fMRI, Lie Detection, and The Fifth Amendment

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Introduction

Functional Magnetic Resonance Imaging ("fMRI") measures variations in brain activity by tracking the flow of blood to varying regions of the brain in real time[1]. The underlying assumption behind fMRI scans is that blood flow and neuronal activation are coupled such that when an area of the brain is being used, blood flow to that region increases in order to provide the necessary oxygen and nutrients required for active neurons [2]. fMRI scans depend on blood-oxygen-level dependent (BOLD) contrasts which create spatial and temporal maps of brain activation patterns. For example, an fMRI scan might show an increase of blood flow to a participant's memory center when asked to recall a list of words that were just presented to her. By this account, fMRI scans are able to produce a physical model or a rough sketch of what is going on inside of our brains. One might also draw the further conclusion that fMRI scans have the power to read our minds and disclose our thoughts[3].

Some companies have developed commercial products such as lie detectors based on fMRI techniques, but research regarding such techniques is not believed to be reliable enough for widespread commercialization[4]. However, this has not stopped a host of researchers from studying the efficacy of fMRI for lie detection from individual levels of analysis to group analysis[5]. In addition to questions of scientific validity – which are still unanswered – these technologies raise legal and ethical issues. Legally required brain scans arguably violate the Fifth Amendment labelled as, "the guarantee against self-incrimination" because they differ from traditional forms of bodily evidence which commonly include fingerprints and blood samples. They differ because they are not just composed to physical evidence, but brain scans are linked to the defendant's mind[6]. If fMRI scans are incorporated into the legal canon of the investigatory processes of the judicial branch, constitutional precautions must be enacted in order to protect our fundamental rights of privacy and individual freedom.

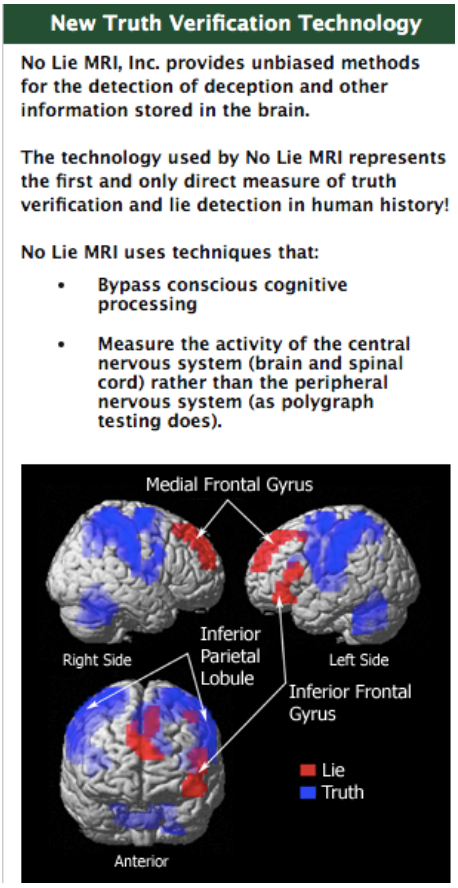
Currently, there is no statement regarding the status of fMRI results in the legal literature[7]. The conclusions of this white paper are twofold, both of which contribute to the notion that the results of fMRI scans qualify as testimonial evidence. First, fMRI scans can potentially reveal pertinent information about the subject's knowledge, beliefs, and mental states. Second, if this information is considered to be testimonial evidence, then it ensures that fMRI scan results are afforded the protection of the Fifth Amendment. If fMRI scans are considered as testimonial evidence and guaranteed protection under the Fifth Amendment, the government cannot compel an individual to submit to the scan and reveal the contents of their mind.

