The Polygraph Test Meets Its Match
Researchers Find Brain Scans Can Be Powerful Tool in Detecting Lies

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Telling a lie produces telltale changes in the brain, researchers announced yesterday at a neuroscience conference in San Diego.

Brain scans of volunteers asked to tell lies showed changes as the subjects tried to suppress what they knew was true. The result might
eventually form the basis of highly accurate lie detector tests, scientists said.

Unlike conventional polygraphs, which assume that liars are anxious and that such anxiety causes measurable changes in skin and blood
pressure, brain scans offer even coldblooded liars little opportunity to cheat because people cannot mask the mental processes responsible for
lying.

"We see that a neural network is engaged when someone tries to deceive," said Ruben Gur, a professor of neuropsychology at the University
of Pennsylvania, where the research was conducted. "The components of that network are both the tendency to suppress telling the truth and
the emotional response involved with the act of deception."

"A procedure like this is very likely in the future for lie detection," he said. Compared with conventional polygraph tests, Gur said, the brain
scans "can be much more powerful."

That is because skilled liars show less anxiety than novices and can sometimes pass polygraph tests, while truthful people can be intimidated
into showing anxiety and be branded as liars. There are also physiological differences between people that can lead to polygraph unreliability.

Trying to separate liars from truth-tellers has been the bane of investigators from ancient times. Philosophers have wrestled with the origins of
untruthfulness and psychologists have struggled to characterize the mental processes involved in lying.

Defining deception in terms of brain activity is difficult, said Daniel Langleben, an assistant professor of psychiatry at the University of
Pennsylvania, because it comes in so many shades: There's lying, there's exaggeration, there's making up stories, there's denial and
rationalization.

"If you are a schoolchild who didn't do his homework, [and] the teacher said, 'Did you do your homework?' you can say, 'Yes' and be a liar, or
say, 'Yes, but the dog ate it.' So there is now confabulation," Langleben said. "It's a different cognitive process to make up a story."

Complicating things further is that there is also self-deception, which allows a person to smoke two packs of cigarettes a day while claiming to
not be addicted, or convince himself that a calorie-laden dessert will not interfere with a diet.

The researchers said they wanted to find the one common cognitive process that underlies all types of lying. They turned to an unusual collaborator, 5th-century philosopher St. Augustine, who said that lying was the knowing suppression of the truth.

Researchers gave 18 volunteers a playing card -- like the Ace of Clubs -- and $20. Each person was placed in an MRI machine, which takes "photographs" of brain activity. As scans were taken, a computer presented the volunteers with different playing cards. When the computer presented the right card -- in this case the Ace of Clubs -- volunteers were told to lie and say it was the wrong card.

To add realism to the laboratory setting, participants were told they would get paid more if they could fool the computer into believing them: "We told them, you can beat the machine if you try really hard," Langleben said. What the volunteers did not know was that the computer knew beforehand which card they had and when they would be lying.

Scans of the volunteers' brains during the deceptive periods revealed increased activity in multiple areas. The most significant was the anterior cingulate cortex -- a small brain structure that looks like the two halves of an apple, some three inches behind the middle of the forehead. It is involved in such cognitive processes as paying attention, making judgments -- and inhibiting a person's responses.

Another active area was the left pre-motor cortex, which is a few inches inside the skull near the left ear. The area was partly activated because subjects had to respond to the computer by pressing a button. But the area also overlaps the prefrontal cortex, which is known to be involved in making inhibitory decisions.

The researchers, who presented their work at the annual meeting of the Society for Neuroscience, said it could take time before the research made its way into forensic settings. For one, the technique is expensive and complicated, and would probably not be cost-effective in catching petty criminals. And a laboratory setting is different from a prison or a courtroom, and those settings could alter the results.

But the technique may be used in important cases -- perhaps in conjunction with polygraph tests -- or in helping to free innocent people who have been imprisoned.

"We have more than a thousand people being held in protective custody" in connection with the Sept. 11 terrorist attacks on the World Trade Center and the Pentagon, Gur said. "We know many of them have done nothing. Any procedure that can help gauge who is there for no reason can be helpful."