Brain Imaging and Courtroom Deception

by Rebecca Dresser

Deception is an all-too-common human activity, one that succeeds because we cannot always detect it in others. It complicates all sorts of human decision-making, including attributing guilt for criminal offenses. The law relies on human fact-finders to determine whether criminal defendants claiming innocence, as well as witnesses testifying about a case, are telling the truth. But the fallibility of human lie detection has fueled the search for a more accurate replacement.

Scientists have developed new approaches to lie detection that use a brain scanning technique called functional magnetic resonance imaging (fMRI) to evaluate whether someone is lying. In experimental settings, researchers have found that different parts of the brain are active when subjects are giving truthful or deceptive answers. The advantage of fMRI is that it can discern the blood flow changes that indicate changes in brain activity. The technique's developers claim that it is much more accurate than the polygraph, the old-fashioned lie detector that relies on increases in blood pressure, pulse rate, and other measures of autonomic arousal to indicate whether someone is telling a lie.

Legal authorities have been skeptical of the polygraph's value, and courts usually exclude test results on grounds that the accuracy rates are too low. Enthusiasts hope that courts will be more receptive to fMRI lie detection techniques. But two recent court decisions suggest that these techniques are far from ready for courtroom use.

Questions of Reliability and Probative Value

In 2010, two judges issued opinions addressing the admissibility of testimony about fMRI lie detection test results. Both determined that the test results were inadmissible. The most extensive analysis comes from Tennessee Federal Magistrate Judge Tu Pham, who conducted a so-called *Daubert* hearing to determine whether test results should be admitted in the trial of Lorne Semrau, a psychologist charged with health care fraud.[1]

Daubert hearings are conducted to determine whether scientific or other technical evidence meets the admissibility criteria set forth by the U.S. Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals*.[2] In *Daubert*, the Court said that Federal Rule of Evidence 702 requires trial judges to determine whether expert testimony is both reliable—supported by scientifically valid reasoning or methodology—and relevant—applicable to the specific issue the court must resolve. Judges making these determinations could consider: (1) whether the scientific technique is testable and whether it has been tested; (2) whether the technique has been subjected to peer review and publication; (3) the technique's known or potential error rate; (4) whether there are standards governing the technique's application; and (5) whether the scientific community accepts the technique.

The defendant in *United States v. Semrau* wanted to submit test results from an fMRI lie detection method developed by a company called Cephos. At the *Daubert* hearing, Magistrate Pham accepted testimony from three expert witnesses, including the chief executive officer of Cephos, a scientist who helped develop the Cephos lie detection method. The magistrate found that the Cephos test had been studied in laboratory experiments and the results published in peer-reviewed journals. But the technique fared less well when he turned to the remaining *Daubert* factors.

Although the Cephos CEO testified that published studies reported an accuracy rate of about 90 percent for the test, another expert at the hearing said those studies were too small to provide valid data. More importantly, the studies were conducted in circumstances quite different from those present in an actual criminal case. Ironically, Magistrate Pham could turn to articles written by the CEO and members of the Cephos scientific advisory panel for a discussion of the differences. First, study subjects failed to represent the general population—none of the studies included subjects as old as the defendant, nor did they include people on medication or those with medical or psychiatric conditions. Second, they all involved "researcher-induced" deception about recent events (Semrau's alleged fraudulent conduct had occurred six to eight years before his fMRI test). The brain activity of subjects instructed to lie about recent events in an experimental setting could differ from that of a person lying about past events in an attempt to escape punishment. Indeed, in one of their own publications, Cephos-affiliated researchers had acknowledged that "different types of lies may produce different brain patterns."[3]

The magistrate also cited the lack of established standards governing the use of fMRI technology. The Cephos CEO testified that he had developed standards for use in his examinations, but as the magistrate pointed out, he

violated them when he repeated one of Semrau's tests after the results suggested Semrau was lying. The CEO claimed this deviation from standards was justified because Semrau was tired when he took the earlier test, but it was an ad hoc (and rather suspicious) judgment. Not surprisingly, Magistrate Pham found as well that fMRI lie detection was not generally accepted by the scientific community for use in real-world settings.

