

New findings reveal social thinking in the infant brain

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An innovative collaboration between neuroscientists and developmental psychologists that investigated how infants' brains process other people's action provides the first evidence that directly links neural responses

from the motor system to overt social behavior in infants.

The research will be published April 12 in *Psychological Science*, the peer-reviewed journal of the Association for Psychological Science.

The study involved thirty-six 7-month-old [infants](#), who were each tested while wearing a cap that used electroencephalography (EEG) to measure brain activity. During the experiment, each infant observed an actor reach for one of two toys. Immediately after, the baby was allowed to select one of the same toys. This procedure was repeated 12 times.

Babies' brain activity predicted how they would respond to the actor's behavior. When the infants recruited their [motor system](#) while observing the actor grasp one of the toys, they subsequently imitated the actor. When they didn't imitate the actor, there was no detectable engagement of the motor system in their brain activity as they watched the actor.

"Our research provides initial evidence that motor system recruitment is contingently linked to infants' social interactive behavior," said lead author Courtney Filippi, a doctoral candidate in developmental psychology at the University of Chicago. "It provides initial evidence that recruiting the motor system during action encoding predicts infants' subsequent social interactive behavior."

Untested possibility

The researchers used EEG to measure a component of brain activity—desynchronization of activity in the mu frequency band—that has been linked to motor cortex activity in adults. Like adults, infants show this response when acting themselves and when watching others' actions, suggesting that the motor system may play a role in the perception of others' actions. Until the current study, however, this possibility had not been tested in infants.

"This research tells us that, by the middle of their first year of life, babies are beginning to be able to understand that people act intentionally—that they choose one toy over another because they want that toy," said Helen Tager-Flusberg, professor of psychological and brain sciences at Boston University, who is familiar with but was not involved in the research. "This understanding on the part of a baby involves not just seeing the other person's action, but also involves the baby's own motor system, which is recruited when he or she chooses the same toy."

Fundamentally, the researchers identified the neural processes that contribute to intelligent social behavior in infants. And it's the first evidence that motor system activation in infants predicts the imitation of others' actions, as well as an apparent understanding of others' goals.

"This is big news, that babies understand what they are observing, that there is a direct connection between observing others, understanding what others are doing, and learning how to act," said co-author Amanda Woodward, the William S. Gray Professor of Psychology at UChicago.

The researcher's methodology also broke new ground. "This is the first attempt to combine the assessment of infants' behavior—in this case, imitating the actions of another person—with measuring brain activity in infants," Tager-Flusberg said.

Proof of concept

"Probably the hardest place to study the relation between brain activity and behavior is with infants, due to limitations in the methods that can be used, and the fact that infants are infants," Woodward noted. "Our methodology represents a breakthrough and a proof of concept."

"We've worked hard over the years to develop the methods that allow us

to record [brain activity](#) from infants while they are engaged in the social world," said co-author Nathan Fox, Distinguished University Professor at the University of Maryland, College Park. "The current research reflects our ability to synchronize brain and behavior in infants during the first year of life."

Although this research will not translate directly into new medical treatments or therapies, it could contribute to medical advances down the road by helping to illuminate how the human brain functions and develops, Woodward added.

"One reason to engage in basic science is to better understand the development of the brain and mind. Here we looked at the development of social cognition, [social behavior](#), and the [motor](#) system, all of which are critical for human development and are often disrupted in developmental disabilities, including autism."

More information: *Psychological Science*,
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