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Researchers find mirror neuron system functions normally in individuals with autism

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A team of neuroscientists has found that the mirror neuron system, which is thought to play a central role in social communications, responds normally in individuals with autism. Their findings, reported in the journal *Neuron*, counter theories suggesting that a mirror system dysfunction causes the social difficulties exhibited by individuals with autism.

The mirror neuron system, the focal point of the *Neuron* study, is composed of two brain areas, which have a unique characteristic—they are active both when we execute movements (e.g. grasping a cup of coffee) and when we passively observe other people executing those same movements. It has been known for many years that these brain areas are important for proper motor control because trauma to these areas causes movement deficits. Yet it has only recently been discovered that these brain areas respond when passively observing others. It has been proposed that this activity represents a process of "movement simulation" that enables us to understand the meanings and the goals of movements we observe.

For the simulation process to work properly, it is imperative that we simulate the exact same movement we are observing. This means that neurons within our mirror system must recognize movements and respond with a unique, movement-selective, response to each (or else we'll confuse different movements and attribute improper goals to the

person we're observing).

Because individuals with autism have difficulty communicating socially and understanding the emotions and intentions of others, it has been hypothesized that they may have a dysfunction in their mirror neuron system. This hypothesis has received a tremendous amount of attention in both the popular and scientific literatures following a number of studies that reported weak mirror neuron system responses in individuals with autism. The issue of movement-selectivity, however, had not been addressed in these studies.

To further test this influential theory, the researchers asked individuals with autism and a control group to observe and execute different hand movements while being scanned with functional magnetic resonance imaging (fMRI). The fMRI measurements allowed the researchers to infer the strength of neural responses in mirror system areas of each group during movement observation and execution. Their results showed that mirror system areas of individuals with autism not only responded strongly during movement observation, but did so in a movement-selective manner such that different movements exhibited unique neural responses. The mirror system responses of individuals with autism were, therefore, equivalent to those commonly reported (and observed here) for controls.

These results, they conclude, argue strongly against the "dysfunctional mirror system hypothesis of autism" because they show that mirror system areas respond normally in individuals with autism. The authors, therefore, suggest that it may be more productive to re-focus autism research in more promising directions.

More information: Heeger et al.: “Normal Movement Selectivity in Autism.” Publishing in Neuron 66, 462-470, May 13, 2010. DOI:10.1016/j.neuron.2010.03.034

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