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Eye movement not engaged in arms race, researchers find

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We make our eye movements earlier or later in order to coordinate with movements of our arms, New York University neuroscientists have found. Their study, which appears in the journal *Neuron*, points to a mechanism in the brain that allows for this coordination and may have implications for rehabilitation and prosthetics.

Researchers have sought to understand the neurological processes behind eye and arm movements. For example, when you reach for an object, what goes on in our brains so that our eyes and arms are in sync? Such coordination is central to the way different systems of the brain communicate with each other, and these undertakings are surprisingly complicated—due to differences in weight, for instance, the arm takes longer than the eye to move.

The question is vital to rehabilitation—a better understanding of these neurological processes may help address the needs of those who have suffered brain injuries and struggle to coordinate movements among different parts of the body. In addition, new insights in this area could lead to more advanced neural prosthetics, which are artificial extensions to the body that restore or supplement function of the nervous system lost during disease or injury. Currently, these devices are somewhat primitive given our relatively limited knowledge of how the brain works to coordinate movement.

In their study, the NYU researchers examined the neurological activity of macaque monkeys while the subjects performed a variety of tasks that

required them to either reach and to simultaneously employ rapid eye movements or to only use rapid eye movements, also known as saccades.

The resulting readings revealed significant coherent patterns of firing of neurons in the brain's posterior parietal cortex (PPC) when both the eyes and arms were required to move for the same task, but not for tasks that involved only saccades. The patterns of firing were found in regions of the PPC that are specialized for moving either the eye or the arm.

Coherent patterns of firing may be due to these different brain areas communicating when coordinating movement, the research team concluded.

"We think we have a mechanism for coordination," explained Bijan Pesaran, a professor in NYU's Center for Neuroscience and the study's senior author, adding that the finding is only a step and additional study is likely to reveal a more complex process. "Our findings show it is the patterns of activity in a specific region of the brain just prior to both saccades and reaching that are important."

In addition, their data showed a coordination of movement between the eyes and arms.

"The brain adjusts timing of eye movements, depending on how long it takes to start moving the arm," Pesaran explained. "Our study is asking how information flows between the arm and eye movement systems, and it shows how coherent patterns of neural activity are important to this communication."

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