

January 2010

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Recommended Citation

Myers, Julie Elizabeth (2010) "The Moment of Truth for fMRI: Will Deception Detection Pass Admissibility Hurdles in Oklahoma?," *Oklahoma Journal of Law and Technology*: Vol. 6 : No. 1 , Article 6.
Available at: <http://digitalcommons.law.ou.edu/okjolt/vol6/iss1/6>

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THE MOMENT OF TRUTH FOR fMRI: WILL DECEPTION DETECTION
PASS ADMISSIBILITY HURDLES IN OKLAHOMA?

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I. Introduction

For decades, authors like George Orwell, Ayn Rand and Ray Bradbury have depicted catastrophic visions of dystopia arising out of our society's advancement: a world where the government sees all and men must fear their own thoughts.¹ Conversely, the ability to prove veracity has been a power sought by society throughout history, evident in all cultures from the oracles of ancient mythology to the "veritaserum" in the *Harry Potter* series.² The clash of these two interests may seem to be exaggerated in novels like *1984*, *Fahrenheit 451* and *Anthem*,³ but this balance may soon be evaluated in Oklahoma courts in a very real way. On June 12, 2008, a woman in India was convicted of murder based on evidence that included a "brain fingerprinting" scan, which essentially analyzed the content of her memory and found her brain to contain stored knowledge regarding the circumstances of the murder.⁴ This is the first instance of

* The author thanks her family for their support during her education, and acknowledges the assistance of Chad Knight, M.D. expected 2012, for providing the author with a working understanding of neuroscience. Further, the author acknowledges the contributions of Joel Huizenga, Steven Laken, Ph.D., and Professor Mary Sue Backus. Lastly, the author gives a special thanks to Professor Liesa Richter for her encouragement as a friend and mentor.

¹ RAY BRADBURY, *FAHRENHEIT 451* (Simon & Schuster 2003) (1966); GEORGE ORWELL, *1984* (Penguin Books 2003) (1949); AYN RAND, *ANTHEM* (Coyote Canyon Press 2008) (1938).

² In the young adult literature series *Harry Potter*, "veritaserum" is a powerful magical potion which compels truthful answers from the drinker. J.K. ROWLING, *HARRY POTTER AND THE ORDER OF THE PHOENIX* 744 (2003).

³ See *supra* note 1.

⁴ Anand Giridharadas, *India's Novel Use of Brain Scans in Courts Is Debated*, N.Y. TIMES, Sept. 15, 2008, at A10.

neuro-lie-detection technology to have been admitted for the prosecution in court anywhere, and the reactions range from enthusiasm to horror.⁵

The battle over admitting neuroimagery evidence has been heated since the widely publicized trial of John Hinckley, Jr., for his assassination attempt on President Reagan.⁶ In that case, computer tomography scans were admitted to prove that Hinckley was incapable of the mental state required for the crime, and the resulting acquittal by reason of insanity caused outrage.⁷ Some proponents of neuro-imaging evidence point to the use of neuro scanning technology in *Roper v. Simmons* as an endorsement of neuro-evidence by the United States Supreme Court.⁸ However, the most recent advancements claim not simply to scan the brain for functional or developmental deficiency as in these past cases, but to truly translate a person's thought process from the images.⁹ Although India's novel ruling has raised serious ethical questions of whether such evidence is reliable enough for use in court,¹⁰ the potential for new neuroimaging methods is undeniably astonishing. Functional magnetic resonance imaging, or fMRI, as a lie-detector is especially promising,¹¹ despite the fact that other forms of lie detection technology have been held inadmissible for over eighty years.¹² Although there is some debate over the exact accuracy of fMRI, to date, this technology has even demonstrated the ability to recognize a specific item - such as a screwdriver or a window - that a person

⁵ *Id.*

⁶ O. Carter Snead, *Neuroimaging and the "Complexity" of Capital Punishment*, 82 N.Y.U. L. REV. 1265, 1293 (2007).

⁷ *United States v. Hinckley*, 525 F. Supp. 1342 (D.C. Cir. 1981).

⁸ *See, e.g., Roper v. Simmons*, 543 U.S. 551 (2005).

⁹ The newest scanning technologies, like fMRI, about which this article focuses, can recognize different types of cognitive patterns which directly correspond to thoughts – this is discussed throughout.

¹⁰ Giridharadas, *supra* note 4, at A10.

¹¹ Mark Pettit, Jr., *fMRI and BF Meet FRE: Brain Imaging and the Federal Rules of Evidence*, 33 AM. J. L. & MED. 319, 320 (2007).

¹² Eric K. Gerard, *Waiting in the Wings? The Admissibility of Neuroimaging for Lie Detection*, 27 DEV. MENTAL HEALTH L. 1, 24 (2008).

is thinking of merely by reading the computerized images of that person's brain activity.¹³ Proponents claim the ability of fMRI technology to discern truth from deception will soon be absolute.¹⁴

Case law on these advanced deception detection technologies is sparse at best, but the Oklahoma Court of Criminal Appeals has had one of the few unique opportunities to confront the early use of neuro-lie-detection evidence.¹⁵ Because the Oklahoma Evidence Code parallels the Federal Rules of Evidence regarding expert testimony, an understanding of federal interpretation concerning novel science will be significant for fMRI evidence in Oklahoma. In fact, early cases of neuro scanning evidence in Oklahoma may have great influence on the outcome of the battle over fMRI admissibility in many jurisdictions. This comment will discuss fMRI and its chances at admissibility in Oklahoma courts and in the Tenth Circuit, which both follow the *Daubert* decision when evaluating novel scientific evidence, and propose an explanation of why it should be admitted as reliable. Part II of this comment will give a succinct explanation of how fMRI functions for lie detection purposes. Part III will present an overview of the standard for novel science admissibility and review how the *Daubert* standard has been applied in Oklahoma courts. Part IV will discuss the likelihood that fMRI technology will succeed under a proper *Daubert* analysis by considering the four factors of reliability. Part V will cover several other considerations that may hinder the admissibility of fMRI evidence in Oklahoma courts, even if it passes the *Daubert*

¹³ *How Technology May Soon "Read" Your Mind, 60 Minutes: Incredible Research Lets Scientists Get a Glimpse at Your Thoughts*, CBS NEWS, Jan. 4, 2009, <http://www.cbsnews.com/stories/2008/12/31/60minutes/main4694713.shtml> [hereinafter CBS NEWS].

¹⁴ Telephone Interview with Joel Huizenga, founder and CEO, No Lie MRI, Inc. (Jan. 19, 2009).

¹⁵ *Slaughter v. State*, 2005 OK CR 2, ¶ 7, 105 P.3d 832, 834.

standard, including Oklahoma Evidence Code section 2403, province of the jury concerns, and our society's cultural aversion to "mind reading" technology. This comment will conclude with Part VI.

II. Understanding fMRI Deception Detection

The term "lie detector" is most commonly associated with a fairly dated technology known as the polygraph test, so an understanding of the differences between this procedure and fMRI is important.¹⁶ The original polygraph test was performed by measuring systolic blood pressure; spikes in blood pressure were assumed to be a physical manifestation of the anxiety caused by lying.¹⁷ Improvements in polygraph procedure include monitoring respiration, skin resistance and cardiovascular function.¹⁸ This data is recorded by machine, and the end result of such a test is actually an interpretation of the test subject's physical reaction data by a human technician, or polygrapher.¹⁹ The human variable of the test - that is the personality of the polygrapher or the methods of asking questions - can affect the results of a polygraph.²⁰ The polygrapher may have increased influence when beginning the test by intentionally instilling fear in the test subject, which is a common practice.²¹ These methods are not always accurate, both because the polygraph test only reflects physical reactions to stress that may or may not be the result of answering falsely, and because of the possibility of

¹⁶ See Leo Kittay, Note, *The Cultural Bias Against "Mind Reading" Devices*, 72 BROOK. L. REV. 1351, 1356 (2007).

¹⁷ *Frye v. United States*, 293 F. 1013, 1013 (D.C. Cir. 1923).

¹⁸ John C. Bush, *Warping the Rules: How Some Courts Misapply Generic Evidentiary Rules to Exclude Polygraph Evidence*, 59 VAND. L. REV. 539, 540 (2006).

¹⁹ *Id.*

²⁰ *Id.*

²¹ Lloyd C. Peebles, III, et al., *Exculpatory Polygraphs in the Courtroom: How the Truth May Not Set You Free*, 28 CUMB. L. REV. 77, 79 (1998).

numerous uncontrolled variables.²² The results can be skewed by either the involuntary anxiety of a nervous person who is answering truthfully or by induced anxiety, such as a person flexing their muscles during truthful answers to even out the results.²³

Furthermore, certain people are simply very skilled at controlling their physiological responses to lying.²⁴

In 1998, the Supreme Court faced its most recent case challenging the admission of polygraph evidence, this time in court-martial proceedings, and held that “there is simply no consensus that polygraph evidence is reliable.”²⁵ Because the reliability of this test has always been questioned²⁶ it has been ruled inadmissible by not only the United States Supreme Court in *Frye v. United States*, in 1923,²⁷ but time and time again by numerous United States Circuit Courts, including the Tenth Circuit in *United States v. Call*, in 1997.²⁸ Polygraph evidence has continued to be excluded even after the adoption of the Federal Rules of Evidence’s more flexible standard for assessing such methods.²⁹ Although *United States v. Posado* was a remarkable case where the Fifth Circuit held that a *per se* ban on polygraph evidence was untenable,³⁰ concerns about the reliability of the process have consistently kept polygraph results out of court.³¹

²² Bush, *supra* note 18, at 542.

²³ Kittay, *supra* note 16, at 1364.

²⁴ Laurence R. Trancredi, *Neuroscience Developments and the Law*, in *NEUROSCIENCE AND THE LAW: BRAIN, MIND, AND THE SCALES OF JUSTICE* 71, 103 (Brent Garland ed., 2004).

²⁵ *United States v. Scheffer*, 523 U.S. 303, 309 (1998).

²⁶ Michael J. Ligons, *Polygraph Evidence: Where Are We Now?*, 65 *MO. L. REV.* 209, 214 (2000).

²⁷ *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923).

²⁸ *United States v. Call*, 129 F.3d 1402, 1405 (10th Cir. 1997).

²⁹ There is a continuing line of cases that excludes polygraph evidence after the adoption of the Federal Rules of Evidence, in 1977, and these cases are discussed immediately *supra*.

³⁰ *United States v. Posado*, 57 F.3d 428, 436 (5th Cir. 1995).

³¹ Polygraph evidence has been consistently held to be unreliable and therefore inadmissible in court. *Scheffer*, 523 U.S. at 309 (“there is simply no consensus that polygraph evidence is reliable”); *Call*, 129 F.3d at 1405 (“polygraph evidence is neither reliable nor admissible”); *United States v. Scarborough*, 43 F.3d 1021, 1026 (6th Cir. 1994) (polygraph tests are “inherently unreliable”); *State v. Ulland*, 943 P.2d 947, 954 (Kan. Ct. App. 1997) (“the results of a polygraph examination are too unreliable to be admissible”).

In contrast, fMRI deception detection is an entirely different scientific process. It does not share most of the concerns associated with the polygraph because fMRI considers not the outward physical manifestations of a lie, but rather examines the source of the false answer - the mental process of lying.³² Current deception detection using fMRI began as a test developed in 2001 by Daniel Langleben, M.D, at the University of Pennsylvania, to analyze the areas of a person's brain activated during a lie.³³ The science behind fMRI is intense, but the concept is fairly easy to understand: when you are telling the truth, only the memory regions of your brain become active and are detected in the fMRI, but when you are lying your brain lights up like fireworks.³⁴ fMRI measures the oxygen levels in different neural regions, known as the blood oxygen level dependent, or BOLD effect.³⁵ These oxygen levels directly correlate to the amount of metabolism (or cellular activity) in that area, so that higher the oxygen levels express more activity present in a certain neural region.³⁶ “[E]ngaging in deception requires additional cognitive processing that will involve centers in the brain controlling executive functions such as problem solving, planning, and the conscious manipulation of information in working memory.”³⁷

at trial”); *Morgan v. Commonwealth*, 809 S.W.2d 704, 706 (Ky. 1991) (“the results of polygraph examinations are unreliable and are therefore inadmissible”); *Fulton v. State*, 541 P.2d 871, 872 (Okla. Crim. App. 1975) (polygraphs are inadmissible “in light of the potential unreliability of polygraph examinations”).

³² Sean A. Spence et al., *Behavioural and Functional Anatomical Correlates of Deception in Humans*, 12 NEUROREPORT 2849, 2849-50 (2001).

³³ Daniel D. Langleben et al., *Brain Activity During Simulated Deception: An Event-Related Functional Magnetic Resonance Study*, 15 NEUROIMAGE 727, 727-28 (2002) [hereinafter Langleben et al., *Brain Activity*].

³⁴ John G. New, *If You Could Read My Mind: Implications of Neurological Evidence for Twenty-First Century Criminal Jurisprudence*, 29 J. LEGAL MED. 179, 180 (2008).

³⁵ Archie Alexander, *Functional Magnetic Resonance Imaging Lie Detection: Is a “Brainstorm” Heading Toward the “Gatekeeper”?*, 7 HOUS. J. HEALTH L. & POL’Y 1, 15-20 (2006).

³⁶ *Id.*

³⁷ New, *supra* note 34, at 181.

