NEWS

# Brain hiccup may explain some social problems in autism

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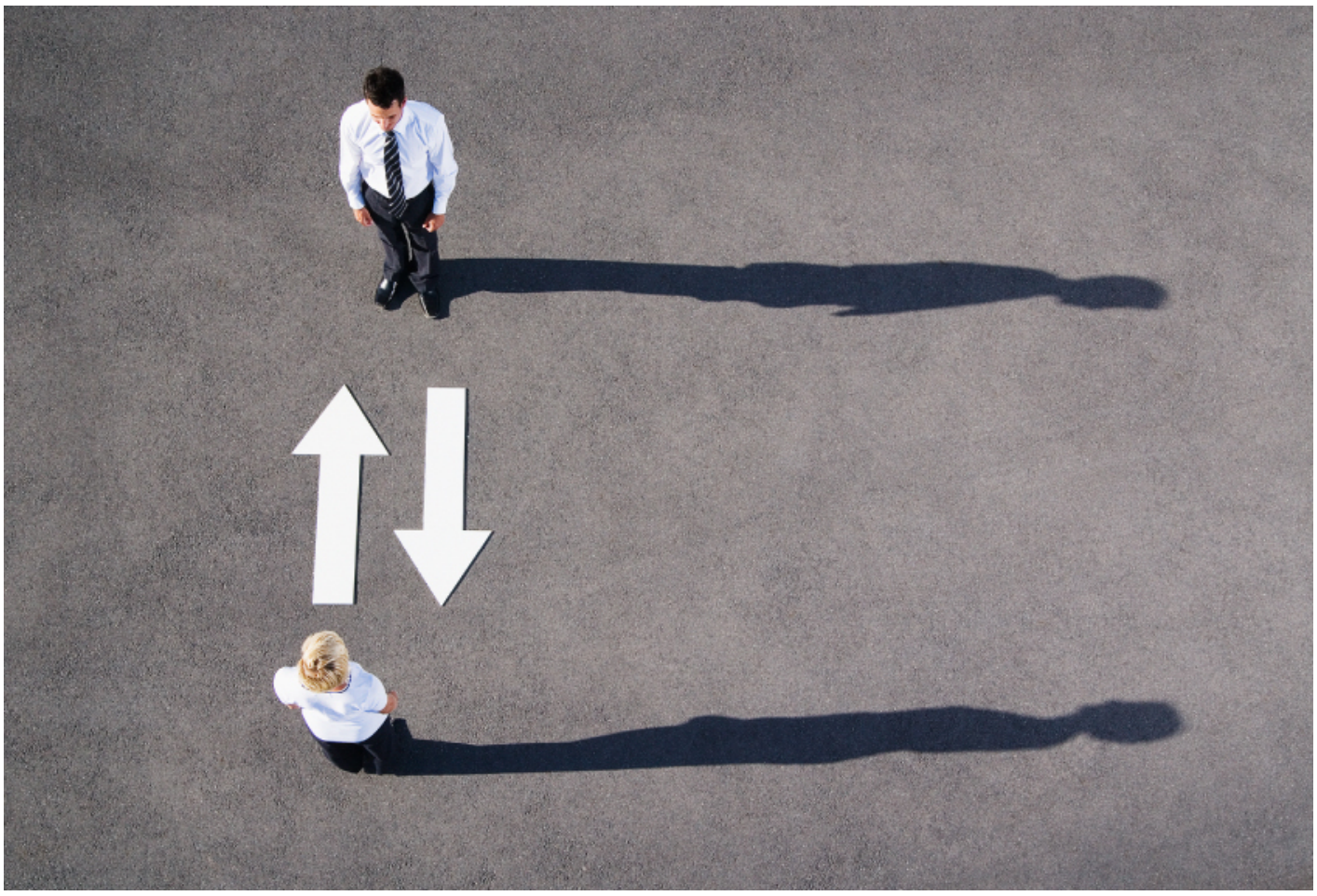

People with autism show an atypical pattern of brain activity when trying to adopt another person's point of view, reports a new study[1]. The aberrant activity occurs in a brain region called the anterior cingulate cortex, and the degree of disruption tracks with social difficulties.

Activity in this region, which is located in the fold between the brain's hemispheres, is known to be involved in '**theory of mind**' — the ability to understand the thoughts and feelings of others[2]. Some people with autism have **difficulty with theory of mind**, says lead investigator **Nicole Wenderoth**, professor of neuronal control of movement at ETH Zurich in Switzerland. "They cannot step away from their own perspective."

Wenderoth and her team explored whether blips in activity in the anterior cingulate cortex have anything to do with this problem.

They used functional magnetic resonance imaging to scan the brains of 16 people with autism and 20 controls as they played a computer game. In the game, players guessed which of two white doors contained a prize. The participants took turns choosing doors with two computer-generated players. They were told that one of these players was under the control of a person they had met before they entered the scanner.

Most of the time, the door containing the prize turned green when a player picked it. The door without the prize, by contrast, turned red. But on some trials, the colors were reversed, with red doors revealing a prize and green doors yielding nothing.

After each turn, the researchers asked the participants whether the outcome of a turn was expected — that is, a green door produced a reward and a red door did not — or unexpected. The participants with autism were less accurate than controls in identifying expected and unexpected outcomes, especially when they were assessing the other players' turns. The results appeared 28 December in *Brain.*

## Poor prediction:

The controls had lower levels of activity in the anterior cingulate cortex when they observed the turns of the player they believed to be controlled by a person than when evaluating their own or the computer's actions. This decrease in activity was larger after an unexpected outcome than an expected one, suggesting that this brain region responds most to situations in which another person experiences an unexpected event.

At a group level, the participants with autism did not show this decrease in anterior cingulate cortex activity, even when the observed outcome was unexpected. But the individual responses varied: The smaller an individual's decline in activity, the greater his social difficulties, as measured by the **Autism Diagnostic Observation Schedule**.

The findings suggest that, in people with autism, this brain region doesn't respond in a typical way to a mismatch between what someone else expects to happen and what actually happens. The diminished response may make it difficult for individuals to take another person's perspective, says **Joshua Balsters**, a postdoctoral fellow in Wenderoth's lab.

The findings also mesh with the so-called **‘magical world’ theory**, which states that people with autism have difficulty matching events with their causes, says **Margaret Kjelgaard**, associate professor of communication sciences and disorders at the MGH Institute of Health Professions in Boston, who was not involved in the study.

Wenderoth and her team found that, in controls, communication between the anterior cingulate cortex and a reward center of the brain tracks with the anterior cingulate cortex signal for unexpected outcomes. This relationship is absent in the autism group.

The researchers plan to study whether disruptions in the brain’s reward system underlie the difficulties that individuals with autism have in understanding another person’s expectation of receiving a reward.

**REFERENCES:**

1. Balsters J.H. *et al. Brain* **140**, 235-246 (2017) **PubMed**
2. Apps M.A. *et al. Neuroimage* **64**, 1-9 (2013) **PubMed**