SYRACUSE JOURNAL OF SCIENCE & TECHNOLOGY LAW

VOLUME 30 SPRING 2014 ARTICLE 6, PAGE 160

I Know What You're Thinking: Brain Imaging and Mental Privacy

Edited by: Sarah Richmond, Geraint Rees, and Sarah J.L. Edwards
Reviewed By: Jenna Furman

Since the 1980s, MRI scanners have been used in medicine to help diagnose various conditions, many of which are found in the brain.[1] The use of such scanners has led to advances in understanding the human mind, both its structure and functions. Such advances have led to greater knowledge of neurological diseases and conditions.[2] This subset of the MRI's imagining technology is typically referred to as "neuroimaging."[3] However, recently many academics and doctors have questioned whether MRI technology could be used to one day "read the minds" of those studied.[4] The use of MRI technology in this way raises not only legal issues regarding the right to privacy of the participant but also ethical issues, such as whether it would be appropriate to use this advanced technology to detect cognitive awareness of a person in a vegetative state. This book compiles essays from psychiatrists, neuroscientists, ethicists, anthropologists, philosophizers, and lawyers which address the legal and ethical issues, along with the scientific benefits and social concerns, raised by the possible future use of MRI-imaging technology to "read minds" of patients. This book review will outline certain arguments addressed in these various essays which provide insight into these legal and ethical issues regarding the use of neuroimaging to "read minds."

---

[1] I KNOW WHAT YOU'RE THINKING: BRAIN IMAGING AND MENTAL PRIVACY 1 (Sarah Richmond, Geraint Rees, and Sarah J.L. Edwards ed., Oxford University Press, 2012).

[2] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 1.

[3] *Id.*

[4] *Id.*

By way of introduction, the first essay in the book is Susanne Shultz and R.I.M. Dunbar's *The Social Brain Hypothesis: An Evolutionary Perspective on the Neurobiology of Social Behavior*.[5] The focus of this essay is the evolutionary developments in the brain and cognition in similar mammals, such as primates, as the closest relative to humans.[6] Shultz and Dunbar examine the evolution of "social cognition" or the cognitive processes which control our social behavior and relationships.[7] The authors contribute the larger size of primate and human brains to their increased capacity for social understanding, thus, a more complex brain structure is necessary.[8] This is called the Social Brain Hypothesis.[9] This hypothesis was developed in the 1980s and undermines the Machiavellian Intelligence Hypothesis which posits that an individual is in constant competition with members of the same species operating within the same social groups.[10] This hypothesis states that as a result of this inherent competition among social groups, the members of the social groups had to develop the capacity for deceit in the form of cheating or lying.[11] However, Shultz and Dunbar argue, and the Social Brain Hypothesis criticizes, that while the Machiavellian Intelligence Hypothesis may explain why primates and humans developed larger brains, it does not account for the distinction between the size of a primate and a human brain.[12] The authors also state that while the expansion of non-social executive regions of the human brain has slowed over time, the expansion of social executive regions of the brain

---

[5] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 13.

[6] *Id.*

[7] *Id.*

[8] *Id.*

[9] *Id.*

[10] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 14.

[11] *Id.*

[12] *Id.*

has increased, more so than other mammals, including primates.[13] This suggests that human brain development has evolved toward greater intentionality in actions with fewer emotional or instinctive components.[14] Thus, Shultz and Dunbar state that the evolution of the social aspects of the brain demonstrates the importance of the brain's cognitive capacities for human interaction and social cognition.[15]

In John-Dylan Hayne's essay, *Brain Reading*, he offers skepticism toward the concept of "brain reading" and explains that the current available technology, including MRI and fMRI technology, would be inadequate in, and ill-suited for, reading a person's arbitrary thoughts.[16] Hayne explains that brain activity can be measured in various ways through the use of EEG, MEG, and now MRI and fMRI technology but all of these have their limitations.[17] EEG and MEG technology can be thought of as a low-resolution view of the brain while MRI and fMRI provide high-resolution views.[18] Hayne later explains that pattern recognition software is absolutely vital for understanding these images and would be necessary for this technology to one day lead to "mind reading."[19] Additionally, Hayne argues that current technology, even MRI and fMRI technology, do not possess a high enough resolution to make mind reading yet possible.[20] He believes the proper resolution for brain imaging technology would be "at least down to 0.5 mm which is the approximate size of the cortical columns."[21] Haynes also states that

---

[13] *Id.* at 22.