Studies even report that this technology can distinguish between different types of deception: isolated lies, spontaneous lies and “well-rehearsed lies that fit into a coherent story.”³⁸ This suggests that no matter how well prepared a person is or how often a story has been repeated the fMRI will detect intentional falsity. Also, to accentuate the difference between memory and creative thinking, examiners could pose the questions in an unanticipated way that would ensure at least some additional processing even if the subject had prepared a logical false story beforehand. However, fMRI is not a crystal ball that can reveal all answers. It can only recognize a lie; it cannot retrieve alternative information from a person’s mind.³⁹ Also, because it detects *deception*, it retains one limitation of the polygraph: the inability to discern the truth from subjectively honest but inaccurate or erroneously recalled statements.⁴⁰

Although experts are still investigating exactly which neural areas are linked to specific cognitive processes involved with lying, the consensus is that far more regions activate during any type of deception than during a statement of truth, and that these are different from the regions associated with truth.⁴¹ The current evidence from these

³⁸ G. Ganis et al., *Neural Correlates of Different Types of Deception: An fMRI Investigation*, 13 CEREBRAL CORTEX 830, 830 (2003).

³⁹ Gerard, *supra* note 12.

⁴⁰ *Id.*

⁴¹ The following are a list of current fMRI studies regarding deception detection: Nobuhito Abe et al., *Deceiving Others: Distinct Neural Responses of the Prefrontal Cortex and Amygdala in Simple Fabrication and Deception with Social Interactions*, 19 J. COGNITIVE NEUROSCIENCE 287 (2007); C. Davatzikos et al., *Classifying Spatial Patterns of Brain Activity with Machine Learning Methods: Application to Lie Detection*, 28 NEUROIMAGE 663 (2005); Ganis, *supra* note 38; Nathan J. Gordon et al., *Integrated Zone Comparison Polygraph Technique Accuracy with Scoring Algorithms*, 87 PHYSIOLOGY & BEHAV. 251 (2006); F.A. Kozel et al., *Functional MRI Detection of Deception After Committing a Mock Sabotage Crime*, 54 J. FORENSIC SCI. 1 (2009) [hereinafter Kozel et al., *Functional MRI Detection*]; F.A. Kozel et al., *Detecting Deception Using Functional Magnetic Resonance Imaging*, 58 BIOL. PSYCHIATRY 605 (2005) [hereinafter Kozel et al., *Detecting Deception*]; F.A. Kozel et al., *A Pilot Study of Functional Magnetic Resonance Imaging Brain Correlates of Deception in Healthy Young Men*, 16 J. NEUROPSYCHIATRY CLIN. NEUROSCI. 3 (2004) [hereinafter Kozel et al., *A Pilot Study*]; F.A. Kozel et al., *A Replication Study of the Neural Correlates of Deception*, 118 BEHAV. NEUROSCIENCE 852 (2004); Daniel D. Langleben et al., *Telling Truth from Lie in Individual Subjects with Fast Event-Related fMRI*, 26 HUM. BRAIN MAPPING 262 (2005); Langleben et al., *Brain Activity*, *supra* note 33; Feroze B. Mohamed et al., *Functional MR Imaging*

studies supports increased activation associated with different lying processes in the bilateral, ventrolateral, dorsolateral, inferolateral, dorsal medial, ventromedial and right anterior prefrontal cortices, the amygdala, the anterior cingulate, areas of the parietal and temporal lobe, and certain sub-cortical regions.⁴² This information is processed through increasingly advanced computer software, which produces vivid and tangible snapshots of neural activity during different questions that can be examined and compared, potentially by a jury.⁴³

Any promising new technology raises questions of whether it is reliable enough for use outside the research context, such as admissibility in court, but experts are putting forth great effort to increase the accuracy of fMRI deception detection and achieve admissibility.⁴⁴ According to Joel Huizenga, founder and CEO of No Lie MRI, Inc., the reliability is already confirmed as quite high. Currently, the accuracy is around 93%, but Huizenga expects to surpass 95% accuracy soon.⁴⁵ Steven Laken, Ph. D., president and CEO of Cephos Corporation, is endorsing an even higher rate, up to 97% accuracy.⁴⁶ Criminal defendant's are now anxious for this technology to be ruled admissible.⁴⁷ This is because these two key companies, No Lie MRI, Inc., and Cephos Corporation, have already begun marketing fMRI deception detection as a litigation tool that will provide

and Polygraph Investigation – Initial Experience, 238 *RADIOLOGY* 679 (2006); Jennifer M. Nuñez et al., *Intentional False Responding Shares Neural Substrates with Response Conflict and Cognitive Control*, 25 *NEUROIMAGE* 267 (2005); K. Luan Phan et al., *Neural Correlates of Telling Lies: A Functional Magnetic Resonance Imaging Study at 4 Tesla*, 12 *ACAD. RADIOLOGY* 164 (2005); Tatia M. C. Lee et al., *Lie Detection by Functional Magnetic Resonance Imaging*, 15 *HUM. BRAIN MAPPING* 157 (2002); Spence et al., *supra* note 32.

⁴² See *supra* text accompanying note 41.

⁴³ Kittay, *supra* note 16, at 1368.

⁴⁴ Laurence R. Trancredi & Jonathan D. Brodie, *The Brain and Behavior: Limitations in the Legal Use of Functional Magnetic Resonance Imaging*, 33 *AM. J.L. & MED.* 271, 283 (2007).

⁴⁵ Telephone Interview with Joel Huizenga, *supra* note 14.

⁴⁶ Telephone Interview with Steven Laken, Ph.D., president and CEO, Cephos Corp. (Jan. 21, 2009).

⁴⁷ *Id.*

concrete evidence to support the veracity of a witness's testimony.⁴⁸ Such evidence could potentially exonerate innocent defendants in a way that has not been matched since the inception of DNA evidence. In addition to its desirable accuracy rates and potential impact as evidence, fMRI testing is highly favored because it is relatively harmless; "[t]he entire brain can be imaged non-invasively with high resolution and patients are not exposed to radiation."⁴⁹ This makes fMRI testing an ideal candidate for elective use, perfect for litigants and criminal defendants.

Still, the real test will come when this new form of lie detection science faces the hurdles of admissibility in court. For Oklahoma, this implicates the same standard applied to the Federal Rules of Evidence regarding expert testimony and novel science, the *Daubert* standard,⁵⁰ as well as other evidentiary rules and even stigmatic hurdles. The progressive standard of the Federal Rules is the reason that innovative evidence, such as unique forms of DNA testing, have been allowed in Oklahoma courts. fMRI, an accurate and well-tested technology with solid supportive findings, may actually clear the hurdles to admissibility under *Daubert*.⁵¹

III. Admissibility Under *Daubert*

Although Oklahoma has followed the federal courts in progressing to a modern, flexible standard for considering novel scientific evidence, the success of fMRI technology under this standard will largely depend on Oklahoma's particular interpretation of the *Daubert* analysis and the general attitude of Oklahoma courts toward

⁴⁸ No Lie MRI, Inc. provides fMRI information and testing to the public. No Lie MRI – Home Page, <http://www.noliemri.com> (last visited Feb. 23, 2010). Cephos Corporation is a competitor company also marketing fMRI testing to the public. Cephos Corp Home Page, <http://www.cephoscorp.com> (last visited Feb. 23, 2010).

⁴⁹ Beth W. Orenstein, *Guilty? Investigating fMRI's Future as a Lie Detector*, RADIOLOGY TODAY, May 16, 2005, at 30, available at http://www.radiologytoday.net/archive/rt_051605p30.shtml.

⁵⁰ Taylor v. State, 1995 OK CR 10, 889 P.2d 319.

⁵¹ Wood v. State, 1998 OK CR 19, 959 P.2d 1.

admitting novel science. This section will explain how the test for reliability in scientific evidence has changed to allow new advancements. It will also consider how Oklahoma has applied this standard to recent scientific developments, and discuss the admission or exclusion of neuroimaging technologies in other jurisdictions.

A. History of the *Daubert* Standard

Introducing scientific evidence in court is powerful and often confusing, thus judges guard the admissibility of such evidence to avoid presenting a jury with information which will not ultimately help it to reach a decision.⁵² Historically, this gate keeping duty was much easier for judges to fulfill because they needed only to look to the currently established beliefs of the scientific community without considering recent advancements.⁵³ In *Frye v. United States*, the court's concise opinion stated the then-well-known dictum that expert testimony "must be sufficiently established to have gained general acceptance in the particular field in which it belongs."⁵⁴ This decision rejected an early version of polygraph technology, the systolic blood pressure deception test, because it "had not yet gained such standing and scientific re-cognition among physiological and psychological authorities as would justify the courts in admitting expert testimony deduced from the discovery, development, and experiments thus far made."⁵⁵ This clearly left no room for the admission of novel science, and for seventy years courts considered only "well-recognized scientific principle[s] or discovery,"⁵⁶ even after the adoption of the Federal Rules of Evidence in 1975.⁵⁷

⁵² FED. R. EVID. 104(a).

⁵³ *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

⁵⁴ *Id.* at 47.

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579 (1993).

When the Federal Rules of Evidence were adopted, rule 702 read as following:

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.⁵⁸

This new language requires scientific evidence to be reliable, but nowhere lists any requirement that the evidence be generally accepted by the scientific community. On its face, the new rule appears to be a more flexible standard that will allow judges to decide whether novel evidence is reliable enough to admit in court without reference to whether it is “sufficiently established” in the scientific community. In 1993, the United States Supreme Court confirmed that this new standard allows judges to weigh credibility independently of general acceptance.⁵⁹

In *Daubert v. Merrell Dow Pharmaceuticals*, the plaintiffs presented evidence of in vitro and in vivo animals studies suggesting that the drug Bendectin could cause birth defects.⁶⁰ Although the plaintiff’s experts were well-credentialed, the District Court granted summary judgment for the defendant on the grounds that this novel scientific evidence presented by the experts did not meet the *Frye* standard of general acceptance.⁶¹

⁵⁸ FED. R. EVID. 702.

⁵⁹ *Daubert*, 509 U.S. 579.

⁶⁰ *Id.*

⁶¹ *Id.* at 583.

The Supreme Court considered the inconsistency between *Frye* and the Federal Rules and held that “the *Frye* test was superseded by the adoption of the Federal Rules of Evidence.”⁶² The Court then set out a framework for judges to follow in fulfilling the new “gate-keeping responsibility” proscribed by the Federal Rules.

The Court specifically stated that they were not creating a “definitive checklist or test,”⁶³ and the decision has been properly interpreted as creating discretionary and non-exhaustive guidelines.⁶⁴ *Daubert* provides a two-step analysis: first, whether the evidence is reliable when considering four factors that addressed the credibility of the science, and second, whether the evidence is relevant to the facts.⁶⁵ The first factor to consider under the reliability prong of the test is whether the evidence has been tested, focusing specifically on its falsifiability, meaning whether the science could be proven false.⁶⁶ Under the second factor, the Court discussed publication and peer review, which would increase chance that an erroneous method has been scrutinized or refuted.⁶⁷ However, the Court stated that a lack of publication was not dispositive because some reliable advancements are worthwhile but too new to yet be published at the time they are offered in court.⁶⁸ This is because publication can often take several years.⁶⁹ Under the third factor, the Court discussed the error rate of the new technique or method, focusing on the amount of control used in reaching a conclusion.⁷⁰ A specific minimum error rate is not stated however, as the jury merely needs to have a basis for assessing how much

⁶² *Id.* at 587.

⁶³ *Id.* at 592.

⁶⁴ Andrew B. Gagen, *What Is an Environmental Expert? The Impact of Daubert, Joiner and Kumho Tire on the Admissibility of Scientific Expert Evidence*, 19 UCLA J. ENVTL. L. & POL’Y 401, 408 (2002).

⁶⁵ *Daubert*, 509 U.S. at 592-93.

⁶⁶ *Id.* at 593.

⁶⁷ *Id.*

⁶⁸ *Id.*

⁶⁹ Telephone Interview with Steven Laken, *supra* note 46.

⁷⁰ *Daubert*, 509 U.S. at 594.

weight to give the evidence ultimately.⁷¹ Under the fourth factor, the Court returned to the science's acceptance in the scientific community, stating that although this is not required it is still relevant in deciding whether a novel science is credible.⁷² All of these factors are weighed together when the judge evaluates the reliability of the science.⁷³ It is important to remember that “[t]he focus, of course, must be solely on principles and methodology, not the conclusions that they generate.”⁷⁴ A proper *Daubert* analysis will focus on the process without being influenced by feasibility of the results produced.⁷⁵

Oklahoma first adopted this progressive and flexible standard in *Taylor v. State*, which considered the admission of DNA evidence as a matter of first impression in Oklahoma.⁷⁶ Oklahoma Evidence Code section 2702 was adopted to govern expert testimony; it was identical to Federal Rule of Evidence 702, except that at the time of its adoption it did not list specific factors for considering reliability: “If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise.”⁷⁷ It has since been amended to mirror the Federal Rules. When the Oklahoma Court of Criminal Appeals confronted the issue of novel science, it held that “the time is right for this court to abandon the *Frye* test and adopt the more structured and yet flexible admissibility standard set forth in *Daubert*.”⁷⁸ The court stated that this new standard provided more

⁷¹ *Id.*

⁷² *Id.*

⁷³ Gagen, *supra* note 64, at 409.