Case Studies and Applied Neuroscience

In a 2014 decision, *Commonwealth v. Baust* revealed how our fingerprints are not covered underneath the protection of our Fifth Amendment Rights: our right against self-incrimination. It was argued that since a fingerprint was not constitutive of "testimony", which the Fifth Amendment protects,

it was not in violation of such a right[8]. More recently, *State v. Diamond* in January 17, 2018 ruled that Fifth Amendment privilege against self-incrimination does not protect a person from being ordered to provide a fingerprint to unlock a seized cellphone because the compelled act is not a testimonial communication[9].

As such, we see the concern here – the Fifth Amendment only covers accounts of verbal testimony. Applied to our brains, we can begin to see the larger picture. Advancements in neuroimaging may allow scientists to get a glimpse of what is going inside of our brains. Certain markers, such as "Brain fingerprinting" which utilize EEG to detect the P300 wave, an event-related potential (ERP) associated with the perception of a recognized, meaningful stimulus, are thought to hold potential for confirming the presence of "concealed information"[10]. fMRI-based lie detection services are currently offered by several companies, most notably No Lie MRI[11]. Many fMRI studies reported increased prefrontal and parietal activity during lying or prolonged response time (RT) with lying [12,13,14,15]. Based on these findings, deception has been conceptualized as the inhibition of truth lie mediated by the prefrontal cortex, with truth being a response mediated by the posterior structures[14,16]. To help clarify the distinction, DARPA funded research to uncover how deception involves a more complex array of neurological processes than truth-telling, and that fMRI could help[17]. If fMRI lie detection becomes more effective at the level of the individual, then the project then becomes showing how results from fMRI can count as an account of testimonial evidence which I will discuss later.



Frontpage of No Lie MRI detailing different brain processes recruited in lie vs. truth-telling and how their fMRI technology works.
Received from: http://www.noliemri.com/

Our Fifth Amendment Right

The Supreme Court's landmark decision in Miranda v. Arizona established that "the government seeking to punish an individual produce the evidence against him by its own independent labors"[18]. Schmerber v. California reaffirmed the decision in Miranda v. Arizona and held that the Fifth Amendment protects the accused from testifying against themself. Specifically, the defendant cannot provide the state with "evidence of a testimonial or communicative nature"[19]. However, the Fifth Amendment, only protects evidence that falls under these categories:

1.) Testimonial,

2.) Compelled, and

3.) Incriminating[20].

fMRI scans challenge our original intuitions regarding our traditional accounts of "testimonial evidence" as they start to blur the differences between testimony and physical evidence.

The fMRI brain scan, it can be argued, produces a form of testimonial evidence because it forces the participant "to disclose the contents of his own mind" which has the possibility to reveal incriminating information [3,21]. The nature of the evidence revealed by fMRI brain scans differentiates it from mere physical evidence. Physical evidence is limited to "an identifying physical characteristic" of an individual, such as a handwriting sample, a blood sample, or fingerprint[22]. Physical evidence is distinct from testimonial evidence and is not afforded the protections of the Fifth Amendment because physical evidence does not communicate "personal beliefs or knowledge of facts"[23]. However, one could argue that our neural biomarkers of brain activity shown by BOLD imaging – which clearly align with physical evidence –raises an interesting controversy of whether we should afford fMRI scans the protection of the Fifth Amendment.

Since the advent of fMRI, this technology has pushed our understanding beyond the dichotomy of "testimonial" and "physical" evidence, thus blurring this line. However, this does not negate the fact that the fMRI can scan communicate the subject's knowledge of facts in certain cases. fMRI scans are able to adequately respond to and correlate with according changes of behavior and a variety of mental states[24]. The court even goes as far to say, in the Schmerber v. California case, that to "compel a person to submit to testing in which an effort will be made to determine his guilt or innocence on the basis of physiological responses, whether willed or not, is to evoke the spirit and history of the Fifth Amendment."[25] Without fully understanding the issues of fMRI and lie detection, it will not be able to tease apart the "testimony" versus "physical" distinction.

