Academy Symposium

Is There Science Underlying Truth Detection?

Emilio Bizzi (MIT)

What is the state of the science underlying the use of functional magnetic resonance imaging (fMRI) technology to detect deception? What are the implications of using brain imaging as evidence in law enforcement and trial proceedings? These questions were put before two panels of experts on February 2, 2007, at the American Academy. MIT Institute Professor and Academy President Emilio Bizzi and Harvard Provost Steven Hyman presided over the symposium, which was cosponsored by the McGovern Institute for Brain Research at MIT and Harvard University. Over 250 people, from universities, law enforcement agencies, and business, registered for the conference.

Marcus Raichle (Washington University in St. Louis School of Medicine) explained the fundamentals of fMRI technology, its use in brain imaging, and its value as a tool for understanding brain function. He noted the worldwide explosion of research using a technology "that peeks inside people's brains and looks at what's going on."

"Like it or not," Raichle said, "it's here, and we're going to need to know how to think about it, and how to deal with it." The potential application is very broad. For example, the federal government conducts over 40,000 polygraph tests each year for employee screening and pre-screening, despite the documented shortcomings of the device. Raichle warned that much more research was necessary to assess the value of using fMRI machines to detect deception.

Nancy Kanwisher (MIT) and Elizabeth Phelps (NYU) each examined current research on MRI-based lie detection. In the few published experiments where measurements have been attempted, success rates for detecting lies are very high. As Kanwisher noted, however, the methods used to generate these conclusions contain significant problems.

When a subject in a laboratory experiment complies with instructions and makes a false response, it is not the same as real-world deception. To cite one example, for criminals, the risks associated with lying are entirely different from those in the laboratory. The anxiety of the subject tested will be far greater outside of the laboratory, regardless of the person's innocence or guilt. Finally, there are numerous countermeasures criminals might employ to evade detection, such as moving their tongue while undergoing a test or performing mental arithmetic. Kanwisher concluded that there is "no compelling evidence that functional MRI will work for lie detection in the real world."

Phelps presented another perspective on this question. The feelings of suspects or witnesses who lie in criminal investigations are likely to be very strong. How do the neural mechanisms related to deception, such as those of memory and conflict, differ when an individual is highly emotional? On the basis of her research, Phelps suggested that "when we look at the brain's circuitry of memory, we may not be able to differentiate those things that we imagined, rehearsed, and thought were plausible events, from those things that actually happened. Our memories contain things that happened in our minds and things that happened in the world." Phelps has found, however, that emotion modifies the signatures of memory. Those attempting to develop fMRI techniques for lie detection will need to understand how emotion and memory interact if they are to produce results that would be useful in a legal context.

A second panel of experts considered the legal and ethical implications of imaging. Stephen Morse (University of Pennsylvania Law School) reminded the audience that all legal criteria are behavioral: they are based on what people do rather than what they think or intend. "Brains don't kill people, people kill people," said Morse. If neuroscience is to be legally relevant, it must help to identify the actual brain correlates of particular kinds of behavior when other evidence of behavior is ambiguous. For Morse, the answer to whether neuroimaging should be admitted as evidence of lying in a court of law comes down to first, whether the evidence is relevant, and second, whether the science behind the imaging is sound.

However, as Walter Sinnott-Armstrong (Dartmouth College) pointed out, these two criteria are difficult to apply because scientists and lawyers treat evidence very differently.

Steven Hyman (Harvard University)

Legal decisions require clear dichotomies – guilty or not guilty; admissible as evidence or not admissible. By contrast, scientists discover continuous probabilities on multiple dimensions. Lawyers and judges can recognize the scientific dimensions and continua, but they still need to draw lines in order to serve their own purposes in reaching decisions.

Sinnott-Armstrong cautioned that using fMRI as a test for lie detection would require a much better understanding of its predictive value. How high is the rate of false-positive errors – an indication that someone is lying

when in fact they are not? Only after the validity of the test is clearly established, and the error rates are known and understood, should neural lie detection be admissible in court.

Jed Rakoff, United States District Judge for the Southern District of New York, brought to the discussion a perspective from within the courtroom. "Witnesses lie," confided Rakoff. "Some just embroider a little bit, some exaggerate, and some tell great big whoppers." In his view, the Anglo-American legal system has dealt effectively with this problem by using the tool of cross-examination: "Practiced liars don't tell falsehoods, they just omit key facts. Cross-examination, if it's good, and it isn't always, will bring that out. Brain imaging would not even be relevant to this situation because everything the witness said would be the truth, just not all the facts." Drawing on the studies and use of the polygraph, Rakoff maintains that, at present, brain imaging as a technique for lie detection is much more likely to cause mischief than to be of real help.

In a concluding presentation, Henry Greely (Stanford Law School) proposed that fMRI technology for lie detection should be banned, "unless or until it is has been proven safe and effective to the satisfaction of a competent government agency, with public disclosure and discussion of the information on which the decision was based." Greely suggested that the use of fMRI for lie detection should be tested in a comparable manner to medical devices that are subject to FDA approval. Testing should be done on diverse sets of people: children, the elderly, the mentally ill, people who have had a drink, people who take blood pressure or other medications. This new technology may hold great promise for use in law enforcement and intelligence, said Greely, but only after it has been sufficiently tested to determine its accuracy.

Participating as an audience member, a chief executive of one of the firms seeking to market fMRI machines to detect deception indicated that despite the underdeveloped state of this technology, interest in its use is very strong. He has received calls from prospective clients in governmental agencies and the private sector, both inside and outside the United States. The Academy plans to publish the panelists' presentations in its Occasional Paper series this summer. ■

Stephen Morse (University of Pennsylvania Law School), Jed Rakoff (U.S. District Court, Southern District of New York), Walter Sinnott-Armstrong (Dartmouth College), and Henry Greely (Stanford Law School)

Marcus Raichle (Washington University in St. Louis School of Medicine)

Nancy Kanwisher (MIT) and Elizabeth Phelps (NYU)