⁷⁴ *Daubert*, 509 U.S. at 595.

⁷⁵ Gagen, *supra* note 64, at 412.

⁷⁶ *Taylor v. State*, 1995 OK CR 10, 889 P.2d 319.

⁷⁷ 12 OKLA. STAT. § 2702 (1981).

⁷⁸ *Taylor*, ¶ 15, 889 P.2d at 328.

“structure and guidance” for what had previously been a confusing analysis, and that it would more properly consider the language of the Oklahoma Evidence Code.⁷⁹

The *Taylor* court also made a point to address the standard of review for specifically novel scientific evidence under *Daubert*. In the past, Oklahoma had asserted an abuse of discretion standard, but had nevertheless “conducted extensive, independent review of novel scientific evidentiary material in determining whether the trial judges’ decision admitting or excluding it was proper.”⁸⁰ The court held that the standard of review for such evidence should be de novo, rather than a review “limited by deference to the trial judge’s discretion.”⁸¹ In this aspect, Oklahoma courts differ from federal courts. This difference may have great impact on fMRI evidence, as it presents far more opportunity for the appellate court in Oklahoma to reconsider the reliability of new scientific evidence than a circuit court or another jurisdiction which follows the federal standard of review.

Essentially, Oklahoma Evidence Code section 2702, and those like it, allow the use of “scientific evidence” in court. The *Daubert* decision then provides the criteria for assessing whether evidence is truly “scientific”.⁸² Each of the *Daubert* factors is fundamentally a means to evaluate accuracy and reproducibility, which in science is the systematic basis for scientific credibility.⁸³ Clearly, an inquiry into accuracy rates and controls is an assessment of accuracy; an appraisal of the testing, publication, peer-review process and acceptance within the relevant scientific field is an effort to make certain that

⁷⁹ *Id.* ¶ 16, 889 P.2d at 329.

⁸⁰ *Id.* ¶ 22, 889 P.2d at 331.

⁸¹ *Id.* ¶ 22, 889 P.2d at 331-32.

⁸² “[I]n a case involving scientific evidence, evidentiary reliability will be based upon scientific validity.” *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 590 (1993).

⁸³ Telephone Interview with Joel Huizenga, *supra* note 14.

others have achieved the same results, and that if they did not, this discrepancy has been exposed. If performed objectively, a *Daubert* analysis merely reinforces the integrity of the scientific method when admitting science as evidence.

B. Novel Science in Oklahoma

Taylor's admittance of DNA evidence was Oklahoma's first indication of a preference toward admitting novel science under the *Daubert* standard.⁸⁴ *Taylor* addressed the first prong of *Daubert* by considering the four factors of reliability. First, the court noted that DNA theory and techniques could be and were at that time tested in numerous studies.⁸⁵ Second, the court noted that these techniques had been subjected to peer review in several instances and that no article had discredited the DNA techniques presented.⁸⁶ Third, the court considered the rate of error of DNA matching and the "series of quality control steps" taken during this process.⁸⁷ The court mentioned that although no exact figure was given for a potential rate of error, evidence suggested that it was extremely unlikely that a mistake in testing would result in an incorrect finding of DNA match, or false positive, but rather would produce no result at all.⁸⁸ Fourth, the court returned to the general acceptance of DNA matching found in the record, which further supported the court's holding that this technique for DNA profiling was "sufficiently reliable to have warranted admission."⁸⁹ Finally, the court considered the second prong of *Daubert*, finding that DNA profiling was relevant to the facts of the case.⁹⁰ Although the Court did not approach the reliability factors as a checklist, its

⁸⁴ *Id.*

⁸⁵ *Taylor*, ¶ 24, 889 P.2d at 333.

⁸⁶ *Id.*

⁸⁷ *Id.*

⁸⁸ *Id.*

⁸⁹ *Id.*

⁹⁰ *Id.* ¶ 25, 889 P.2d at 334.

decision does not necessarily show a more lenient analysis of expert testimony because all four factors were easily met, including a finding of general acceptance, which would have allowed the evidence in under the *Frye* standard.⁹¹ Nevertheless, the court did accept evidence of possible error in the process; there was sufficient testimony at the hearing that the procedure employed adequate controls and that DNA profiling was highly accurate, but this testimony did not suggest the method was perfect.⁹²

In *Wood v. State*, the Oklahoma Court of Criminal Appeals faced a similar issue of first impression regarding a new development in DNA matching known as the PCR method. After review, the court also found that this evidence met the *Daubert* standard.⁹³ Reviewing the trial court's *Daubert* analysis, the court noted that (1) the new methods had been tested, (2) the methods had been peer-reviewed, (3) evidence of a sufficient error rate had been presented, and (4) several other jurisdictions had admitted evidence of the PCR method of DNA testing by finding that it was generally accepted within the scientific community.⁹⁴

This decision is similar to *Taylor* in that it admitted another novel scientific method under *Daubert*, and yet did not confront a situation where several factors were fulfilled while one was found lacking.⁹⁵ Similar to *Taylor*, the novel science considered in *Wood* was a matter of first impression in Oklahoma, thus subjecting it to section 2702, but the method had been found by other jurisdictions to be generally accepted.⁹⁶ Both of these cases suggest that Oklahoma is willing to admit novel science, but do not

⁹¹ *Id.* ¶ 5, 889 P.2d at 323.

⁹² *Id.* ¶ 24, 889 P.2d at 333.

⁹³ *Wood v. State*, 1998 OK CR 19, 959 P.2d 1.

⁹⁴ *Id.* ¶ 40, 959 P.2d at 11.

⁹⁵ *Id.*

⁹⁶ *Id.*

necessarily imply that Oklahoma will be more lenient under *Daubert* than it was under *Frye*, or that it will admit evidence so new that it is deficient under one of the reliability factors.

A different type of science was considered by Oklahoma under a *Daubert* analysis in *Gilson v. State* in 2000.⁹⁷ In this case, the court reviewed a theory used by Dr. Wanda Draper to determine whether children who were subject to abuse were competent to be witnesses at trial.⁹⁸ Here, the trial court did not accept the doctor's method as reliable after a *Daubert* analysis, and the exclusion of this evidence was under review.⁹⁹ The court held that there was no error in excluding the evidence, and discussed three of the *Daubert* factors.¹⁰⁰ First, the court noted that there was *no* testimony that this method of assessing the competence of children could or had been tested.¹⁰¹ The court made no mention of publication or peer review, but noted secondly that *no* evidence had been presented that this method was generally accepted in the child development field.¹⁰² Lastly, the court discusses several reasons why there could be significant error with Dr. Draper's assessment, including the fact that the children had only been interviewed once, and that incorrect interview techniques could have greatly affected the children.¹⁰³ These unmonitored variables reflected inadequate controls. The court's decision did not need to include a discussion of all four factors once an analysis of three factors led to the

⁹⁷ *Gilson v. State*, 2000 OK CR 14, 8 P.3d 883.

⁹⁸ *Id.* ¶ 66, 8 P.3d at 907.

⁹⁹ *Id.* ¶¶ 66-68, 8 P.3d at 908.

¹⁰⁰ *Id.*

¹⁰¹ *Id.* ¶ 67, 8 P.3d at 908.

¹⁰² *Id.*

¹⁰³ *Id.*

conclusion that the method was unreliable, because the *Daubert* analysis is appropriately applied as a flexible standard of balancing guidelines, and not as a checklist.¹⁰⁴

This decision provides some insight on what will render a novel method unreliable under section 2702 in Oklahoma. The court did not consider every factor, but did find that three of the four conveyed unreliability, holding that the method did not survive the *Daubert* standard. Still, when the court examined the record for evidence of these factors during the hearing it found *no* evidence to support reliability.¹⁰⁵ This does not provide a clear understanding of how the court would rule if evidence *was* present in the record but minimal - or contradictory - regarding only one of the reliability factors.

Another situation was presented in *Christian v. Gray*, in which the trial court excluded the expert evidence of lung damage due to a lack of pre-injury spirometry testing (a measure of lung function).¹⁰⁶ This case exemplifies the standard of review applied in Oklahoma when reviewing a *Daubert* decision on the admissibility of scientific evidence.¹⁰⁷ The trial court attempted a *Daubert* analysis regarding the expert's finding that damage was due to chemical exposure by the defendant, but stated that a main reason for denying admissibility was "because the expert did not possess 'baseline data' of Plaintiff's pulmonary functions prior to Plaintiff's exposure."¹⁰⁸ However, the court does not find in the record that this baseline test was considered necessary by others in the field in order for the expert's findings to be credible.¹⁰⁹ The trial court's desire for evidence of a "baseline" test for lung function before the alleged injury savors strongly of

¹⁰⁴ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 593 (1993).

¹⁰⁵ *Gilson v. State*, 2000 OK CR 14, ¶ 67, 8 P.3d at 908.

¹⁰⁶ *Christian v. Gray*, 2003 OK 10, ¶ 49, 65 P.3d 591, 610.

¹⁰⁷ *Id.* ¶ 42, 65 P.3d at 608.

¹⁰⁸ *Id.* ¶ 49, 65 P.3d at 610.

¹⁰⁹ *Id.*

the focus on “controls” in *Daubert*, but the record never clearly states this rationale as part of a *Daubert* analysis and the appellate court does not appear to acknowledge this possible connection. As a result, the appellate court holds that the exclusion of the expert evidence was erroneous because evidence of a baseline test is not “one of the particular *Daubert* factors, or some other factor determined to be appropriate in applying *Daubert*.”¹¹⁰ Still, the court specifically states that their decision did not determine that the expert evidence necessarily satisfied *Daubert*; rather, the record merely presented this as an improper exclusion that failed appellate review and rendered the trial court’s order unenforceable.¹¹¹

This case illustrates Oklahoma’s interpretation of the requirements of a trial court’s *Daubert* analysis under section 2702, and the circumstances that could amount to erroneous exclusion. Where, as in this case, the exclusion is based on an assumed fact or other basis outside the exact *Daubert* criteria, an Oklahoma appellate court might overturn the decision, even when the reason could liberally be construed as part of a *Daubert* factor. This may suggest a hesitancy to exclude a science when the trial court applies strict or inflexible standards for accuracy.

Gilson and *Christian* are similar to *Wood* and *Taylor* in that these decisions confront novel science where the evidence regarding reliability is strongly weighted toward one extreme or the other. These cases fail to provide a definite prediction of how Oklahoma courts will rule when there is an even mix of factors that suggest reliability and factors that suggest the method or science is unreliable. Nevertheless, the decisions of *Taylor* and *Wood*, as well as the requirement that an exclusion be made consistent with

¹¹⁰ *Id.* ¶ 54, 65 P.3d at 612.

¹¹¹ *Id.*

Daubert factors, would seem to suggest a warm welcome to competent novel science. When Oklahoma overturned the decision of the *Daubert* hearing on the appeal in *Christian*, it was because the science was inappropriately excluded, not inappropriately admitted.¹¹² The court's reaction to what was possibly a stringent accuracy argument in *Christian* may alleviate some of the concern over an inordinately severe rate of error requirement for neuroimaging evidence. Because fMRI does in fact display evidence of reliability under several other factors, and this evidence will only be strengthened by the time it is offered as evidence in Oklahoma, the court should perform a straightforward *Daubert* analysis and accept it despite other issues, such as an aversion to futuristic technology or a section 2403 analysis, discussed *infra*.

C. Neuroimaging Technology in Court

Although at the time of this writing no case directly addresses fMRI deception detection under *Daubert*,¹¹³ two criminal defendants have attempted to admit the lie-detection-related technology of “brain fingerprinting” in post-conviction proceedings, one of which occurred in Oklahoma.¹¹⁴ Although this technology is fundamentally different than fMRI in both theory and application, and therefore should not be compared to fMRI, this case does at least provide some understanding of how section 2702 may be applied to novel neuroscience. In 2005, the Oklahoma Court of Criminal Appeals reviewed brain fingerprinting, though the decision leaves the issue of admitting neuroimaging technologies disappointingly speculative.¹¹⁵ In *Slaughter v. State*, the petitioner appealed his conviction based on the “novel science” of brain fingerprinting,

¹¹² *Christian v. Gray*, 2003 OK 10, ¶ 49, 65 P.3d 591, 610.

¹¹³ A 2009 search of Westlaw and LexisNexis revealed no case law for fMRI evidence of this particular application.

¹¹⁴ *Slaughter v. State*, 2005 OK CR 2,105 P.3d 832.

¹¹⁵ *Id.*

which he argued should be admitted for post-conviction relief because it was not available at the time of his trial.¹¹⁶ In this case, brain fingerprinting entailed a brain scan during which the petitioner was asked about the details of the crime, and where the scan results showed that his brain did not contain information which a guilty party's brain would contain.¹¹⁷

The court attempted to conduct a thorough *Daubert* analysis of the reliability of brain fingerprinting, but was unfortunately thwarted by an unprepared and unreliable expert.¹¹⁸ The court noted that Dr. Farwell, the expert presenting this evidence, provided an affidavit that would appear at first to satisfy the four reliability factors: (1) he claimed that brain fingerprinting is extensively tested, (2) recognized by peer review and published, (3) accurate with a very low error rate, and (4) is generally accepted by those in the scientific community dealing specifically with neuroimaging advancement.¹¹⁹ Nevertheless, the court stated that it could not find brain fingerprinting reliable because the claims were “not supported by anything other than [Dr. Farwell’s] bare affidavit.”¹²⁰ This affidavit promised the court a comprehensive report, providing details about the procedure, yet after six months the court received neither any such report, nor any explanation for its absence.¹²¹ The court also noted a 2001 report that found the technique behind brain fingerprinting had not been well tested or peer reviewed, and that it was not generally accepted.¹²² The court’s consideration of this dated report was not practical as doing so disregarded how much critique within the scientific community can

¹¹⁶ *Id.* ¶ 7, 105 P.3d at 834.

