

Moral judgments can be altered ... by magnets

By disrupting brain activity in a particular region, neuroscientists can sway people's views of moral situations.

Anne Trafton, MIT News Office

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To make moral judgments about other people, we often need to infer their intentions — an ability known as “theory of mind.” For example, if one hunter shoots another while on a hunting trip, we need to know what the shooter was thinking: Was he secretly jealous, or did he mistake his fellow hunter for an animal?

MIT neuroscientists have now shown they can influence those judgments by interfering with activity in a specific brain region — a finding that helps reveal how the brain constructs morality.

Previous studies have shown that a brain region known as the right temporo-parietal junction (TPJ) is highly active when we think about other people's intentions, thoughts and beliefs. In the new study, the researchers disrupted activity in the right TPJ by inducing a current in the brain using a magnetic field applied to the scalp. They found that the subjects' ability to make moral judgments that require an understanding of other people's intentions — for example, a failed murder attempt — was impaired.

The researchers, led by Rebecca Saxe, MIT assistant professor of brain and cognitive sciences, [report their findings](#) in the *Proceedings of the National Academy of Sciences* the week of March 29. Funding for the research came from The National Center for Research Resources, the MIND Institute, the [Athinoula A. Martinos Center for Biomedical Imaging](#), the [Simons Foundation](#) and the David and Lucille Packard Foundation.

The study offers “striking evidence” that the right TPJ, located at the brain's surface above and behind the right ear, is critical for making moral judgments, says Liane Young, lead author of the paper. It's also startling, since under normal circumstances people are very confident and consistent in these kinds of moral judgments, says Young, a postdoctoral associate in MIT's Department of Brain and Cognitive Sciences.

“You think of morality as being a really high-level behavior,” she says. “To be able to apply (a magnetic field) to a specific brain region and change people's moral judgments is really astonishing.”

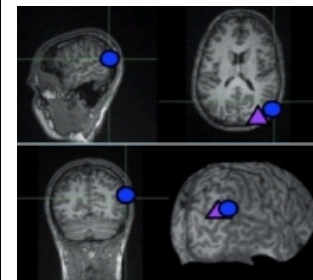
Thinking of others

Saxe first identified the right TPJ's role in theory of mind a decade ago — a discovery that was the subject of her MIT PhD thesis in 2003. Since then, she has used functional



Graphic: Christine Daniloff

multimedia



MRI brain scans showing the location of the right temporoparietal junction (blue circle). The purple triangle shows a nearby region that the researchers disrupted with magnetic stimulation as a control experiment. Images courtesy Rebecca Saxe laboratory, MIT

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magnetic resonance imaging (fMRI) to show that the right TPJ is active when people are asked to make judgments that require thinking about other people's intentions.

In the new study, the researchers wanted to go beyond fMRI experiments to observe what would happen if they could actually disrupt activity in the right TPJ. Their success marks a major step forward for the field of moral neuroscience, says Walter Sinnott-Armstrong, professor of philosophy at Duke University.

"Recent fMRI studies of moral judgment find fascinating correlations, but Young et al usher in a new era by moving beyond correlation to causation," says Sinnott-Armstrong, who was not involved in this research.

The researchers used a noninvasive technique known as transcranial magnetic stimulation (TMS) to selectively interfere with brain activity in the right TPJ. A magnetic field applied to a small area of the skull creates weak electric currents that impede nearby brain cells' ability to fire normally, but the effect is only temporary.

In one experiment, volunteers were exposed to TMS for 25 minutes before taking a test in which they read a series of scenarios and made moral judgments of characters' actions on a scale of one (absolutely forbidden) to seven (absolutely permissible).

In a second experiment, TMS was applied in 500-millisecond bursts at the moment when the subject was asked to make a moral judgment. For example, subjects were asked to judge how permissible it is for a man to let his girlfriend walk across a bridge he knows to be unsafe, even if she ends up making it across safely. In such cases, a judgment based solely on the outcome would hold the perpetrator morally blameless, even though it appears he intended to do harm.

In both experiments, the researchers found that when the right TPJ was disrupted, subjects were more likely to judge failed attempts to harm as morally permissible. Therefore, the researchers believe that TMS interfered with subjects' ability to interpret others' intentions, forcing them to rely more on outcome information to make their judgments.

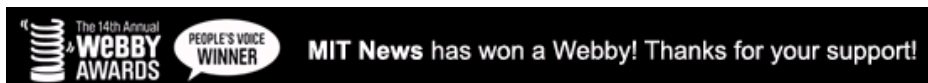
"It doesn't completely reverse people's moral judgments, it just biases them," says Saxe.

