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Brain study on memory delay explains visuomotor mistakes

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Who will win the women's singles tennis title at the 2016 Rio Olympics this August? That's a question recent York U brain research can help answer.

The new study shows that when doing a visual task, neural activity in the frontal cortex initially reflects the visual goal accurately but errors accumulate during a memory delay, and further escalate during the final memory-to-motor transformation.

"Think of all the times you see something and plan to act on it, but after only a short delay you make a mistake," explains Professor Doug Crawford. "For example, before my morning coffee kicks in, I'm great at making silly mistakes, like putting the honey away in the fridge instead of the peanut butter."

For the study, published online at *eNeuro*, led by PhD candidate Amirsaman Sajad in Crawford's Visuomotor Neuroscience Lab, researchers recorded signals in the frontal cortex during the delay between target-related visual activity and intended gaze-related motor activity. The visual response and memory activity for the time in between was then analyzed.

"We looked at what happens from vision to memory to action, and how the spatial code changes through time in the frontal cortex," says Sajad.

In the Olympics tennis analogy, when a high degree of accuracy is

required, a one-second delay in frontal cortex processing could make the difference between an Olympic gold and silver, says Crawford.

These findings are of particular significance to research in diseases affecting frontal cortex function, he says, "because if errors accumulate in healthy individuals, the accumulations would be much worse with diseases that affect frontal cortex function."

More information: A. Sajad et al. Transition from Target to Gaze Coding in Primate Frontal Eye Field during Memory Delay and Memory-Motor Transformation, *eNeuro* (2016). DOI: 10.1523/ENEURO.0040-16.2016

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