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 that rare injury rated situations that would challenge increased willingness to kill or harm another person if doing so would save others lives.

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 seeks to explain this by demonstrating that a specific brain area, the ventromedial prefrontal cortex, was altered when the region is offline. In extreme circumstances, people with the injury will even endorse suffocating an infant 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 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 pea.

People with this injury can be licid, easygoing, talkative and intelligent, but socially awkward, seemingly clueless about the do's and don'ts of 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 workers. 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 life 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 (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."

The authors included Dr. Daniel Tranel of Iowa; Dr. Marc Hauser of Harvard; and other neuroscientists. "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 control physical sensations and emotions, and the amygdala, which is involved in fear and anxiety. The brain is thus thought to have a "social brain," which includes the ventromedial area, and which is thought to play a role in moral decision making."

"This area, when it's working, will give rise to social emotions that we can feel, like embarrassment, guilt and shame, which are critical for 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 emotions, 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 is 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 processing ethical dilemmas. But the more primitive ventromedial area continued to anchor it with emotional influence 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 in place, and over the years culture has worked on it to make it even better."