[14] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 22.

[15] *Id*. at 24.

[16] *Id*. at 28-34.

[17] *Id*. at 28.

[18] *Id*.

[19] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 30.

[20] *Id*. at 32.

[21] *Id*. A cortical column is the smallest topographic unit in the neocortex.

the heavy noise that comes from the use of fMRI and EEG technology and the breathing of the patient presents a barrier to mind reading because it contaminates the signals received, and thus, limits the accuracy of brain reading.[22] Haynes believes that while this technology may be fully developed in the somewhat near future, there are significant methodological limitations currently in place that prevent mind reading from occurring.[23] He also points out that were such technology to exist, it should be commercially distributed and implemented to aid severely impaired patients, such as those suffering from near total paralysis, and that industry standards should be developed, and enforced, regarding the use of this brain reading technology.[24]

In Tim Bayne's essay, *How to Read Minds*, he suggests that fMRI technology has already developed to the limited extent that it can be used to predict one's thoughts.[25] He refers to this process as "brain decoding" rather than brain reading, and states that as a result of interest in this area, this field has grown substantially in recent years.[26] He cites three different studies in his essay which support his view that current brain reading technology is very close to being able to decode the human brain, and thus, a person's thoughts.[27] In the first study, subjects were asked to "decide either to add or subtract two numbers that had been presented to them" and the researchers were able to predict with 70% accuracy which the subjects decided to do based on the use of fMRI technology.[28] In a second study, researchers used fMRI technology to decode the brain of a mentally ill woman who allegedly murdered her child, and based on her fMRI

---

[22] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 32.

[23] *Id*. at 39.

[24] *Id*.

[25] *Id*. at 41.

[26] *Id*.

[27] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 41.

[28] *Id*.

results, the researchers believed that she might in fact be innocent.[29] Lastly, when a woman in a vegetative state was studied and asked to imagine either playing tennis or walking through her home, neuroimaging technology showed that brain activity was stimulated in the areas regarding motor imagery and spatial navigation.[30] Thus, the researchers believed that she possessed some kind of consciousness despite her physical state.[31]

However, Bayne also raises concerns about the methodology and scope of brain reading technology and its ethical implications.[32] He brings to light questions concerning: the possibility of ascribing a mental state to a person on the basis of neuroimaging data; the conditions under which brain reading might be permitted; the kinds of mental states to be read with this technology; and how behavior and introspection may be linked or separated from the mental processes demonstrated by brain reading.[33]

In Geraint Rees and Ryota Kanai's essay, *Predicting Human Behavior from the Brain Structure,* the authors contemplate ethical and legal issues surrounding mental privacy in the healthcare sector that may arise from brain reading technology.[34] Specially, Rees and Kanai examine whether a relationship exists between brain structure and behavioral traits from brain structure, and if so, its possible implications on a patient's right to privacy.[35] The authors are concerned that the "existence of such a relationship might enable prediction of behavioral traits from brain structure," especially through the use of MRI technology.[36] While Rees and Kanai

---

[29] *Id*. at 39.

[30] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 41.

[31] *Id*.

[32] *Id*. at 41-55.

[33] *Id*. at 41-42.

[34] *Id*. at 59.

[35] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 59.

[36] *Id*.

concede that traits usually are not entirely indicative of specific instances of behavior, people do tend to show "consistency in their behavior across a range of situations."[37] Therefore, if traits are related to brain structure, then one may be able to predict how a person will generally behave from measurement of his or her brain structure alone.[38] Rees and Kanai state that once an "unambiguous relationship" has been shown between brain structure and behavioral trait this relationship could be used to predict behavioral traits from brain anatomy.[39] The authors then state that in a society like ours, where MRIs are used in routine health care procedures or for academic research but are also governed by legal privacy and data protection laws, any new technology should be subject to such laws and should avoid the commercial sector.[40] For example, if MRI technology is used commercially, employers may use it to screen job applicants for particular behavioral traits.[41] Although job applicants would have to consent to such a mental examination, failure to consent would most likely result in the employer refusing to consider the job applicant for the position.[42] Additionally, the comprehensive data gained through an MRI examination would effectively allow the employer to find "collateral" information about an applicant and his or her traits that, while not directly related to the application process, could exclude the applicant from obtaining a position.[43] Rees and Kanai warn that the legal implications regarding a person's mental privacy need be considered as brain reading technology further progresses to ensure that individuals are protected from unjust privacy invasions.[44]

---

[37] *Id*.