Problems with fMRI - Group vs. Individual Analysis

Although fMRI data may count as testimonial evidence, there are general concerns about its efficacy that warrant discussion[26]. Skeptics about the validity of such technology argue that the conclusions drawn from fMRI "lie detection" experiments conducted to date are only valid within the context of the experimental data [27]. One could imagine the host of differences between lying in a laboratory setting versus lying in a genuine setting. For example, lies are generally considered to be more emotionally salient and should thus supposedly show activation in the lateral PFC. Lying is also considered to be riskier which might implicate vMPFC activation. However, lies in the laboratory setting are going to be non-emotional, directive, and not risky at all. These are speculative ideas, but they begin to reveal key issues with how we approach fMRI results and truth-telling in the lab.

The laboratory versus genuine setting also plays a further role as well when calling the credibility of fMRI results into question. A 2003 study by Ganis et al., revealed that practiced lies resulted in markedly decreased BOLD activation when compared to unpracticed lies in "every deception-related region of interest identified except for one associated with memory retrieval."[12,27]. Outside of the laboratory, when one is about to be interrogated about a lie, there will be a bevy of confounds in addition to the standard confounds. It is quite likely that the person being interrogated will have rehearsed and memorized the lie which may potentially eliminate any salient differences between the neural markers of deception and truth-telling[27]. There is also a marked difference between brain activation patterns of the process of lying versus the process of truth manipulation. Hakun et al., cast doubt on whether the existing literature bears on the question of whether there are consistent neural correlates of deception as a result of this confound[28].

What we are looking for, in an ideal world, is to identify truth from lie at the level of the individual subject and at the level of the individual question. The problem with this, however, is that most (if not all) of fMRI studies of lie detection focus on truth vs. lie differences aggregated over numerous subjects being asked numerous questions[29]. A large amount of data over a period of time might reveal general correlations and trends that implicate a specific pattern of neural activation as being strongly correlated with a particular experimental condition. However, these data cannot tell us whether the pattern of activation is specific to the neural process of deception and not also common to other experimental conditions (or mental processes). Thus, for the moment, current studies cannot shed much light on whether fMRI can reliably detect lies at the level of the individual subject or question which would be most useful and relevant for use in the courtroom[29].

Conclusions and Parting Thoughts

This article has shown that, while fMRI scans may be of a physical nature, they should count as testimonial evidence in the court of law as they produce evidence of our mental states. However, concerns are being raised that neuroscientific findings may be problematic for the legal community. Research on the neuroscientific data of deception and truth-telling has no philosophical bearing on the question that matters most to the judicial branch, "Can fMRI-based lie detection methods provide a legally relevant answer in the court of law?[29]" which at this moment is an overwhelming no. It seems apparent that more research will need to be conducted before fMRI-based lie detection approaches a level of significant acceptance for the court. However, this article indicates why fMRI scans should be afforded the protection under the Fifth Amendment, why it is a problem and why this issue needs to be addressed prudently before fMRI scans are accepted in the court without adequate information and legal protection.

References:

1. Huettel, S., Song, A., and McCarthy, G. (2004). *Functional Magnetic Resonance Imaging.* Sunderland, MA: Sinauer Associates

2. Logothetis, N. K., Pauls, J., Augath, M., Trinath, T. & Oeltermann, A. Neurophysiological investigation of the basis of the fMRI signal. *Nature* **412**, 150–157 (2001).

3. Boundy M. The government can read your mind: can the constitution stop it? Hast Law J. 2011;63:1627–43.

4. Langleben, D. D., & Moriarty, J. C. (2012). Using Brain Imaging for Lie Detection: Where Science, Law and Research Policy Collide. *Psychology, public policy, and law : an official law review of the University of Arizona College of Law and the University of Miami School of Law*, *19*(2), 222–234.

5. Farah, M. J., Hutchinson, J. B., Phelps, E. A., & Wagner, A. D. (2014) Functional MRI-based lie detection: Scientific and societal challenges. Nature Reviews Neuroscience, 15, 123-31.