¹¹⁷ *Id.* ¶ 8, 105 P.3d at 834.

¹¹⁸ *Id.* ¶ 10, 105 P.3d at 834-35.

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ *Id.* ¶ 15, 105 P.3d at 835.

¹²² *Id.* ¶ 16, 105 P.3d at 835-36.

develop in a span of five years, particularly with novel technology. Ultimately however, the court held that the claims in Dr. Farwell’s affidavit were “unconvincing, and more importantly, legally insufficient” for admittance under *Daubert*.¹²³

Regrettably, the court should have had the opportunity to consider suitable verifications of testing, peer review and error rates, but was unable to do so because of poor participation by the expert involved. The language of this opinion calls Dr. Farwell’s claims “interesting,” “startling” and “unconvincing,”¹²⁴ and makes the mental leap that “[t]he failure to provide such evidence to support the claims raised can lead to no other conclusion . . . but that such evidence does not exist.”¹²⁵ Still, this decision did not directly denounce the possibility of neuroimaging technologies satisfying *Daubert*. It merely held that the expert in this particular case provided insufficient material to support his claims. The Oklahoma Court of Criminal Appeals decided this case in 2005, and partially in reference to a critical report from 2001, which in the neuroimaging field would have rendered it outdated if not obsolete. For fMRI evidence offered in the future, the few years that have passed since *Slaughter* will have generated an ever-increasing number of published studies and expert reviews, and possibly more general acceptance of such technology by scientists and judges alike. Also, fMRI is a fundamentally different technology than brain fingerprinting and is considered to be the imaging technology of choice,¹²⁶ and arguably the best candidates for admittance in court. By disallowing brain fingerprinting to be admitted merely on grounds that the expert failed to supply the comprehensive report, the Oklahoma Court of Criminal Appeals left open the possibility

¹²³ *Id.*

¹²⁴ *Id.* ¶¶ 10-13, 105 P.3d at 834-35.

¹²⁵ *Id.* ¶ 15, 105 P.3d at 835.

¹²⁶ Trancredi, *supra* note 24, at 276-77.

that a reliable neuroimaging deception detection technology, such as fMRI, could successfully present more concrete evidence of credibility and gain admittance.

The *Daubert* court made a point to explain that the reliability factors were not intended to be used as a checklist; one factor could be insufficient in supporting reliability - such as when a new science has not been yet published at the time it is offered in court - and yet by balancing all factors the weight of the evidence could still support reliability.¹²⁷ However, most Oklahoma cases reviewing a *Daubert* analysis do not present technologies where some factors suggest the science is highly reliable and others suggest the science is unreliable, so it is uncertain how Oklahoma courts will address a novel science with mixed evidence of reliability. Most novel science examined in Oklahoma falls clearly to either side of the *Daubert* line. Due to the stricter standard with which judges may view novel neuroscience, it is possible – though not especially likely - that fMRI evidence presented in Oklahoma will be highly scrutinized under one or more factors. This may present a less obvious prediction for rulings in Oklahoma courts, but will not preclude fMRI deception detection evidence from surviving an objective *Daubert* test.

D. Neuroimaging in Other Jurisdictions

A few other jurisdictions have had encounters with brain fingerprinting and fMRI evidence for applications other than deception detection, yet none have included in their opinions any language that would clarify the likelihood of admitting such technology under *Daubert*. In *Harrington v. State*, the Supreme Court of Iowa examined evidence of brain fingerprinting in an application for post-conviction relief.¹²⁸ Nevertheless, the court

¹²⁷ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 593 (1993).

¹²⁸ *Harrington v. State*, 659 N.W.2d 509 (Iowa 2003).

dispensed with the case on a due process issue, thus avoiding any analysis of the reliability of the brain fingerprinting evidence.¹²⁹

Similarly, the Supreme Court of Idaho examined a claim of ineffective counsel which argued that the attorney should have subjected the defendant to fMRI procedures in order to identify a mental abnormality.¹³⁰ However, this application of fMRI imaging was a wholly separate theory from the science of fMRI of deception detection. Again, the court ignored the issue of novel science by stating that the counsel's strategy and methods were not ineffective.¹³¹

A series of First Amendment cases involving the Entertainment Software Association presented fMRI evidence in the Northern District of Illinois and the Eastern District of Michigan in 2005, and the District of Minnesota in 2006.¹³² These cases offered fMRI evidence, not for deception detection, but rather to demonstrate the effects of violent video games on an adolescent brain.¹³³ *Entertainment Software Association et al. v. Blagojevich* provides a lengthy discussion of fMRI evidence.¹³⁴ Although the procedure measured blood flow to the brain similar to fMRI deception detection, the theory of the procedure differed completely; it related to inhibiting impulses, which diverges greatly from the study of the BOLD effect in different neural regions.¹³⁵ The court did not do a full *Daubert* analysis, but did discuss peer review and publication of

¹²⁹ *Id.* at 516.

¹³⁰ *State v. Payne*, No. 32389, 2008 WL 2447447, at *26 (Idaho June 18, 2008).

¹³¹ *Id.*

¹³² *Entm't Software Ass'n v. Hatch et al.*, 443 F. Supp. 2d 1065 (D. Minn. 2006); *Entm't Software Ass'n v. Blagojevich et al.*, 404 F. Supp. 2d 1051 (N.D. Ill. 2005); *Entm't Software Ass'n et al. v. Granholm*, 404 F. Supp. 2d 978 (E.D. Mich. 2005).

¹³³ *Blagojevich*, 404 F. Supp. 2d at 1067.

¹³⁴ *Id.*

¹³⁵ *Id.* at 1064.

the method at issue, as well as the possibility of error in the results.¹³⁶ In discussing the error rate, the court found the evidence unpersuasive based on a lack of control for the variables in the procedure,¹³⁷ but after this conclusion the court gave no further analysis of the science.

In *Entm't Software Ass'n et al v. Hatch*, the court mentions fMRI studies of violence effects on the brain, but finds that the evidence is neither convincing nor relevant enough to even warrant a *Daubert* analysis.¹³⁸ Likewise, in the third case, *Entm't Software Ass'n et al v. Granholm*, the court briefly discusses the fMRI studies offered, but disregards these studies after only “[a] cursory review of the research,” and never applies any *Daubert* reliability factors.¹³⁹

Although some of the above cases consider the reliability of fMRI, none present case law which considers fMRI evidence for deception detection. The procedure for assessing the effects of video games is fundamentally different than that for deception detection¹⁴⁰ and in the few years that have passed since these cases were decided the accuracy and techniques of fMRI have greatly increased so that any earlier analysis of reliability is no longer relevant. The decisions do share the common theme of avoiding any detailed analysis of reliability, and this possibly reflects a judicial attitude that the foremost neuroimaging technologies are not even well-grounded enough to warrant analysis in court. Or perhaps these courts recognize that such technologies were presented before they had matured enough to withstand the appropriate tests, and the judges simply wished to set them aside for a later court when such evidence is more

¹³⁶ *Id.* at 1064-67.

¹³⁷ *Id.*

¹³⁸ *Id.* at 1069-70.

¹³⁹ *Id.* at 982.

¹⁴⁰ *Id.* at 1064.

likely to withstand *Daubert* and where future judges are more accustomed to assessing technological advancements. In either case, no opinion that has considered fMRI evidence, even briefly, has considered the admission of this science for its ability to detect deception. Thus, this dicta can have no real impact on any future analysis of the science, even as persuasive support.¹⁴¹ Ultimately, the sparse case law history leaves a relatively blank canvas for a decision in Oklahoma regarding the admissibility of fMRI deception detection evidence.

IV. A *Daubert* Analysis of Functional Magnetic Resonance Imaging

FMRI deception detection technology may be new and quite incredible, but from a strictly black-letter standpoint it is highly likely that fMRI will satisfy the *Daubert* prongs of relevance and reliability. This section will first discuss the likelihood of fMRI's admissibility under the *Daubert* reliability factors: testing, peer review and publication, rate of error, and general acceptance by the scientific community. This section will also discuss why fMRI will pass the second prong: relevance to the case.

A. Testing

The first factor *Daubert* discusses for analyzing reliability is “whether the [novel science] can be (and has been) tested.”¹⁴² The Court goes further and states that a primary focus should be on whether the technique or method can be falsified or refuted.¹⁴³ Although fMRI deception detection is quite new, there have been around twenty studies by well-recognized companies and academic institutions, and more studies

¹⁴¹ In 2009, a search of Westlaw and LexisNexus revealed no cases that had considered the admissibility of fMRI deception detection evidence.

¹⁴² *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 593 (1993).

¹⁴³ *Id.*

will be conducted each year.¹⁴⁴ Langleben’s initial “guilty knowledge” study, completed in 2001 and published in 2002, tested subjects with playing cards and revealed that “there is a neurophysiological difference between deception and truth at the brain activation level that can be detected with fMRI.”¹⁴⁵ Another 2001 study, by rival fMRI researcher Sean Spence, M.D., discovered “lying (relative to truth) was associated with greater activity in bilateral ventrolateral prefrontal cortices” when subjects were asked “yes” or “no” questions, and truth produced no increased activity.¹⁴⁶ A 2002 study similarly discovered that “feigned memory impairment . . . revealed four principle (sic) regions of brain activation: prefrontal and frontal, parietal, temporal, and sub-cortical.”¹⁴⁷

A 2003 study further investigated the theory by comparing memorized lies as part of a “coherent story” to “spontaneous lies” and found that while spontaneous lies created the most activation, both types of lies caused more activation than the truth state.¹⁴⁸ In 2004, F. Andrew Kozel, M.D., published two studies, one which compared individual to group results, and another which attempted to replicate past findings and confirmed the method of fMRI deception detection as “reasonable.”¹⁴⁹ A trio of 2005 studies focused on applying fMRI to “single deceptive and truthful responses in individual subjects,” rather than group data.¹⁵⁰ Two more studies were published in 2005, one of which concluded that more activation was present during false responses regarding personal information, and another which aimed to “evoke performance anxiety about generating lies” in an

¹⁴⁴ See *supra* text accompanying note 41.

¹⁴⁵ Langleben et al., *Brain Activity*, *supra* note 33, at 731.

¹⁴⁶ Spence et al., *supra* note 32, at 2851.

¹⁴⁷ Lee et al., *supra* note 41, at 157.

¹⁴⁸ Ganis, *supra* note 38, at 830.

¹⁴⁹ Kozel et al., *Detecting Deception*, *supra* note 41, at 605-06; Kozel et al., *A Pilot Study*, *supra* note 41, at 3-4.

¹⁵⁰ Davatzikos et al., *supra* note 41, at 663-64.

attempt to more closely simulate a practical application.¹⁵¹ In 2006 two articles were published on a collaborative study which supported past conclusions and also aimed to “create a more ‘real life’ experience than traditional analog studies.”¹⁵² This study involved subjects either shooting a gun or being falsely identified on surveillance footage to create emotional stimuli, and a financial incentive to lie successfully which attempted to replicate a realistic motivation to be believed.¹⁵³ In 2007 a study utilized positron emission tomography, a method of measuring neural activity through electrical charges, to corroborate the fMRI findings which suggested increased activity during deception in several pre-frontal sub-regions of the brain, including the left dorsolateral, right anterior and ventromedial prefrontal cortices.¹⁵⁴ The most recently released study is from January, 2009.¹⁵⁵ This study again addresses concerns that fMRI testing has been too isolated should employ real world scenarios.¹⁵⁶ Here, a mock crime group stole and damage compact disks containing incriminating footage before undergoing fMRI testing.¹⁵⁷

An article in the *American Journal of Law and Medicine* discussed the National Institute of Health’s ongoing initiative for major research groups that would share and compare fMRI test results from twenty-six different institutions,¹⁵⁸ which aims to minimize variability and ensure uniform results.¹⁵⁹ The tests will compare multiple procedures with one individual using a single fMRI unit, as well as one individual being

¹⁵¹ Nuñez et al., *supra* note 41, at 267-68; Phan et al., *supra* note 41, at 164.

¹⁵² Mohamed et al., *supra* note 41, at 679-80; Gordon et al., *supra* note 41, at 251.

¹⁵³ *Id.*

¹⁵⁴ Abe et al., *supra* note 41, at 287.

¹⁵⁵ Kozel et al., *Functional MRI Detection*, *supra* note 41, at 1.

¹⁵⁶ *Id.*

¹⁵⁷ *Id.*

¹⁵⁸ Trancredi, *supra* note 24, at 281.

