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Brain Injury Said to Affect Moral Choices

By BENEDICT CAREY

Damage to an area of the brain behind the forehead, inches behind the eyes, transforms the way people make moral judgments in life-or-death situations, scientists reported yesterday. In a new study, people with this rare injury expressed increased willingness to kill or harm another person if doing so would save others’ lives.

The findings are the most direct evidence that humans’ native revulsion to hurting others relies on a part of neural anatomy, one that evolved before the higher brain regions responsible for analysis and planning.

The researchers emphasize that the study was small and that the moral decisions were hypothetical; the results cannot predict how people with or without brain injuries will act in real life-or-death situations. Yet the findings, appearing online yesterday, in the journal Nature, confirm the central role of the damaged region, the ventromedial prefrontal cortex, which is thought to give rise to social emotions, like compassion.

Previous studies showed that this region was active during moral decision making, and that damage to it and neighboring areas from severe dementia affected moral judgments. The new study seals the case by demonstrating that a very specific kind of emotion-based judgment is altered when the region is offline. In extreme circumstances, people with the injury will even endorse suffocating an infant if that would save more lives.

“I think it’s very convincing now that there are at least two systems working when we make moral judgments,” said Joshua Greene, a psychologist at Harvard who was not involved in the study. “There’s an emotional system that depends on this specific part of the brain, and another system that performs more utilitarian cost-benefit analyses which in these people is clearly intact.”

The finding could have implications for legal cases. Jurors have reduced sentences based on brain-imaging results showing damage. The new study focused on six patients who had suffered damage to the ventromedial area from an aneurysm or a tumor. The cortex is the thick outer wrapping of the brain, where the distinctly human, mostly conscious functions of thinking and language reside. “Ventral” means “underneath,” and “medial” means “near the middle.” The area in adults is about the size of a large plum.

People with this injury can be lucid, easygoing, talkative and intelligent, but socially awkward, seemingly numb to the ebb and flow of subtle social cues and emotions. They also have some of the same moral instincts that others do.

The researchers, from the University of Iowa and other institutions, had people with the injury respond to
moral challenges. In one, they had to decide whether to divert a runaway boxcar that was about to kill a group of five workmen. To save the workers they would have to flip a switch, sending the car hurtling into another man, who would be killed.

They favored flipping the switch, just as the group without injuries did. A third group, with brain damage that did not affect the ventromedial cortex, made the same decision.

All three groups also strongly rejected doing harm to others in situations that did not involve trading one certain death for another. They would not send a daughter to work in the pornography industry to fend off crushing poverty, or kill an infant they felt they could not care for. But a large difference in the participants’ decisions emerged when there was no switch to flip — when they had to choose between taking direct action to kill or harm someone (pushing him in front of the runaway boxcar, for example) and serving a greater good.

Those with ventromedial injuries were about twice as likely as other participants to say they would push someone in front of the train (if that was the only option), or suffocate a baby whose crying would reveal to enemy soldiers where the subject and family and friends were hiding.

The difference was very clear for all the ventromedial patients, said Dr. Michael Koenigs, a neuroscientist at the National Institutes of Health who led the study while at the University of Iowa. After repeatedly endorsing killing in these high-conflict situations, Dr. Koenigs said, one patient told him, “Jeez, I’ve turned into a killer.”

His coauthors were Liane Young, Fiery Cushman and Marc Hauser of Harvard; Daniel Tranel of the University of Iowa; Ralph Adolphs of the California Institute of Technology; and Antonio Damasio of the University of Southern California.

The ventromedial area is a primitive part of the cortex that appears to have evolved to help humans navigate social interactions. The area has connections to deeper, unconscious regions like the brain stem, which transmit physical sensations of attraction or discomfort; and the amygdala, a gumdrop of neural tissue that registers threats, social and otherwise. The ventromedial area integrates those signals with others from the cortex, including emotional memories, to help generate familiar social reactions.

“This area, when it’s working, will give rise to social emotions that we can feel, like embarrassment, guilt and compassion, that are critical to guiding our social behavior,” said Dr. Antonio Damasio, a co-author of the study and a neuroscientist at the University of Southern California.

Those sensations put a finger on the brain’s conscious, cost-benefit scale weighing moral dilemmas, Dr. Damasio said, creating a tension that even trained snipers can feel when having to pull the trigger on an enemy. This tension between cost-benefit calculations and instinctive emotion in part reflects the brain’s continuing adjustment to the vast social changes since the ventromedial area of the cortex first took shape.

The area probably adapted to help the brain make snap moral decisions in small kin groups — to spare a valuable group member’s life after a fight, for instance. As human communities became increasingly
complex, so did the cortical structures involved in parsing ethical dilemmas. But the more primitive ventromedial area continued to anchor it with emotional insistence on an ancient principle: respect for the life of another human being.

“A nice way to think about it,” Dr. Damasio said, “is that we have this emotional system built in, and over the years culture has worked on it to make it even better.”