When subjects received TMS to a brain region near the right TPJ, their judgments were nearly identical to those of people who received no TMS at all.

While understanding other people's intentions is critical to judging them, it is just one piece of the puzzle. We also take into account the person's desires, previous record and any external constraints, guided by our own concepts of loyalty, fairness and integrity, says Saxe.

"Our moral judgments are not the result of a single process, even though they feel like one uniform thing," she says. "It's actually a hodgepodge of competing and conflicting judgments, all of which get jumbled into what we call moral judgment."

Saxe's lab is now studying the role of theory of mind in judging situations where the attempted harm was not a physical threat. The researchers are also doing a study on the role of the right TPJ in judgments of people who are morally lucky or unlucky. For example, a drunk driver who hits and kills a pedestrian is unlucky, compared to an equally drunk driver who makes it home safely, but the unlucky homicidal driver tends to be judged more morally blameworthy.



Comments

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 **wade s - Cell phones** 2010-03-30 07:02:07

I wonder how this compares to cell phone usage, and if prolonged exposure would cause any permanent change.

 **Andy in Michigan** 2010-03-30 09:08:06

My 6-year-old son and 3-year-old daughter were born with profound hearing loss. Both of them had cochlear implant surgery when they were 12 months old. The surgery involves placing an antenna on the skull, under their skin located behind and above the right ear. The antenna stays affixed via an internal and external magnet located directly external to the right temporoparietal junction (RTPJ). The authors of the study including Liane Young indicate the RTPJ is the most morally sensitive region of the brain affected by magnetic fields.

Did my wife and myself ok a surgery to provide hearing to our children at the cost of destroying their moral compass? That would explain their behavior when they were 2 and 3 years old, but wait - maybe they were just being normal terrible "2's"?

I would appreciate the authors of the study to follow-up to see if people with cochlear implants have trouble making moral decisions. There have been over 60,000 people implanted with cochlear implants in the USA and over 180,000 worldwide, that seems to be a large enough sample group to examine and make conclusions regarding moral decisions and magnetic stimulus of the affected brain regions.

 **dalasv** 2010-04-01 04:57:30

While I certainly would be interested to see the results of an investigation like this, I'm willing to bet that your children are not suffering from this type of "magnetically stimulated moral suppression" or whatever you'd want to call it.

I'm pretty sure the magnets used in this study and the magnets used in your childrens' implants are very different in terms of strength and application.

 **LL Designer** 2010-03-30 10:28:00

How might the interference of the TPJ correlate to the thought processes of those with mental illness? (i.e., extreme paranoia)

 **Maria Odete Madeira - Bad Cartesianism** 2010-03-30 10:28:27

That magnets affect the organism, that's a trivality. EM fields can affect any human cognitive dynamics, of which moral judgment is just an example.

Insistence of "neuroscience" upon the reduction of the organism to the brain, a single organ, is unscientific, a replication of a bad Cartesianism.

Any judgment, by its nature, involves the whole organism, in relation with the environment/world, independently of the brain region mobilized at the moment.

 **JORGE - Brain Injury** 2010-04-01 10:59:30

Hi Doctor;


I am very interesting in your magnets, but I suffer an accident 5 years ago, and had surgery on my right side of the brain, almost exactly in the area that you show on the scans, had three hematomas and my brain shift 1 milimeter to the left and the doctor had to cut part of my right side, do you think this my behavior and can use your magnets to see the difference.

Thanks in advance

Jorge Ortuno

 **scared - What type of magnet and how strong?** 2010-04-02 05:02:22

How do the magnets used in the study compare to the many electromagnetic frequencies that humans have been increasingly subjected to including but not limited to those of wireless and RFID? Are the newer televisions using electromagnetic frequencies also? How might all of these affect the brain? Humans were not always around these things... Is it possible that these new technologies may alter morality on a large scale? I would really like to know the answer to that question.

 stalepie - **reverse**

2010-04-05 05:29:15

Could magnets be used to increase morality (make people make better moral judgments)?
What about making criminals less criminal?

 gabriel bear - **inhibition vs signal/noise**

2010-04-30 07:42:14

the unspecified magnetic pulse is inhibiting chemical processes that would otherwise occur by connecting to other brain locations. "moral" is a cultural determination, and in the absence of direct observable outcome, "theory of mind" is a bit paranoid.

"Moral judgment" is an artifact of a belief system. That artifacts of any kind can be damaged seems self-evident.