¹⁵⁹ *Id.*

tested in different fMRI facilities.¹⁶⁰ The comparison of these studies will help confirm that fMRI technology is reproducible and has not been falsified or refuted. Because fMRI deception detection is such a recent and quickly-advancing technology, it will assuredly attract even further testing and study by well recognized researchers before it faces a *Daubert* analysis in court. Huizenga confirms that No Lie MRI, Inc., has funded a number of studies which further investigate and refine deception detection, and that these studies are either ongoing or have yet to emerge from the peer review and publication process.¹⁶¹ Similarly, Laken will soon be publishing new material that assesses the effects that fatigue and decreased motivation for accuracy may have on fMRI accuracy.¹⁶²

In prior decisions which applied section 2702, Oklahoma appellate courts held that minimal discussion of the testing factor would suffice for a proper *Daubert* analysis, only noting that it was apparent to the trial court through testimony that the science in question had and could be tested.¹⁶³ When the court rejected a scientific method under section 2702 there was *no* evidence of testing in the record.¹⁶⁴ This does not suggest an especially strenuous standard. Based both on the plentiful testing that fMRI deception detection has already undergone, as well as the certainty that such testing will increase in both volume and detail before a decision in Oklahoma court, it is extremely likely that fMRI will be held reliable under the testing factor, weighing strongly in favor of admission under *Daubert*.

¹⁶⁰ *Id.*

¹⁶¹ Telephone Interview with Joel Huizenga, *supra* note 14.

¹⁶² Telephone Interview with Steven Laken, *supra* note 46.

¹⁶³ In *Wood*, the court merely stated that DNA had and could be tested; Likewise, in *Taylor*, the court merely stated that DNA had and could be tested. *Wood v. State*, 1998 OK CR 19, ¶ 40, 959 P.2d 1, 11; *Taylor v. State*, 1995 OK CR 10, ¶ 24, 889 P.2d 319, 333.

¹⁶⁴ *Gilson v. State*, 2000 OK CR 14, 8 P.3d 883.

B. Peer Review and Publication

The second factor the *Daubert* court considered in deciding reliability is whether the novel science has been peer reviewed and published.¹⁶⁵ Nevertheless, the Court specifically states that peer review and publication “does not necessarily correlate with reliability,” acknowledging that some sciences may be too new for publication at the time they are admitted in court, but will still present accurate and meaningful evidence.¹⁶⁶ The *Daubert* court believed publication was an important consideration because peer-review of a novel science allows greater opportunity for a faulty method or theory to be refuted or criticized.¹⁶⁷

For fMRI evidence, despite being a very young science, publication and peer review should not prove to be a difficult hurdle. Currently, results from numerous fMRI studies as well as in depth discussions of the process behind this technology have been published in a wide selection of peer-reviewed medical and legal journals.¹⁶⁸ These articles specifically consider the theory, methods, and accuracy in reference to possible application in court.¹⁶⁹ More importantly, however, *no* articles to date have been published which refute fMRI deception detection technology or claim an unacceptable accuracy rate.¹⁷⁰ The amount of critical analysis available on this technology certainly appease the *Daubert* court’s concern that once published and peer reviewed, flaws in the methods or theory of a faulty science are more likely to be revealed.¹⁷¹ The fact that this

¹⁶⁵ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 593 (1993).

¹⁶⁶ *Id.*

¹⁶⁷ *Id.*

¹⁶⁸ *See supra* text accompanying note 41.

¹⁶⁹ *Id.*

¹⁷⁰ Telephone Interview with Joel Huizenga, *supra* note 14.

¹⁷¹ *Daubert*, 509 U.S. at 593.

criticism has not occurred with fMRI deception detection strongly supports the reproducibility and validity of these results.

In Oklahoma, courts have allowed novel science to satisfy the factor of peer review with a minimal showing.¹⁷² In *Taylor*, the record showed no peer reviewed articles that had discredited the science in question, and in *Wood* the court merely accepted at face value testimony that the DNA method had been peer reviewed.¹⁷³

Although it is possible that an article may be published which refutes fMRI technology in some way before fMRI evidence is offered in court, this is extremely unlikely as there is currently no controversy over the legitimacy of the science beyond slightly differing accuracy rates or the types of studies performed.¹⁷⁴ There is certainly enough publication by peer reviewed journals on fMRI technology and methods to satisfy this factor as it has been discussed thus far in Oklahoma. Therefore, a consideration of peer review and publication should also weigh heavily in favor of holding that fMRI is a reliable science.

C. Rate of Error

The third factor the *Daubert* court considered was “the known or potential rate of error.”¹⁷⁵ The Court further stated that the standards of control for the procedure should be considered.¹⁷⁶ However, the *Daubert* court never specifies a statistic that would necessarily satisfy the error rate factor.¹⁷⁷ Considering the error rate of other types of admissible evidence is no more helpful in determining a minimum error rate because

¹⁷² *Wood v. State*, 1998 OK CR 19, ¶ 40, 959 P.2d 1, 11; *Taylor v. State*, 1995 OK CR 10, ¶ 24, 889 P.2d 319, 333.

¹⁷³ *Wood v. State*, 1998 OK CR 19, ¶ 40, 959 P.2d 1, 11; *Taylor v. State*, 1995 OK CR 10, ¶ 24, 889 P.2d 319, 333.

¹⁷⁴ Per interview with Joel Huizenga, Jan. 19, 2009, no articles that refute the theory of fMRI deception detection had been published. Telephone Interview with Joel Huizenga, *supra* note 14.

¹⁷⁵ *Daubert*, 509 U.S. at 594.

¹⁷⁶ *Id.*

¹⁷⁷ *Id.*

many well accepted types of evidence display relatively low accuracy. Nevertheless, it is still possible that a novel science which is not well understood (or even feared) by the court may be held to a stricter standard with regard to error rate.¹⁷⁸ This is perhaps the most controversial factor due to inconsistencies between the low error rate expected from a science hoping to pass *Daubert* and the high error rates reported for certain long-accepted types of evidence.¹⁷⁹ For example, eyewitness testimony is frequently inaccurate because of faulty memory, stress and a phenomenon called unconscious transference.¹⁸⁰ These problems explain why eyewitness testimony is arguably the number one source of wrongful conviction.¹⁸¹ Still, eyewitness testimony remains a well accepted and compelling form of evidence in American courtrooms under the assumption that such evidence may help the jury even if it is not one hundred percent accurate.¹⁸²

Similarly, fingerprinting methods, another established source of evidence in courtrooms, have recently been questioned for not being subjected to the same standard of analysis as other sciences, and because certain methods are not supported by known error rates.¹⁸³ In Oklahoma, *Stacy v. State* discussed and admitted fingerprinting evidence in 1930.¹⁸⁴ However, this was long before Oklahoma courts incorporated the *Daubert* analysis into their assessment of the reliability of scientific evidence.¹⁸⁵

Although the *Stacy* decision considered the amount of published work on fingerprinting

¹⁷⁸ Kittay, *supra* note 16, at 1382.

¹⁷⁹ Sean Kevin Thompson, *A Brave New World of Interrogation Jurisprudence?*, 33 AM. J. L. & MED. 341, 342 (2007).

¹⁸⁰ Jennifer L. Overbeck, *Beyond Admissibility: A Practical Look at the Use of Eyewitness Expert Testimony in the Federal Courts*, 80 N.Y.U. L. REV. 1895, 1898-1902 (2005).

¹⁸¹ *Id.* at 1895-96.

¹⁸² *Id.* at 1895.

¹⁸³ See David M. Siegel et al., *The Reliability of Latent Print Individualization: Brief of Amici Curiae Submitted on Behalf of Scientists and Scholars by The New England Innocence Project, Commonwealth v. Patterson*, 42 CRIM. L. BULL. 21 (2006), available at Westlaw, 42 No 1 Crimlawbull Art 2.

¹⁸⁴ *Stacy v. State*, 1930 OK CR 154, 292 P. 885.

¹⁸⁵ *Taylor v. State*, 1995 OK CR 10, 889 P.2d 319.

and the number of other jurisdictions with laws requiring fingerprinting in certain situations, the decision makes no mention of error rate.¹⁸⁶ Despite the later adoption of *Daubert*, this precedent for admitting scientific evidence with a relatively high or unknown error rate has produced unresolved inconsistencies.

In Oklahoma, the decisions involving a *Daubert* analysis present only a minimal discussion of error rate. The *Taylor* court accepted DNA analysis after testimony that the company's work was submitted to a blind test which ensured that proper procedures were followed, despite a lack of figures regarding a known or potential rate of error.¹⁸⁷ This conveys an appropriate focus on control rather than merely what percentage should be met for an acceptable error rate. Still, the Court mentioned that an error would be more likely to produce no result than an incorrect result, which addresses the concern of wrongful convictions based on extremely persuasive but inaccurate evidence.¹⁸⁸ Later, the *Wood* decision again accepted testimony that the rate of error for the new method of DNA analysis was acceptable and the laboratory had undergone proficiency testing to guarantee proper control and procedure.¹⁸⁹ These cases suggest that the showing required to satisfy the rate of error factor in Oklahoma would not be especially stringent or inflexible.

In cases where Oklahoma has not found an acceptable error rate, the decision was not due to a listed error rate being insufficient, but rather due to a complete absence of error rate evidence or a complete lack of baseline control. In *Gilson*, the court approved exclusion under *Daubert* because an error rate was not listed, and because the method of

¹⁸⁶ *Stacy*, 1930 OK CR 154, 292 P. 885.

¹⁸⁷ *Taylor*, ¶ 19, 889 P.2d at 333.

¹⁸⁸ *Id.*

¹⁸⁹ *Wood v. State*, 1998 OK CR 19, ¶ 40, 959 P.2d 1, 11.

using a single interview with multiple human variables presented by the interviewer did not maintain adequate controls and inherently suggested high probability of error.¹⁹⁰ *Christian* similarly presents a liberal interpretation of acceptable error rate. Here, the appellate court overturns the trial court's decision to exclude the evidence because it lacked a "baseline" lung assessment, holding that a pre-injury test for comparison was not compulsory.¹⁹¹ This is significant because a pre-injury test would seem to fall under the genre of controls. Thus, holding that the trial court erred by applying too rigorous a standard for adequate controls conveys that Oklahoma courts may have a more relaxed expectation for control and accuracy.

One of the largest studies on the accuracy of fMRI revealed a 7 - 10% error rate, which is considered impressive for an emerging science.¹⁹² Other studies have produced even lower rates of error when fMRI is used to test the basic question of true or false, some as accurate as 99%.¹⁹³ Laken is currently promoting 97% accuracy for Cephus Corporation, and expects improvement.¹⁹⁴ This figure is a product of studies performed at his facility and reviewed at the University of Texas Southwestern Medical Center, in Dallas.¹⁹⁵ Similarly, Huizenga states that No Lie MRI, Inc. will soon be promoting accuracy rates of 95%.¹⁹⁶ This is a more cautious figure, but Huizenga qualifies that as a product of the current studies the accuracy rate should rise to 99% in three to ten years.¹⁹⁷ 99% accuracy is extremely significant because for methods such as fMRI testing, perfect

¹⁹⁰ *Gilson v. State*, 2000 OK CR 14, ¶¶ 66-1, 8 P.3d 883, 908.

¹⁹¹ *Christian v. Gray*, 2003 OK 10, ¶ 49, 65 P.3d 591, 610.

¹⁹² Kittay, *supra* note 16, at 1381.

¹⁹³ Davatzikos et al., *supra* note 41, at 633; *see also* Trancredi, *supra* note 24, at 290.

¹⁹⁴ Telephone Interview with Steven Laken, *supra* note 46.

¹⁹⁵ *Id.*

¹⁹⁶ Telephone Interview with Joel Huizenga, *supra* note 14.

¹⁹⁷ *Id.*

accuracy is - in theory under the Heisenberg uncertainty principle - impossible.¹⁹⁸

Although there are still problems with fMRI, the techniques for deception detection are continually improving.¹⁹⁹

Another consideration under *Daubert* is the controls and standards for the science.²⁰⁰ This is an area where fMRI will fare well, because so little of the process is performed by humans. A computer presents a question to which the subject responds, and advanced computer software receives the answer and analyzes the results.²⁰¹

Although MRI machines are run and monitored by humans, the test is essentially an autopilot function without the presence of an examiner; the analysis and conclusions are entirely the result of the algorithmic computer programs, which provide high spatial resolution.²⁰² This computerized aspect places fMRI testing in a whole different class of control than most other types of evidence which use human interpretation to reach results, such as fingerprinting and even, to an extent, DNA sequencing. Commentators have noted that this “reduced risk of human fallibility associated with . . . fMRI tests” will increase the likelihood that fMRI is considered reliable by courts where polygraph testing was found insufficient.²⁰³

Furthermore, the open source software for fMRI testing is refined every few years, and Laken expects these advancements to continue.²⁰⁴ Laken also anticipates additional improvements in the algorithmic equations employed to interpret fMRI data,

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 594 (1993).

²⁰¹ Gerard, *supra* note 12, at 10.

²⁰² Seong-Gi Kim et al., *Functional Magnetic Resonance Imaging of the Human Brain*, 74 J. NEUROSCIENCE METHODS 229, 229-30 (1997).

²⁰³ Gerard, *supra* note 12, at 26.

²⁰⁴ Telephone Interview with Steven Laken, *supra* note 46. The most current version of fMRI software is SPM8 (2009). The initial version was SPM5. Cephos Corporation uses version SPM2, which has been revised but is still relevant.

which will further increase accuracy.²⁰⁵ As both the scanning technology and analyzing software continue to progress before fMRI technology is offered in court, the amount of effective control in the procedure will certainly weigh heavily in favor of the reliability of this technology.

