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## Scientists Draw Link Between Morality And Brain's Wiring

By ROBERT LEE HOTZ, WSJ.COM  
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Most of us feel a rush of righteous certainty in the face of a moral challenge, an intuitive sense of right or wrong hard to ignore yet difficult to articulate.

A provocative medical experiment conducted recently by neuroscientists at Harvard, Caltech and the University of Southern California strongly suggests these impulsive convictions come not from conscious principles but from the brain trying to make its emotional judgment felt.

Using neurology patients to probe moral reasoning, the researchers for the first time drew a direct

link between the neuroanatomy of emotion and moral judgment.

Knock out certain brain cells with an aneurysm or a tumor, they discovered, and while everything else may appear normal, the ability to think straight about some issues of right and wrong has been permanently skewed. "It tells us there is some neurobiological basis for morality," said Harvard philosophy student Liane Young, who helped to conceive the experiment.



In particular, these people had injured an area that links emotion to cognition, located in the ventromedial prefrontal cortex several inches behind the brow. The experiment underscores the pivotal part played by unconscious empathy and emotion in guiding decisions. "When that influence is missing," said USC neuroscientist Antonio Damasio, "pure reason is set free."

Bringing medical tools to bear on moral questions, cognitive scientists are invading the territory of philosophers, theologians and clerics.

Usually, the human brain is of two minds when it comes to morality -- selfish but self-sacrificing, survivalist yet altruistic, calculating but also compassionate. Many dilemmas force a choice between the lesser of two evils, invoking a clash of competing neural networks, said Harvard neuroscientist Joshua Greene. Intuition tempers rational deliberation, especially when our actions to help some people will harm others.

At this level of inquiry, the mind is a special effect generated by neurons. Trust is a measure of neuropeptide levels, while fairness is an electromagnetic pattern in the right prefrontal cortex. Disrupt it with a strong magnet, as did University of Zurich researchers in 2006, and any sense of fair-dealing fades away like a radio station subsumed by static.

Is morality innate or learned? Join Robert Lee Hotz and other readers in a discussion. Not everyone reasons through moral conundrums in the same way, of course. Decisions hinge on family values, cultural heritage, legal traditions and religious beliefs -- or on the kind of brain you can bring to bear on the problem.

At the University of Iowa Hospital, the researchers singled out six middle-age men and women who had injured the same neural network in the prefrontal cortex. On neuropsychological tests, they seemed normal. They were healthy, intelligent, talkative, yet also unkempt, not so easily embarrassed or so likely to feel guilty, explained lead study scientist Michael Koenigs at the National Institutes of Health. They had lived with the brain damage for years but seemed unaware that anything about them had changed.

To analyze their moral abilities, Dr. Koenigs and his colleagues used a diagnostic probe as old as Socrates -- leading questions: To save yourself and others, would you throw someone out of a lifeboat? Would you push someone off a bridge, smother a crying baby, or kill a hostage?

All told, they considered 50 hypothetical moral dilemmas. Their responses were essentially identical to those of neurology patients who had different brain injuries and to healthy volunteers, except when a situation demanded they take one life to save others. For most, the thought of killing an innocent prompts a visceral revulsion, no matter how many other lives weigh in the balance. But if your prefrontal cortex has been impaired in the same small way by stroke or surgery, you would feel no such compunction in sacrificing one life for the good of all. The six patients certainly felt none. Any moral inhibition, whether learned or hereditary, had lost its influence.

The effort to understand the biology of morality is far from academic, said Georgetown University law professor John Mikhail. The search for an ethical balance of harm is central to medical debates on vaccine safety, organ transplants and clinical drug trials. It colors political disputes over embryonic stem-cell research, capital punishment and abortion. It is the essence of much military strategy and the underlying logic of terrorism.



For Harvard neuroscientist Marc Hauser, the moral-dilemma experiment is evidence the brain may be hard-wired for morality. Most moral intuitions, he said, are unconscious, involuntary and universal. To test the idea, he gathered data from thousands of people in hundreds of countries, all of whom display a remarkable unanimity in their basic moral choices. A shared innate capacity for morality may be responsible, he concluded.

Many scientists think his theory needs more proof. Since no two brains are exactly alike, each brain's ability to perceive right and wrong might be unique. The world is a thicket of moral maxims we readily ignore. Even so, it would be curious if, in the neural substrates of morality, we find common ground.

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