

Thinking of you: Studies of blind reveal how we think about other people

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(PhysOrg.com) -- Human beings constantly make inferences about other people's state of mind, usually without even realizing they are doing it. Cognitive scientists call this ability "theory of mind," and until recently, not much has been known about the brain mechanisms underlying it.

A new paper by MIT neuroscientists suggests that the process does not involve actually imagining yourself in the other person's position, as some scientists have theorized. Instead, humans carry an abstract model of how other people's minds work, which they can apply to others' situations to predict how they feel, even if they have never had the same experience.

The study also offers evidence that theory of mind is seated in specific [brain regions](#), even in the congenitally blind - people whose brains have never received any visual input, a major source of information about other people's state of mind.

The work appeared this week in the online edition of the [Proceedings of the National Academy of Sciences](#).

Thinking about others

Humans use theory of mind every time they evaluate someone else's mental state and determine what they know, what they want, and why they are happy or sad, angry or scared.

"It's something we do all the time in our everyday interactions," says Marina Bedny, postdoctoral associate in MIT's Department of Brain and Cognitive Sciences and lead author of the paper.

Though theory of mind is an old concept that philosophers, including Descartes, have long studied, very little is known about how it works. Two theories predominate, according to Rebecca Saxe, MIT assistant professor of brain and cognitive sciences and senior author of the paper.

The first theory, known as simulation, suggests that when people try to figure out others' mental reactions to an event, they imagine themselves in the same situation. In other words, "we're trying to achieve a matching of the experience we've had to the experience the other person is having," says Saxe.

The second theory proposes that the human brain uses an abstract model of how minds work, analogous to the model we have of how the physical world works. This model would allow people to understand others' minds without having the same experiences, just as we know that an egg dropped from a 10-story building will crack when it hits the ground, even if we have never tried it.

Saxe and Bedny decided to approach the problem by studying congenitally blind people, who have never had visual input. If the simulation theory were correct, it would be expected that blind people could not reason about the visual experiences of others the same way that sighted people do, because they cannot mentally re-create the experience of seeing something.

For example, though a blind person could understand the experience of seeing a love letter from a boyfriend and feeling happy - one of the examples the researchers used in their study - she would have no memories of having that exact experience herself.

However, the researchers found that blind people performed just as well in predicting the feelings of other people as sighted people did, and used the same brain regions to do it, suggesting that simulation is not necessary and the brain is using an abstract model of others' mental states.

Brain organization

The new paper also addresses a related question: How much does the location of higher-order brain functions such as theory of mind depend on genetic preprogramming and how much is determined by sensory experience?

Several studies have shown that under certain circumstances, the brain is capable of re-organizing itself in response to sensory input, or lack thereof. For example, in congenitally blind people, the cortex that normally processes basic visual information can be taken over for language processing.

Because sighted people often gain insight into others' emotions through vision (by seeing facial expressions, for example), some theories suggested that blind people would use different brain regions when performing theory of mind tasks.

However, the team's fMRI (functional magnetic resonance imaging) brain scans revealed no differences between brain regions activated in blind and sighted people as they predicted others' mental states. This offers evidence that the organization of higher-level cognitive functions, such as theory of mind, is not determined by sensory experience, according to Saxe. It's an open question whether [brain](#) organization in these regions is genetically preprogrammed, or depends on other aspects of experience, like language.

Provided by Massachusetts Institute of Technology ([news](#) : [web](#))

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