The current fMRI deception detection studies have been producing differing rates of error, but in general these error rates are relatively low.²⁰⁶ There is also a general expectation that the technology will improve until it reaches an error rate of near zero.²⁰⁷ If fMRI deception detection were presented in Oklahoma court today, it is extremely likely that the accuracy rates presented, generally above 90%, would be sufficient for the court to consider the technology reliable.²⁰⁸ Moreover, as the accuracy of fMRI deception detection continually improves, the chances of this technology satisfying the error rate factor will likewise continually improve. Thus, if it is not subject to *Daubert* until several years from now it will certainly take more than a criticism of accuracy to exclude this evidence. Overall, the increasingly low error rate of fMRI deception detection will strongly encourage Oklahoma courts to find this technology reliable.

D. General Acceptance

The final factor the *Daubert* court discusses when deciding on the reliability of novel science is the general acceptance the science has gained within the scientific community.²⁰⁹ This is a direct reference to the earlier *Frye* standard that the Court has

²⁰⁵ *Id.*

²⁰⁶ Telephone Interview with Joel Huizenga, *supra* note 14.

²⁰⁷ *Id.*

²⁰⁸ As discussed *supra*, Oklahoma has accepted new technologies such as DNA analysis with a cursory review of evidence suggesting error rates were favorable and controls were sufficient. These cases present no prejudice *against* scientific evidence, so evidence of up to 99% accuracy would appear to be nearly dispositive of this factor.

²⁰⁹ *Daubert*, 509 U.S. at 594.

incorporated into the *Daubert* analysis,²¹⁰ yet in the current analysis it will no longer be dispositive, but will be weighed alongside the other three factors.²¹¹ The Court states that although general acceptance is no longer an ultimate standard, “a known technique which has been able to attract only minimal support within the community. . . may properly be viewed with skepticism.”²¹²

In Oklahoma, the *Taylor* court held that it was “abundantly clear” that the DNA methods in question had been generally accepted by the relevant scientific community, based on the testimony of two experts.²¹³ In *Wood*, the court reached the same conclusion, but felt the general acceptance factor had necessarily been satisfied because numerous other jurisdictions had found the PCR method to be generally accepted within the scientific community.²¹⁴ These two cases consider different standards for general acceptance while reaching a similar conclusion. *Wood* describes a situation where the science has been admitted in other jurisdictions and the court may look to other assessments of general acceptance. Conversely, *Taylor* suggests that Oklahoma may be willing to find general acceptance of the novel science in question based only on the testimony of experts that such general acceptance exists. The *Gilson* decision does not appear to suggest an especially difficult hurdle to finding general acceptance either, since this court found no evidence at all in the record to support general acceptance in the applicable field when holding that the method was not generally accepted. None of these cases discussed general acceptance in depth once some evidence of acceptance was

²¹⁰ *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923).

²¹¹ *Daubert*, 509 U.S. at 594.

²¹² *Id.*

²¹³ *Taylor v. State*, 1995 OK CR 10, ¶ 24, 889 P.2d 319, 333.

²¹⁴ *Wood v. State*, 1998 OK CR 19, ¶ 40, 959 P.2d 1, 11.

presented, so perhaps a mere statement by credible experts that fMRI deception detection is generally accepted would suffice.

Experts do have differing opinions over the accuracy and advanced capabilities of fMRI technology regarding deception detection, yet it is generally accepted within the neuroimaging community that drawing conclusions based on correlations between activity in certain neural regions and deception is a valid science.²¹⁵ The sheer number of leading research groups who are developing and standardizing fMRI deception detection speaks to the growth of its acceptance.²¹⁶ Although Oklahoma cases which consider general acceptance in a *Daubert* analysis have not discussed a situation where evidence is presented to both establish and refute general acceptance, a credible showing of fMRI acceptance within at least the specific area of neuroimaging advancement would likely be sufficient to weigh in favor of reliability as a whole in a *Daubert* analysis.

E. Relevance of Novel Science

The second prong of *Daubert* considered whether the novel science “properly can be applied to the facts in issue,”²¹⁷ although the court does not discuss this element in length. This prong is effectively an assessment of relevance. The *Taylor* court merely mentions this prong - stating that the science must assist the jury - and finds that DNA matching is clearly relevant to determining whether the defendant was guilty of rape.²¹⁸ The *Wood* court does not discuss this prong at all in their review of the trial court’s *Daubert* analysis.²¹⁹ In regards to the instant situation, it is key to remember that the

²¹⁵ New, *supra* note 34, at 182-84.

²¹⁶ Twenty-six leading research groups have been invited to take part in a communal effort to compare and share evaluations of fMRI deception detection testing. Trancredi, *supra* note 24, at 281.

²¹⁷ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 593 (1993).

²¹⁸ *Taylor v. State*, 1995 OK CR 10, ¶ 20, 889 P.2d 319, 330.

²¹⁹ *Wood*, ¶ 37, 959 P.2d at 11.

credibility of testimony is always relevant. Because fMRI results which support or discredit the credibility of testimony will certainly be relevant to fact finding, meeting the relevance prong will not be an issue.

Ultimately, fMRI evidence should prove admissible in Oklahoma courts under a true *Daubert* analysis. Although there is some concern that courts may apply the reliability factors as a checklist and disallow a novel science when only one factor does not support reliability, the *Daubert* decision specifically cautioned against this.²²⁰ None of the Oklahoma cases reviewing a *Daubert* analysis consider this specific situation, but neither does the language in these cases suggest such a “checklist” approach would be taken. The language suggests that a reasonable amount of evidence from credible sources which supports reliability will result in the admissibility of expert evidence, and that Oklahoma courts are willing to embrace novel science. fMRI deception detection technology currently has much support from academics who praise its accuracy and reliability, and because fMRI is an area of high interest in the neuro-imaging community the research and effort behind its development will continue as more funding becomes available.²²¹ This should provide sufficient weight under each of the reliability factors. Even if one factor demonstrates less reliability than the others, a balance of the factors together should still be sufficient to hold fMRI reliable in a true interpretation of *Daubert*. Section 2702 merely requires specialized evidence to be scientifically reliable, which means that it must be accurate and reproducible.²²² As Steven Morese, J.D., Ph. D. optimistically states, “[i]f neuroscientific evidence is specifically relevant in an individual

²²⁰ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 593 (1993).

²²¹ Telephone Interview with Joel Huizenga, *supra* note 14.

²²² Section 2702 is substantively identical to Federal Rule of Evidence 702, discussed *supra*, which is drafted to require scientific evidence to be reliable rather than generally accepted.

case, as *Daubert* requires, and it is based on competent science, it *will* be admitted.”²²³

Thus, it is highly probable that if fMRI evidence is offered in Oklahoma courts it will succeed under Oklahoma Evidence Code section 2702, and likely that a similar result will be reached in the Tenth Circuit under Federal Rule of Evidence 702.

VI. Other Admissibility Hurdles

Although fMRI deception detection demonstrates adequate scientific reliability to recommend admission under a true *Daubert* analysis, there are several other issues that may prove detrimental to admission in Oklahoma courts. The possibility of evidence that proposes to visually interpret a person’s thoughts raises questions of jury confusion, overreaching influence, social stigmas regarding “mind reading” technology, and even an elimination of the jury completely. This section will discuss admissibility hurdles under Oklahoma Evidence Code section 2403, the concern that fMRI technology invades the province of the jury and the possible influence of a societal aversion to fMRI on judges. This section will conclude by mentioning several other relevant issues that cannot be discussed fully in this comment, but may develop once fMRI evidence is admitted.

A. Oklahoma Evidence Code Section 2403

Chief Judge Gibson of the Eighth Circuit wrote that if lie detection evidence is admitted in court “it is likely to be shrouded with an aura of near infallibility, akin to the ancient oracle of Delphi.”²²⁴ Ironically, the reputation for “near infallibility” that fMRI researchers are promoting may also prove a detriment to its admittance. One of the most difficult evidentiary obstacles that fMRI deception detection evidence may face is section 2403, which governs the admittance of evidence which is relevant, but perhaps

²²³ Trancredi, *supra* note 24, at 198 (emphasis supplied).

²²⁴ *United States v. Crumby*, 895 F. Supp. 1354, 1356 (8th Cir. 1995).

inadmissible because of another overwhelming concern, usually that it is too influential.²²⁵ Oklahoma Evidence Code section 2403 states: “Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, misleading the jury, undue delay, needless presentation of cumulative evidence, or unfair and harmful surprise”²²⁶ This rule is nearly identical to Federal Rule of Evidence 403, which was discussed in *Daubert*, as well as many other cases that consider the admission of novel science.²²⁷ Specifically, “undue prejudice,” “confusion of the issues” and “misleading the jury” are grounds on which fMRI might be ruled inadmissible.²²⁸

One concern judges may have is that jurors will overvalue evidence from an impressive new lie detection technology and accept these results as conclusive, despite cross-examination regarding possible error.²²⁹ In *United States v. Scheffer*, the United States Supreme Court recognized this inherent issue as applied to traditional polygraph evidence, fearing the “risk that juries will give excessive weight to the opinions of a polygrapher”²³⁰ The Tenth Circuit recognized the same issue in *United States v. Call*, noting that the scientific nature of lie detection procedures may cause the jury to overvalue this evidence.²³¹ Judges will likely have the same concerns when considering fMRI evidence.

²²⁵ Chief Judge Gibson’s comment that lie detection technologies are perceived as infallible illustrates the concern that leads judges to make section 2403 exclusions because they fear evidence will not assist the jury but rather will “mislead” a jury by inducing over-reliance.

²²⁶ 12 OKLA. STAT. § 2403 (2001).

²²⁷ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 595 (1993).

²²⁸ *Id.*

²²⁹ Kittay, *supra* note 16, at 1384.

²³⁰ *United States v. Scheffer*, 523 U.S. 303, 313-14 (1998).

²³¹ *United States v. Call*, 129 F.3d 1402, 1406 (10th Cir. 1997).

Moreover, there are certain aspects of fMRI evidence that would make this concern even more compelling, such as the impact that vivid high-resolution images which illustrate an individual's neural activity will have on the jury.²³² Such brightly visualized images may create a false sense of familiarity with the science, which increases the undue prejudice of the scientific evidence.²³³ In an interview regarding the potential for fMRI images, 60 Minutes correspondent Lesley Stahl commented on this influence, stating that “[w]hen you show someone a brain scan people just believe it. It reeks of credibility.”²³⁴ Many scholars believe this is exactly what happened in the John Hinckley trial: despite testimony by a radiologist who refuted the basis of the defense's argument, the jury was over-awed by evidence of a CT scan and improperly returned a verdict of not guilty.²³⁵ Furthermore, today's juries may be seduced by evidence that purports to be the product of state-of-the-art computer software due to our society's excessive trust in computers as irrefutably accurate.²³⁶ These concerns over undue prejudice are well founded and could easily have an impact on the admissibility of fMRI evidence in Oklahoma.

Judges may also see “confusion of the issues” or “misleading the jury” as a concern when evaluating fMRI evidence under section 2403 because they fear a jury may not be able to fully understand the evidence.²³⁷ In *Daubert*, the Court noted this possibility, stating “[e]xpert evidence can be both powerful and quite misleading because of the difficulty in evaluating it. Because of this risk, the judge in weighing possible

²³² Alexander, *supra* note 35, at 20.

²³³ Kittay, *supra* note 16, at 1384.

²³⁴ CBS NEWS, *supra* note 13.

²³⁵ Laura Stephens Khoshbin and Shahram Khoshbin, *Imaging the Mind, Minding the Image: An Historical Introduction to Brain Imaging and the Law*, 33 AM. J. L. & MED. 171, 184 (2007).

²³⁶ *Id.*

²³⁷ Pettit, *supra* note 11, at 327.

prejudice against probative force . . . exercises more control over experts than over lay witnesses.”²³⁸ Presenting fMRI evidence would entail at least a cursory explanation of how the scan is performed and the theory of different mental processes activating different neural regions. The attorney would then present images of the neural activity during testimony to the jury and explain why these images support the truth or falsity of the testimony. Finally, the jury would consider cross-examination of fMRI credibility which would likely be quite scientific in nature and cover error rates and possible flaws in the technical process or theory. Clearly, this would all be well-advanced scientific discussion even as presented to the jury. Although judges have allowed numerous types of expert testimony on intricate scientific evidence, technology which claims to “read the mind” certainly pushes the envelope. Thus, a judge could foreseeably exclude this evidence on the basis that it would confuse a jury and not aid in the ultimate assessment of a verdict.

An exclusion under section 2403 is especially effective because the trial or hearing judge has great discretion to find that the probative value of evidence has been outweighed.²³⁹ An appellate court will not reverse a section 2403 ruling unless there has been a clear abuse of discretion.²⁴⁰ Unlike a *Daubert* exclusion that is now subject to de novo appellate review in Oklahoma, it would be fairly simple for a trial judge to exclude fMRI evidence under section 2403 with little opportunity for the appellate court to reverse.²⁴¹

²³⁸ *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 595 (1993).

²³⁹ *Robinson v. Borg-Warner Protective Serv. Corp.*, 2001 OK 59, ¶14, 31 P.3d 1041, 1044.

²⁴⁰ *Id.*

²⁴¹ It would certainly be difficult for an appellate court to find that a trial court abused its discretion when excluding a new science as misleading, especially when new sciences are inherently difficult to understand for those who are not within the scientific field.