[38] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 59.

[39] *Id*. at 64.

[40] *Id*. at 65.

[41] *Id*.

[42] *Id*.

[43] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 66.

[44] *Id*.

Adrian M. Owen, in his essay, *When Thoughts Become Actions: Neuroimaging in Non-Responsive Patients*, writes about the effect that brain reading technology could have in the medical field, especially on determining the awareness and/or consciousness of individuals in a vegetative state.[45] Medically, a person in a vegetative state is deemed to possess "wakefulness without awareness."[46] However, if brain imaging technology could demonstrate that a person in a vegetative state was conscious or aware, then this would entirely change diagnosis of these patients within the medical field.[47] While the diagnosis of a vegetative state is not made until repeated examinations have shown no evidence of "sustained, reproducible, purposeful, or voluntary behavioral response to visual, auditory, tactile, or noxious stimuli", the diagnosis is vulnerable to a false negative result, where the absence of evidence becomes evidence of the vegetative state itself.[48] Owen also suggests that these diagnoses are very often subject to error because the nature of the injury, as one effecting the brain, effects the entire neurological system.[49]

Owen's essay focuses on whether, through brain reading, "measurable brain 'responses' could be marshaled and used as a proxy for a motor response, then a patient who is entirely unable to move may be able to signal awareness by generating a pattern of brain activity that is indicative of a specific thought or intention."[50] Owen cites a study which demonstrates this possibility where 41 participants with disorders of consciousness were examined at an incremental level, according to their brain activation, to increasingly complex language

---

[45] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 73.

[46] *Id*.

[47] *Id*.

[48] *Id*.

[49] *Id*.

[50] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 75.

paradigms.[51] The results of this study showed that 19 of the patients, almost fifty percent, were found to have exhibited "normal" or "near normal" temporal lobe responses to sound and simple speech.[52] The study also found that four patients were found to have exhibited "normal" fMRI activity even during the most complex speech paradigm in the study.[53] Thus, these results demonstrate that there may be evidentiary proof that many of those deemed in a vegetative state may possess some level of consciousness or awareness.[54] Thus, this type of technology could be used to aid in understanding other consciousness disorders in the medical field and to determine whether such patients may, in fact, be conscious at some level.[55] Owen offers another example of this technology demonstrating consciousness where if a patient repeats a response to a physical command, which is read by the brain imaging technology, there would be little doubt as to that patient's awareness.[56] Additionally, Owen points to another study in which persons in a vegetative state that exhibited atypical cortical activity, or activity in the higher level associative cortices, were more likely to recover from this vegetative state.[57] Thus, the benefits in understanding a patient's diagnosis, prognosis, and recovery can be currently seen through the use of brain imaging technology, and any further technology will only aid understanding of disorders of consciousness in the future.

Athena Demertzi and Steven Laureys, in their essay, *Where in the Brain is Pain?: Evaluating Painful Experiences in Non-Communicative Patients,* examine the effects that brain imaging technology may have on non-communicative patients in aiding in their care, especially

[51] *Id*. at 76.

[52] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 76.

[53] *Id*.

[54] *Id*.

[55] *Id*.

[56] *Id*. at 79.

[57] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 82.

treatment for pain.[58] The authors explain that, in a healthy person, PET and fMRI technology show that there is no "pain centre" of the brain but there is a "distributed neural circuitry."[59] This circuitry is then divided into two distinct brain networks: the lateral pain system, which measures physical pain, and the medial pain system, which measures emotional responses to pain.[60] Demertzi and Laureys raise concerns about whether the feeling of pain suggests a level of consciousness, and whether pain, without a clear "pain centre", can ever be accurately read by neuroimaging technology.[61] Thus, this technology could be helpful in determining, at the very least, a minimal prerequisite of awareness in persons with consciousness disorders.[62] Demertzi and Laureys believe that further advancements in brain imaging technology will lead to an effective understanding of a patient's pain and thus, lead to effective pain management for these patients.[63] The authors also emphasize that clear ethical and legal standards need to be articulated in the development of this technology for use on patients with disorders of consciousness.[64]

Emily Borgelt, Daniel Buchman, and Judy Iles' essay, *Practitioner's Views on Neuroimaging: Mental Health, Patient Consent, and Choice*, raises ethical concerns about the use of brain imaging technology on persons unwilling or unable to consent to such procedures and those persons' privacy rights.[65] Borgelt, Buchman, and Iles worry that the use of such technology could potentially lead to "discrimination based on the apparent cognitive capacity or abnormality" of the individual and they question the appropriateness of the "means of collecting

---

[58] *Id*. at 89.