6. Farrell B (2010) Can't get you out of my head: the human rights implications of using brain scans as criminal evidence. Interdisciplinary Journal of Human Rights Law 4(1): 89–95

7. Muniz, 496 U.S. at 597

8. Commonwealth v. Baust, 89 Va. Cir. 267 (Va. Cir. Ct. 2014).

9. State v. Diamond, 2018 WL 443356 (Minn. 2018).

10. Farwell, L. A. & Smith, S. S. Using brain MERMER testing to detect knowledge despite efforts to conceal. *J. Forensic Sci.* **46**, 135–143 (2001).

11. No Lie MRI, Inc., http://noliemri.com/customers/Overview.htm (last visited April 13, 2019)

12. Ganis, G, Kosslyn, SM, Stose, S, Thompson, WL, Yurgelun-Todd, DA (2003): Neural correlates of different types of deception: an fMRI investigation. *Cereb Cortex* **13**: 830– 836.

13. Kozel, FA, Padgett, TM, George, MS (2004): A replication study of the neural correlates of deception. *Behav Neurosci* **118**: 852– 856.

14. Langleben, DD, Schroeder, L, Maldjian, JA, Gur, RC, McDonald, S, Ragland, JD, O'Brien, CP,Childress, AR (2002): Brain activity during simulated deception: an event-related functional magnetic resonance study. *Neuroimage* **15**: 727– 732.

15. Lee, TM, Liu, HL, Tan, LH, Chan, CC, Mahankali, S, Feng, CM, Hou, J, Fox, PT, Gao, JH (2002): Lie detection by functional magnetic resonance imaging. *Hum Brain Mapp* **15**: 157– 164.

16. Spence, SA, Hunter, MD, Farrow, TF, Green, RD, Leung, DH, Hughes, CJ, Ganesan, V (2004): A cognitive neurobiological account of deception: evidence from functional neuroimaging. *Philos Trans R Soc Lond B Biol Sci* **359**: 1755– 1762

17. Langleben D. D, Loughead J. W, Bilker W. B, Ruparel K, Childress A. R, et al. (2005) Telling truth from lie in individual subjects with fast event-related fMRI. Hum Brain Mapp 26: 262–272

18. Miranda v. Arizona, 384 U.S. 436, 460 (1966)

19. Schmerber, 384 U.S. at 764 (1966).

20. Doe v. United States (Doe II). 487 U.S. 201, 207 (1987).

21. Curcio v. United States, 354 U.S. 118, 128

22. Gilbert v. California, 388 U.S. 263, 267 (1967)

23. Pennsylvania v. Muniz, 496 U.S. 582, 597 (1990)

24. Pardo, M. S., & Patterson, D. (2013). Minds, Brains, and Law: The Conceptual Foundations of Law and Neuroscience. Oxford University Press.

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

26. Christ, S. E., Van Essen, D. C., Watson, J. M., Brubaker, L. E., & McDermott, K. B. (2009) The contributions of prefrontal cortex and executive control to deception: Evidence from activation likelihood estimate meta-analyses. Cerebral Cortex, 19, 1557–66

27. Farah, M. J., Hutchinson, J. B., Phelps, E. A., & Wagner, A. D. (2014) Functional MRI-based lie detection: Scientific and societal challenges. Nature Reviews Neuroscience, 15, 123-31.

28. Hakun, J. G., Seelig, D., Ruparel, K., Loughead, J. W., Busch, E., Gur, R. C., & Langleben, D. D. (2008) fMRI investigation of the cognitive structure of the concealed information test. Neurocase, 14, 59–67.

29. Wagner AD, Bonnie RJ, Casey BJ, Davis A, Faigman DL, Hoffman MB, Jones OD, Montague R, Morse S, Raichle ME, Richeson J, Scott ES, Steinberg L, Taylor-Thompson KA, Yaffe G (2016) fMRI and Lie Detection. The MacArthur Foundation Research Network on Law and Neuroscience