This very situation arose in *United States v. Call*, when the Tenth Circuit reviewed the exclusion of polygraph evidence under the new *Daubert* standard.²⁴² In *Call*, the district court excluded the polygraph evidence under both *Daubert* and Federal Rule of Evidence 403, which is nearly identical to Oklahoma Evidence Code section 2403²⁴³ and also is subject to review only for abuse of discretion.²⁴⁴ The Tenth Circuit decision referenced “the danger that the jury may overvalue polygraph results as an indicator of truthfulness because of the polygraph’s scientific nature.”²⁴⁵ Although the federal standard for a review of a *Daubert* analysis is abuse of discretion, unlike in Oklahoma, the Tenth Circuit still held that it was unnecessary to reach the questions posed by a review of the district court’s *Daubert* analysis because the polygraph evidence was properly excluded under Federal Rule of Evidence 403.²⁴⁶

Remarkably however, in *Taylor*, the Oklahoma Court of Criminal Appeals revisited the balance of probative value under section 2403, despite the high standard of review for such rulings, and found that the exclusion *was* an abuse of discretion.²⁴⁷ The court held that DNA sequencing “evidence was highly probative on the issue of the perpetrator’s identity,” and that it was not unfairly prejudicial; it merely tended to incriminate the defendant.²⁴⁸ The court made no mention of this relatively advanced and incredible science confusing the jury or being given too much weight. This language suggests that Oklahoma courts may see no prejudicial detriment in admitting complex

²⁴² *United States v. Call*, 129 F.3d 1402, 1405 (10th Cir. 1997).

²⁴³ 12 OKLA. STAT. § 2403 (2001); FED. R. EVID. 403.

²⁴⁴ *Call*, 129 F.3d at 1405.

²⁴⁵ *Id.* at 1406.

²⁴⁶ *Id.* at 1405.

²⁴⁷ *Taylor v. State*, 1995 OK CR 10, ¶ 20, 889 P.2d 319, 334.

²⁴⁸ *Id.*

novel scientific evidence, even when such breakthrough evidence would likely have a forceful impact on the jury, as evidence of a DNA match does.

fMRI evidence is quite advanced and new, but no more so than DNA sequencing was in 1995. Both sciences share a further similarity in that admission of such evidence could potentially decide the case in which it is introduced. In contrast, polygraph evidence has long been plagued with a stigma of fallibility, and the Oklahoma Court of Criminal Appeals rejected this evidence specifically because of “the potential unreliability of polygraph examinations.”²⁴⁹ Such unreliability lessens the probative value of scientific evidence in a section 2403 balancing analysis. Conversely, fMRI has demonstrated a very high level of accuracy, which is expected to improve.²⁵⁰ Also, evidence that could aid a jury in determining credibility is extremely valuable since research has shown lay people to be quite inaccurate when detecting lies: the accuracy rates are only around 60%.²⁵¹ Judge Duniway of the Ninth Circuit discusses this shortcoming of the jury in a dissent regarding the deference given to credibility determinations on appeal:²⁵²

I am convinced, both from experience as a trial lawyer and from experience as an appellate judge, that much that is thought and said about the trier of fact as a lie detector is myth or folklore. Every trial lawyer knows, and most trial judges will admit, that it is not unusual for an accomplished liar to fool a jury (or, even, heaven forbid, a trial judge) into believing him because his demeanor is so convincing. The expression of

²⁴⁹ *Fulton v. State*, 1975 OK CR 200, ¶ 4, 541 P.2d 871, 872.

²⁵⁰ Telephone Interview with Joel Huizenga, *supra* note 14.

²⁵¹ Aldert Vrij et al., *Detecting Lies in Young Children, Adolescents and Adults*, 20 APPLIED COGNITIVE PSYCHOL. 1225 (2006).

²⁵² *Penasquitos Village, Inc. v. Nat’l Labor Relations Bd.*, 565 F.2d 1074, 1084-85 (C.A. 1977).

his countenance may be open and frank; he may sit squarely in the chair, with no squirming; he may show no nervousness; his answers to questions may be clear, concise and audible, and given without hesitation; his coloration may be normal neither pale nor flushed. In short, he may appear to be the trial lawyer's ideal witness. He may also be a consummate liar Conversely, many trial lawyers, and some trial judges, will admit that the demeanor of a perfectly honest but unsophisticated or timid witness may be or can be made by an astute cross-examiner to be such that he will be thought by the jury or the judge to be a liar. He may be unable to face the cross-examiner, the jury, or the judge; he may slouch and squirm in the chair; he may be obviously tense and nervous; his answers to questions may be indirect, rambling, and inaudible; he may hesitate before answering; he may alternately turn pale and blush. In short, he may, to the trier of fact, be a liar, but in fact be entirely truthful.²⁵³

Thus, a highly reliable scientific means to aid in accurately determining witness credibility has great probative value. In the case of fMRI evidence, the probative value of such reliable scientific evidence would be much higher than that of the polygraph test in past rulings, making it more likely that fMRI's probative value will outweigh any possible concerns over prejudice or confusion.²⁵⁴ Because the Oklahoma Court of

²⁵³ *Id.*

²⁵⁴ If a science that can discern truth is shown to have an accuracy rate of up to 99% then it would automatically have a monumental probative value as evidence, where as a lie-detection method that is inaccurate may have nearly no probative value; it has failed in its very purpose, that of identifying statements that are true.

Criminal Appeals found no fault in the level of impact and complexity of highly probative DNA evidence, it is likely that if fMRI evidence is held to be reliable under *Daubert* then this evidence will also pass a section 2403 balancing test.

B. Province of the Jury

While section 2403 addresses concerns about evidence that may have too great an impact on the jury's decision, some critics of fMRI evidence, and all lie detection evidence, suggest that these technologies go beyond influencing the jury and threaten the very existence of the jury itself. The United States Supreme Court voiced this concern in *Scheffer* with regards to the exclusion of polygraph evidence:

A fundamental premise of our criminal trial system is that 'the jury is the lie detector.' Determining the weight and credibility of witness testimony, therefore, has long been held to be the 'part of every case [that] belongs to the jury, who are presumed to be fitted for it by their natural intelligence and their practical knowledge of men and the ways of men.' By its very nature, polygraph evidence may diminish the jury's role in making credibility determinations.²⁵⁵

In cases which turn on the credibility of opposing witnesses, a perfect lie detector could produce an infallible result and the judge would simply rule for the side telling the truth. No jury would be necessary. In a legal system where the promise of a jury is paramount, this idea causes deep unrest. Scholars have noted that some judges may simply reject this evidence because lie detection evidence of any kind encroaches on the province of the jury to the point that no role is left for the jury.²⁵⁶ The decision in

²⁵⁵ United States v. Scheffer, 523 U.S. 303, 313 (1998).

²⁵⁶ Pettit, *supra* note 11, at 328-29.

Scheffer to allow categorical exclusion of polygraph evidence in court-martial proceedings was based as much on the fear that “the traditional responsibility of court members to ascertain the facts and adjudge guilt or innocence would be usurped,” as on a finding that polygraph evidence was not reliable enough for admission.²⁵⁷ Similarly, in disallowing polygraph evidence under *Daubert*, the Tenth Circuit stated that “[t]he credibility of witnesses is generally not an appropriate subject for expert testimony . . . because it usurps a critical function of the jury.”²⁵⁸

This line of thinking is consistent with the decades of decisions that have kept polygraph evidence out of court, and will almost certainly be an argument for excluding fMRI evidence as well. Nevertheless, we only recently have learned how truly limited the ability of juries to accurately discern veracity is.²⁵⁹ One argument for admitting fMRI evidence is that these results will not displace the jury’s fact finding power, but rather will be a much needed aid to difficult credibility determinations of key witnesses that will help the jury to better weigh the evidence presented at trial as a whole.²⁶⁰ The dissent in *Scheffer* reflected this belief, stating that lie detection evidence does not displace the jury’s role.²⁶¹ Instead, evidence that bears on credibility is merely helpful in making a credibility determination, and proper jury instruction will protect such evidence from becoming dispositive.²⁶² In cases where the testimony is not self-narrative, judges or opposing attorneys can always remind the jury of the potential for subjectively honest yet

²⁵⁷ *Scheffer*, 523 U.S. at 309.

²⁵⁸ *United States v. Call*, 129 F.3d 1402, 1406 (10th Cir. 1997).

²⁵⁹ Robin Marantz Henig, *Looking for the Lie*, N.Y. TIMES MAG., Feb. 5, 2006, at 47, available at <http://www.nytimes.com/2006/02/05/magazine/05lying.html>.

²⁶⁰ *Call*, 129 F.3d at 1406.

²⁶¹ *Scheffer*, 523 U.S. at 336.

²⁶² *Id.*

mistaken testimony, which would not cement the facts of a case even in the presence of fMRI evidence of perfect accuracy.

In fact, most sciences can be viewed as either a means to assist the fact finder or as a means to shift power away from the fact finder, but this has not ultimately resulted in the exclusion of all science. Even photography was once feared as an advancement that would usurp the court's role in fact finding,²⁶³ but despite the potential for fraudulent images photographs are commonly admitted today. Jurors have learned to properly consider photographs as only one piece of evidence - very influential but not absolute.²⁶⁴ Similarly, fMRI evidence can be adapted to use in court through jury instruction and cross-examination. These litigation tools can explain the nature of the science as merely evidence to assist in credibility determinations and can clarify the limitations of fMRI results. An accurate understanding of the technology will allow the trier of fact to realize that they still must fulfill their role of evaluating all evidence, including fMRI deception detection results, to reach a verdict.²⁶⁵

C. Societal Aversion to “Mind-Reading” Technology

In sixteenth century Tudor England, the country was for a time blanketed in fear because an increasingly tyrannical Henry VIII passed, and enforced through torture, a law that made the mere thought of treason a crime punishable by death.²⁶⁶ It has long since been established that thoughts alone cannot be criminally punished, but the fear of a court's access to a person's thoughts for the purpose of adjudication has endured.²⁶⁷ As

²⁶³ Michael S. Pardo, *Neuroscience Evidence, Legal Culture, and Criminal Procedure*, 33 AM. J. CRIM. L. 301, 311 (2006).

²⁶⁴ *Id.*

²⁶⁵ *Id.* at 312.

²⁶⁶ JOANNA DENNY, KATHERINE HOWARD: A TUDOR CONSPIRACY (2005).

²⁶⁷ This is reflected, as discussed *infra*, by the resistance of some scholars and judges to any type of “mind reading” science.

discussed above, fMRI deception detection may prove to be a more accurate and reliable technology than many well-accepted forms of evidence, but perhaps the most difficult obstacle to overcome - and the one which is most likely to skew judicial interpretation of the law - is an inherent distrust of any science which purports to “read a person’s mind”. The presumption that an individual’s ideas are protected is deeply imbedded in our society and our constitution, and in an age where privacy is constantly threatened the mind is often considered the last truly private sanctuary.²⁶⁸ Now, for the first time in all of history the technology may exist to allow, not our testimony or actions, but our thoughts themselves to be proven as evidence in court. Scholars are already discussing the horror of “state action that punishes an individual or holds an individual responsible for thoughts.”²⁶⁹ One author has theorized that these “Orwellian fears” will play a more important role in excluding fMRI evidence than the evidentiary codes themselves.²⁷⁰

Some critics have made comprehensive statements that fMRI deception detection evidence should *never* be admitted in judicial proceedings. In a public debate regarding the admissibility of fMRI lie detection, United States District Judge Jed Rakoff was firmly opposed to admissibility, as revealed in the title to his comments: “Can Science Detect Lies? Not in My Court.”²⁷¹ Although Judge Rakoff claimed to respect the progress being made in this field, he still believed that fMRI deception detection would lead to more “mischief” than benefit in the courtroom and that veracity is better

²⁶⁸ Provisions such as the Fifth Amendment (protection from self-incrimination) and the First Amendment (freedom of speech) are quintessential embodiments of the belief that one’s thoughts should be free from government or legal interference.

²⁶⁹ Stacey A. Tovino, *The Confidentiality and Privacy Implications of Functional Magnetic Resonance Imaging*, 33 J.L. MED. & ETHICS 844, 848 (2005).

²⁷⁰ Kittay, *supra* note 16.

²⁷¹ Corydon Ireland, *Symposium: ‘Will Brain Imaging Be Lie Detector Test of the Future?’*, HARV. U. GAZETTE, Feb. 8, 2007.

discovered through the traditional means of cross-examination.²⁷² Such absolute rejection of fMRI technology in the wake of other imperfect scientific developments that have been admitted, such as DNA, diagnostic medical tests, and complex forensic evidence, may reflect a deeper held presumption against “mind-reading” science.

Similarly, a recent *New York Times* article discussed “neurolaw” and whether “the use of brain-scanning technology as a kind of super mind-reading device will threaten our privacy and mental freedom,” even suggesting that a new legal concept of “cognitive liberty” may develop as a result.²⁷³ The medical community is aware of this stigma, as indicated by Joseph Fins’ article entitled “The Orwellian Threat to Emerging Neurodiagnostic Technologies.”²⁷⁴ Fins’ article discusses why “[i]nterventions which involve the brain have long been prone to special scrutiny,”²⁷⁵ and urges medical professionals not to exaggerate the capabilities of neuroimaging technologies lest “their legitimate diagnostic use [be] undermined and made more difficult.”²⁷⁶

Could Oklahoma courts interpret the law more stringently because there is a fear of enabling “mind-reading” technologies to gain an undesirable foothold in our legal system, even when they have realistically satisfied an objective *Daubert* analysis? Possibly the language in *Slaughter* calling brain fingerprinting “interesting,” “startling” and “unconvincing” reflects exactly this stigma - that such science is uncertain at best, and surely inappropriate for a stable judicial system. Or perhaps it is merely a well-earned reaction to poorly presented evidence with almost no documented support for an

²⁷² *Id.*

²⁷³ Jeffrey Rosen, *The Brain on the Stand*, N.Y. TIMES MAG., Mar. 11, 2007, at 49.

