
HEALTH

Spirituality and sense of awe seem to be hard-wired into our brains, researchers find

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Spirituality and a sense of awe seems to be hard-wired into our brains.

"Many religious traditions carry the notion that 'God is love,' and it appears this may be true at the level of human brain circuits," said Dr. Michael Fox, senior author of a new Harvard study that identifies a brain circuit involved in the inclination to sense a higher power or seek a deeper meaning in life.

For the study, 88 patients answered questions about spirituality before and after undergoing surgery to remove brain tumors that damaged localized areas of their brain. Researchers found a strong statistical association between spirituality and surgical changes in a circuit that passes through a brain region called the periaqueductal gray.

"The lesion locations we studied only caused a subtle change in spirituality, but the fact that they all hit a specific brain circuit was surprising," said Fox, who directs the Center for Brain Circuit Therapeutics at Brigham and Women's Hospital in Boston.

The periaqueductal gray (PAG) is also involved in pain sensation, consciousness, threat response and feelings of compassion and fear, suggesting that spirituality might be a combination of factors – "a dash of pain inhibition, a sprinkle of altruism and a little bit of fear conditioning," said Michael Ferguson, a research neuroscientist who led the study.

Other circuits hit by the lesions cause delusions, said Fox, an associate professor at Harvard Medical School. "This does not mean that religion is a delusion (as some have suggested) but it does help explain why religion and delusions may share certain features, such as unshakable belief that something is true," he said in an email.

The study "is yet further evidence that the brain devotes significant metabolic and neural resources/real estate to what we call religion and spirituality," said Patrick McNamara, a neuroscientist at the Boston University School of Medicine, who was not involved in the study but conducts related work.

There is probably no one brain circuit devoted solely to spirituality, he said via email, but brain resources, sites and circuits are often reused for other purposes. "This tells us that 'spirituality' is probably an emergent experience built up from more basic human experiences involving love, compassion, altruism and belief formation among other things," he said.

Spiritual experiences include religion but can also be felt when looking at the stars or the birth of a baby, said Dr. Andrew Newberg, a professor at Thomas Jefferson University Hospital in Philadelphia, who wasn't involved in the new study but has researched the link between spirituality and the brain for a quarter-century.

"There isn't just one part of the brain that turns on when we're spiritual and off when we're not," he said.

The periaqueductal gray has a lot of receptors for the hormone oxytocin, known to promote parent-child bonding. "The idea of feeling connected to something and feeling loved ... that certainly makes sense" in the context of spirituality and religion, he said.

It's long been known that ritual and spirituality are essential to the human experience, Newberg said. Archaeologists have found bodies buried 100,000 years ago with trinkets and flowers. He said evolutionarily, those kinds of traditions evolved from animal mating rituals that helped creatures feel a sense of connectedness to others.

"This is a very basic property of who we are as human beings," Newberg said.

Although most of the people in the study identified as Christian, Ferguson, who teaches in both Harvard Medical School and Harvard Divinity School, said the study was designed to get at fundamental, cross-cultural beliefs.

He hopes to explore whether there are brain circuits linked to religious fundamentalism versus a more mystical sense of the beyond or a higher power.

Ferguson also hopes the work will benefit patients. Identifying brain circuits associated with diverse spiritual practices may eventually give clinicians a toolkit of evidence-based spiritual therapeutics they can match to patients' specific symptoms.

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