenated and deoxygenated hemoglobin. These changes closely track underlying neural activity.

The findings "implicate the parieto-frontal mirror system in encoding the spatial components of observed actions and the primary motor cortex in the formation of novel motor memories through observation," wrote Frey and research assistant Valerie E. Gerry in their conclusions.

"This study is the first in a series of several experiments that we plan to do," Frey said. "It tells us something about how our own motor systems can be engaged and stimulated even in the absence of overt movements. This could prove important as a means of facilitating rehabilitation of individuals with movement impairments or paralysis."

Source: University of Oregon