# Magnetic fields test 'reflexes' of autism

Method may pave way for treatment

Lindsay Oberman of Beth Israel Deaconess Medical Center used transcranial magnetic stimulation on John Elder Robison, who has Asperger syndrome. (Photo Courtesy of John Elder Robinson)

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Scientists are trying a new approach to unravel the workings of the autistic brain: the neurological equivalent of banging a patient's knee with a hammer to test reflexes.

Instead of a hammer, though, researchers are pressing a flat paddle against patients' heads and creating a magnetic field that triggers brain cell activity.

As the quest to understand autism has grown more urgent, researchers have used brain scanners to peer into autistic minds, searched for faulty genes, and scrutinized the play of 1-year-olds.

The work has provided theories - but few concrete answers - about what goes awry to cause social isolation, repetitive behaviors, and communication problems that afflict an estimated one in 150 children with autism spectrum disorders. The hunt has focused on everything from "mirror neurons," brain cells some re searchers think enable people to understand other's actions and intentions, to an overgrowth of local connections in the brain.

Now a small but growing number of researchers see hope in a tool called transcranial magnetic stimulation, which lets scientists spark activity in specific areas of the brain

and watch what happens to patients' behavior. The technology may illuminate some of the biology behind the disease, and some specialists speculate it may one day offer a treatment.

"There's a lot of mystery about autism - it's not as if there's a well-understood story of what's going on at all, and there's a huge variety of autism, too," said John Gabrieli, a neuroscientist at Massachusetts Institute of Technology. Transcranial magnetic stimulation "is fantastic for identifying brain regions that are essential for specific mental functions. . . . I think if we can start to use it more systematically with autism, one could hope we'd understand a lot more about what's going on."

Gabrieli said he hopes to team up with researchers at Beth Israel Deaconess Medical Center who are already getting preliminary results with the technology, finding that autistic brains appear to be more malleable than those of other people.

Researchers at the Boston hospital's Berenson-Allen Center for Noninvasive Brain Stimulation used rapid, repetitive stimulation to simulate what happens in the brain when people learn a new task. Then they gave a single pulse of stimulation and measured minute muscle twitches that told them how long people's brains maintained connections formed by the initial stimulation.

In people with no evidence of autism, changes lasted about 30 minutes, on average. But in people on the autism spectrum, the initial stimulation caused brain changes that lasted much longer - on average an hour and a half.

"As they're going through their world, their brains are changing their circuits much more and much longer," said Lindsay Oberman, a postdoctoral researcher at Beth Israel Deaconess. "They're making connections, just not breaking them at the same rate as normal people."

That suggests to Oberman that important cognitive processes may be getting stuck on labyrinthine side roads.

Researchers in the laboratory are also investigating whether stimulating a specific area of the brain improves language skills.

John Elder Robison, 51, said he decided to participate in the experiments because it wasn't until he reached adulthood that he was diagnosed with Asperger syndrome, a disease on the autism spectrum.

"I have a strong desire to do this to benefit people like me," Robison said. "I knew how much I had struggled as a young person - not knowing, being called 'retard' or 'freak.' This might help young people."

Use of transcranial magnetic stimulation to investigate autism is in its early days, but the technology is well-established. In the noninvasive procedure, a current travels through two loops in a figure-eight-shaped paddle, creating a changing magnetic field. The paddle is pressed against the patient's head, and the changing field induces an electrical current in brain tissue.

Transcranial magnetic stimulation was approved by the US Food and Drug Administration as a depression treatment last fall. The main side effect is a risk of seizure, but the risk is low, researchers say, because years of research have provided insight into how to use the technology safely.

While such stimulation may turn out to be a useful tool in autism research, Michael Merzenich, emeritus professor at the University of California at San Francisco, cautioned that a limitation of the technology may be that so much has gone wrong in the autistic brain.

"Virtually any way you would probe it in detail, you'd quickly reveal abnormalities," Merzenich said. "My question is, if I start poking around . . . it's a pretty complex, multivariable mess that I'm poking. How likely is it that's going to lead to great insight?"

Dr. Manuel Casanova, a neuroscientist at the University of Louisville, began using the technique on patients a few years ago.

Casanova was interested in groups of brain cells called minicolumns, which are abnormally small in autistic people and seem to lack what he calls an inhibitory "shower curtain" that prevents activity from spilling into the rest of the brain. His idea was to boost the shower curtain using the stimulation.

Casanova reported last year in the Journal of Autism and Developmental Disorders that when he used repetitive stimulation on 13 high-functioning people with autism spectrum disorder, the treatment seemed to improve synchronization between brain regions. The patients were also able to sit still longer, follow directions better, and reduce repetitive behaviors.

Initially, he paid for the research out of his own pocket, but last week he received gratifying validation - a grant from the National Institutes of Health to support his work over the next four years.

Dr. Marco Iacoboni, a psychiatry professor at the University of California at Los Angeles, recently submitted a grant proposing a study using the technique. He would like to use it to inhibit activity in a part of the brain that may be suppressing the activity of "mirror neurons" - brain cells that appear to be active both when a person moves and when the person watches someone move.

Robison, the Asperger patient, said he believes some of the experiments at Beth Israel Deaconess have helped him, and Oberman and colleagues have been encouraged by their attempts to use the tool as a treatment. But researchers embracing the tool also urge caution.

"These are just the very first steps - it's the first man on the moon just collecting rocks and looking at the composition of the rocks," Iacoboni said. "There is a very strong rationale for doing this; that's why it's promising. But people shouldn't hope we've found anything yet."

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