²⁷⁴ Joseph J. Fins, *The Orwellian Threat to Emerging Neurodiagnostic Technologies*, 5 AM. J. BIOETHICS 56 (2005).

²⁷⁵ *Id.* at 57.

²⁷⁶ *Id.* at 56.

admittedly revolutionary claim. Perhaps Oklahoma courts will embrace fMRI deception detection evidence once it satisfies the *Daubert* standard, just as they have embraced MRI and CAT scan results as beneficial and now commonplace advancements. Still, the fact remains that there is at least some societal aversion to technologies which purport to invade the mind.²⁷⁷ This may not bar fMRI from admissibility in Oklahoma court, but it likely will not make the evidentiary hurdles easier, so the doctors and scientists promoting fMRI evidence had better be ready to put on a good show when their day in court comes.

D. Further Concerns

Even if fMRI deception detection passes the numerous admissibility hurdles under the Oklahoma Evidence Code, there is a wide array of other concerns that critics have raised as affecting the potential legal uses of this science. Could an individual be forcibly subjected to fMRI testing? If so, then in what situations and under what conditions? Because of the compelling nature of fMRI deception detection results as potential evidence, this science will face rigorous scrutiny under constitutional law, health care and research regulations, employment regulation and even with regard to homeland security, and the outcomes will likely be observed by Oklahoma courts. This comment will mention these concerns, although a full understanding of each issue will reach far beyond the scope of evidentiary analysis and this comment.

Perhaps the most common of these issues is the implications of fMRI evidence in the context of constitutional law. The Bill of Rights is intended to protect against inappropriate methods for obtaining evidence, namely the Fourth Amendment prohibition

²⁷⁷ See *supra*, notes 273, 274.

against unreasonable search and seizure and the Fifth Amendment prohibition against compulsory self-incrimination.²⁷⁸ Such offenses are most likely when the evidence is potentially powerful, as in the case of fMRI deception detection results.²⁷⁹ Because fMRI results produce evidence from an individual's body, the individual has a reasonable expectation of privacy and to compel an fMRI would constitute a search, despite the fact that the information is retrieved without physically intruding into the body.²⁸⁰ As a result, without the consent of the individual the government would need a warrant based on probable cause that this person's testimony is or would be false.²⁸¹ This would most likely be a reasonable search, however, as a scan that poses little or no risk to the subject is even less invasive than the forcible taking of blood which is held to be reasonable.²⁸²

The second major constitutional matter, the privilege against self-incrimination, revolves around whether fMRI deception detection results are testimonial or physical.²⁸³ The idea of compelled fMRI testing is problematic from the start because even minimal head movement during the procedure could destroy the accuracy of the result,²⁸⁴ and it would be difficult to prevent an individual from moving if they were disinclined to participate willingly. Severe sedation is a poor solution because this would not result in

²⁷⁸ U.S. CONST. amend. IV; U.S. CONST. amend. V.

²⁷⁹ fMRI evidence has the potential to be the ultimate exculpatory device, but could also be equally damning in nature. The lure of obtaining this evidence for use against a defendant in a criminal trial (which would seem to promise to secure any conviction) tempt prosecutors and investigators to push the envelope when inducing defendants to agree to fMRI procedures.

²⁸⁰ Even though an fMRI test does not physically enter the body, retrieving evidence without physical invasion by technological means still constitutes search and seizure. *Katz v. United States*, 389 U.S. 347, 358 (1967). Because an fMRI test extracts evidence from the body it is similar to having a blood sample taken from the body. Taking blood however, has been held a reasonable search and seizure. *Schmerber v. California*, 384 U.S. 757, 758 (1966). Therefore, an even less intrusive gathering of evidence such as a neural scan would almost certainly be considered reasonable. *See also* Pardo, *supra* note 263, at 325.

²⁸¹ See discussion *supra* note 281.

²⁸² *Schmerber*, 384 U.S. at 758-59.

²⁸³ *Id.* at 328.

²⁸⁴ Telephone Interview with Joel Huizenga, *supra* note 14.

acceptable cognition for providing testimony.²⁸⁵ Even if this problem is resolved however, the Fifth Amendment prevents an individual from being compelled to incriminate him or herself.²⁸⁶ If the nature of compelled fMRI results which provide answers to questions directly related to litigation are held to be within the scope of “testimonial,” then the Fifth Amendment will prevent this evidence from being admitted.²⁸⁷ This could be possible if the court finds that in proffering fMRI deception detection results “the State use[s] as evidence against [the subject of the fMRI] the substance of his disclosures.”²⁸⁸ Conversely, the physical and scientific nature of the procedure may be found similar to fingerprints, urine or blood samples, which do not offend the self-incrimination clause.²⁸⁹ Currently, there is no clear indication towards either outcome.²⁹⁰

Nevertheless, such constitutional questions are likely irrelevant at this point because fMRI evidence is not currently being promoted as evidence for prosecutors; According to Laken, all current interest in the use of fMRI deception detection in court comes from defendants or judiciary interest in use for defense purposes.²⁹¹ A voluntary fMRI procedure would avoid both the self-incrimination issue and the reasonable search and seizure issue, and for now would focus only on evidentiary obstacles. Although

²⁸⁵ Clearly, a defendant would have to be both conscious and in full capacity in order to provide useful responses, otherwise the fMRI results would be no better than those of an inebriated person (for which no studies have been done to date).

²⁸⁶ U.S. CONST. amend. V.

²⁸⁷ *Estelle v. Smith*, 451 U.S. 454, 464-65 (1981).

²⁸⁸ *Id.*

²⁸⁹ *Schmerber v. California*, 384 U.S. 757, 764 (1966).

²⁹⁰ Pardo, *supra* note 263, at 329.

²⁹¹ Telephone Interview with Steven Laken, *supra* note 46.

these questions may come into play later, it is highly unlikely that they will have any effect on the initial admissibility rulings in Oklahoma court.²⁹²

Another peripheral concern is how to treat the results of fMRI research which inadvertently reveal a medical condition of the subject being examined. Privacy rights could potentially be implicated if the subject does not wish to know about the condition.²⁹³ There is also a risk that the information could be leaked to discriminatory employers despite confidentiality agreements.²⁹⁴ The Americans with Disabilities Act limits an employer's use of medical examinations that screen for certain traits, but the Equal Employment Opportunity Commission has excluded "tests designed and used only to measure honesty" from the definition of medical examinations.²⁹⁵

There are also certain regulations pertaining to the polygraph test which may be interpreted to apply to fMRI technology. For example, a 2005 federal statute, the Employee Polygraph Protection Act, states that with certain exemptions it is unlawful for an employer to subject an employee to a "lie detector test."²⁹⁶ Lie detector test for this purpose is defined as "polygraph . . . or any other similar device (whether mechanical or electrical) that is used . . . for the purpose of rendering a diagnostic opinion regarding the honesty or dishonesty of an individual."²⁹⁷ Although fMRI is not specifically named, it is highly likely that this statute will be applied to any neuroimaging lie detection technology

²⁹² A total of 100% of those litigants seeking to admit fMRI deception detection results are those involved in criminal trials or appeals for exculpatory use by the defendants themselves. Due to the far more dubious nature of fMRI as a prosecutor's tool, proponents of the evidence generally do not wish to involve these questions in the initial *Daubert* hearings that fMRI might face. *Id.*

²⁹³ Brent Garland, *Neuroscience and the Law: A Report*, in NEUROSCIENCE AND THE LAW: BRAIN, MIND, AND THE SCALES OF JUSTICE, *supra* note 24, at 3, 35.

²⁹⁴ *Id.*

²⁹⁵ Tovino, *supra* note 269, at 847.

²⁹⁶ 29 U.S.C. § 2002(1) (2006).

²⁹⁷ *Id.* § 2001(3).

because of the statute's clear intent to encompass as-yet-undeveloped or unlisted lie detection methods.

One last issue worth mention is the potential implications the war on terror may have on fMRI deception detection development. The government is highly interested in acquiring advanced and accurate lie detection technology, as evidenced by the tremendous amount of funding from the Department of Defense and the Department of Homeland Security designated to investigating polygraphs and neural sciences,²⁹⁸ although these technologies differs greatly from the fMRI application discussed in this comment. Amid intense current debate over the balance between controversial detention practices such as water-boarding and the protection of U.S. citizens, the government interest in technology to accurately and harmlessly determine truth may grow. At the least, it may affect the attitudes toward and regulation of fMRI. One author hypothesizes that the U.S. "legal response to the war on terror" may pave the way to "justifying the use of privacy invasive techniques,"²⁹⁹ such as fMRI. Even a leading researcher, Scott Faro, M.D., believes that fMRI will likely be applied to "issues related to terrorism, national security, and high-level corporate crime," and that in these realms the exorbitant cost of fMRI tests for mere screening "could be worth it."³⁰⁰ Although such developments are merely speculative at this time, fMRI technology certainly has the potential to incite debate in the areas of privacy and national security.

²⁹⁸ "[T]he Department of Homeland Security granted \$3.5 million to Lockheed Martin and Rutgers University" to develop advanced lie detection sciences. Stacey A. Tovino, *Functional Neuroimaging Information: A Case for Neuro Exceptionalism?*, 34 FLA. ST. U. L. REV. 415, 428-29 (2007). For more on the use of fMRI in homeland security advancements, see Jennifer Wild, *Brain Imaging Ready to Detect Terrorists, Say Neuroscientists*, 437 NATURE 457 (2005).

²⁹⁹ Trancredi, *supra* note 24, at 188.

³⁰⁰ Orenstein, *supra* note 49, at 30.

As seen in these examples, fMRI deception detection has the potential for application in many different contexts and will face distinctive challenges in each. Although it is yet unknown how judges may rule with regard to many of these situations, in all cases where fMRI evidence is proffered in court, this science will first have to overcome admissibility hurdles which mirror or are similar to those in the Oklahoma Evidence Code.³⁰¹ Still, it is advantageous to be familiar with the emerging issues which could immediately develop if fMRI evidence does survive a *Daubert* analysis and the section 2403 balancing test.

VII. Conclusion

Without a recorded case of fMRI deception detection evidence being offered at trial, this new science faces uncertainties, but amid continual study and escalating accuracy rates the potential for fMRI deception detection is undoubtedly phenomenal. In Oklahoma court, admissibility will turn on the *Daubert* standard for reliability and the section 2403 balancing test, evidentiary hurdles which nearly mirror their counterparts in the Federal Rules of Evidence and many other states. Although *Daubert* presents several factors which scrutinize the reliability of a science, fMRI deception detection has been thoroughly subjected to extensive testing, publication and peer review, and has produced extraordinary accuracy rates without being refuted by a single publication in the field of neuroscience.³⁰² fMRI deception detection is a unique science, set apart from polygraphs, other neuroimaging techniques, and even other fMRI applications. It should properly be analyzed as such and not subjected to preconceptions associated with any

³⁰¹ FED. R. EVID. 702; 12 OKLA. STAT. § 2403 (2001).

³⁰² Telephone Interview with Steven Laken, *supra* note 46; Telephone Interview with Joel Huizenga, *supra* note 14.

previous methodologies presented as science. The *Daubert* factors essentially question the reproducibility and accuracy of a novel science in a way that gives it equal footing with long-established sciences, and if analyzed objectively, fMRI deception detection should pass with flying colors.

Section 2403 does present an opportunity for stigmas against “mind reading” technology, or alternately a fear of science that might usurp the jury’s role, to be manifest in a ruling that bars fMRI evidence as being overly influential or confusing to the jury. Nevertheless, accurate fMRI deception detection evidence has a very high probative value and can be assimilated into the legal context in the same way that DNA, CAT scans, forensics, and many other types of evidence have, even though these advancements were, at their time of first impression, equally astounding and persuasive as evidence. Oklahoma courts have not shown an aversion to novel science or applied the evidentiary standards in an especially severe way. Oklahoma’s judicial system is quite capable of evaluating and appropriately applying what will likely become an invaluable legal tool.

As Professor Henry T. Greely states, “The invention by neuroscientists of perfectly or extremely reliable lie-detecting or truth-compelling methods might have substantial effects on almost every trial and on the entire judicial system.”³⁰³ However, fMRI evidence remains a reliable science that satisfies the requirements of the Oklahoma Evidence Code. The implications of a technology that can ascertain deception goes to the heart of the goal of our jurisprudence: to determine and promote veracity and justice.

³⁰³ Henry T. Greely, *Prediction, Litigation, Privacy, and Property: Some Possible Legal and Social Implications of Advances in Neuroscience*, in *NEUROSCIENCE AND THE LAW: BRAIN, MIND, AND THE SCALES OF JUSTICE*, *supra* note 24, at 114, 137.

Rather than fear the misapplication of such an important advancement, courts should eagerly anticipate the development of law that allows the judicial system to employ fMRI deception detection in the ongoing quest for truth.