Magistrate Pham ruled that the fMRI test results were also inadmissible under Federal Rule of Evidence 403. This rule allows judges to exclude evidence whose probative value is substantially outweighed by the risk of unfair prejudice to an opposing party. The magistrate gave several reasons for questioning the probative value of the test results. Semrau's test was done privately, which meant that the defense was free to withhold the results if they were unfavorable. Prosecutors had no prior knowledge of the test, nor did they have an opportunity to evaluate the questions Semrau was asked. Finally, the CEO himself said the fMRI test results were at best an indication of the defendant's overall credibility, rather than the truth or falsity of his specific responses. For all of these reasons, Magistrate Pham was unconvinced of the test's probative value: "the court fails to see how [the CEO's] testimony can assist the jury in determining whether Dr. Semrau's testimony is credible."

In discussing the probative value of the fMRI test results, the magistrate also expressed concern that the evidence could improperly diminish the jury's role in evaluating credibility. This was one of the judge's major concerns in the other 2010 court ruling on admissibility of fMRI lie detection evidence. In *Wilson v. Corestaff Services*,[4] the plaintiff in an employment discrimination case sought to introduce fMRI test results to show that a certain witness was being truthful in his testimony. In New York, the admissibility of scientific evidence is governed by standards set forth in *Frye v. United States*.[5] *Frye* permits expert testimony based on "scientific principles, procedures or theory only after [they] have gained general acceptance in the relevant scientific field." Such testimony must also bear "on a topic beyond the ken of the average juror." The judge in *Wilson* said testimony about fMRI test results failed to meet either standard. Besides the scientific community's failure to accept the fMRI test as a reliable method of lie detection, the test results were being offered to support witness credibility, which "from the dawn of the common law" has been a matter jurors are eminently qualified to judge for themselves.

How Can fMRI Results Become Admissible?

These rulings, especially Magistrate Pham's extensive analysis, supply guidance on what would be needed for fMRI lie detection test results to be admitted into evidence. Future studies must produce data that can reasonably be applied to the population of persons whose veracity is at issue in the courtroom. But the artificiality of the experimental setting could be an ongoing problem, for conducting research with individuals actually facing incarceration would be difficult. Magistrate Pham acknowledged the problem but said admissibility could still be achieved:

> in the future, should fMRI-based lie detection undergo further testing, development, and peer review, improve upon standards controlling the technique's operation, and gain acceptance in the real world, this method may be found to be admissible even if the error rate is not able to be quantified in a real world setting.

But it is far from certain that future studies will produce the data that would lead to fMRI lie detection's acceptance in the real world. Many scientists say that current fMRI methods have limitations that will prevent them from ever qualifying as valid techniques. Some believe that innovations combining fMRI with other neuroscience tools could yield valid methods for real-world lie detection, but much more research will be needed to determine this.[6]

Besides demanding better data to support the reliability of fMRI lie detection, courts may be unwilling to admit test evidence that compromises the jury's historical role. In a Supreme Court decision holding that defendants do not have a constitutional right to present polygraph test evidence, three justices joined Justice Thomas's opinion expressing concern that lie detection evidence—unlike expert testimony about DNA analysis and other scientific matters outside the ordinary person's knowledge—could lead jurors to "abandon their duty to assess credibility and guilt."[7] A highly accurate lie detection method would force judges to decide between the human lie detectors they have always relied on and a technique that might do a better job than humans.

In the short run, *Semrau* and *Wilson* are likely to deter efforts to present fMRI lie detection evidence in courtroom proceedings. Other judges will look to these decisions if they are asked to admit such evidence. Of course, individual trial judges make decisions about admissibility of evidence, so fMRI test results could be admitted elsewhere. But the best response to this year's rulings would be for fMRI enthusiasts to go back to the laboratory and do the research that could reduce scientific and judicial skepticism about the technique.

1. The magistrate judge prepared a report and recommendation for the trial court judge in Semrau's criminal case. *United States v. Semrau*, Report and Recommendation, No. 07-10074, 2010 U.S. Dist. (W.D. Tenn., May 31, 2010).

2. 516 U.S. 869 (1993).

3. *Semrau*, *supra* note 1, citing K.A. Johnson, M.S. George, and F.A. Kozol, "Detecting Deception Using Functional Magnetic Resonance Imaging," *Directions in Psychiatry* 28 (2008): SR1, SR8.

4. *Wilson v. Corestaff Services*, 2010 WL 1949095, at *3 (N.Y. Sup. Ct., May 14, 2010).

5. 293 F. 1013 (D.C. 1923).

6. B. Luber et al., "Non-Invasive Brain Stimulation in the Detection of Deception: Scientific Challenges and Ethical Consequences," *Behavioral Sciences and the Law* 27 (2009): 191-208.

7. *United States v. Scheffer*, 523 U.S. 303 (1998).