[59] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 89.

[60] *Id*.

[61] *Id*. at 96.

[62] *Id*.

[63] *Id*.

[64] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 96.

[65] *Id*. at 99.

and storing neuroimaging data of already marginalized populations."[66] The authors are further concerned with the definition of brain privacy and protection itself.[67] This essay focuses specifically on the use of such technology in the mental health field and whether the procedures for informed consent to such brain imaging would be valid where the decision making capacity of psychiatric patients may be comprised.[68] Borgelt, Buchman, and Iles hope to inform the field of neuro-ethics with their perspectives on the use of brain imaging on those deemed mentally ill and the standards that should govern the use of such technology in this area to alleviate concerns that these patients would be exploited by such examinations.[69]

In Brendan D. Kelly's essay, *Brain Imaging in Clinical Psychiatry: Why?*, he explores the clinical uses of brain imaging technology in treating psychiatric patients.[70] Kelly states that while brain imaging technology may be helpful in understanding certain psychiatric disorders, so far this technology has not led to any clear results in assessing or understanding any psychiatric disorder.[71] While there may be an inference that blood flow to certain regions of the brain could be dispositive of certain disorders, such as dementia, these studies are inconclusive and often carry abnormal results which do not lead to any consistent finding.[72] Thus, for brain imaging to become useful for psychiatrists in a clinical setting, a greater link between the biological information provided by brain imaging and its clinical implications would need to be discovered.[73]

---

[66] *Id*.

[67] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 99.

[68] *Id*. at 99-100.

[69] *Id*. at 102-103.

[70] *Id*. at 111-12.

[71] *Id*. at 113-14.

[72] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 115-117.

[73] *Id*. at 117.

Colin Campbell and Nigel Eastman's essay, *The Neurobiology of Violence: Science and Law*, addresses the use of brain imaging to infer a relationship between biology and violence and how this relationship would implicate criminal offenders' rights to privacy and a fair trial.[74] The authors argue that the admissibility of neuroimaging technology would rest on its relevance to constructs such as the offender's "intent" and "responsibility" if his or her cognitive processes could be linked to antisocial personality disorder.[75] Additionally, Campbell and Eastman debate whether evidence gained through neuroimaging would be reliable enough to be admitted at trial to explain an offender's behavior when the studies themselves are not yet conclusive.[76]

Similarly, in Stephen J. Morse's essay, *Diminished Capacity, Neuroscience, and Just Punishment*, Morse discusses the legal ramifications of using brain imaging to determine whether an offender possesses a "diminished capacity" to understand his offense, and thus should receive a lesser punishment because the punishment's deterrent or moral effects would be lost on this offender.[77] Morse also highlights the ethical concerns regarding the use of brain imaging and its implications on the person's right to privacy.[78] Morse believes that currently brain imaging and neurological examinations of this type have no place in the legal system and they may not have a place in the future if privacy rights are not dealt with prior to their use within the justice system.[79]

Jonathan D. Moreno and Sonya Parashar's essay, *National Security, Brain Imaging, and Privacy*, examines the implications that brain imaging technology may have on national security

---

[74] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 139.

[75] *Id*. at 144.

[76] *Id*. at 145.

[77] *Id*. at 155.

[78] *Id*.

[79] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 170-171.

agencies, specifically whether this technology may be used to aid in interrogation or deception detection.[80] Since September 11, 2001, the United States government has funded grants to neuroscientists interested in using brain imaging and fMRI experiments to determine whether a person with "guilty knowledge" can be identified.[81] The government conducted a study where participants were directed that they would be able to keep a $20 bill if they could fool the study administrators in their neuro-scan.[82] This study resulted in almost 88 percent accuracy in determining truthful statements from lies.[83] While this study suggests that brain imaging may be particularly helpful in the national security context, Moreno and Parashar also delve into the privacy implications the use of this technology would have on possible offenders.[84]

Thus, this book compiles essays from psychiatrists, neuroscientists, ethicists, anthropologists, philosophizers, and lawyers which address the legal and ethical issues, along with the scientific benefits and social concerns, raised by the possible future use of MRI-imaging technology to "read minds" of patients. The book includes various essays which provide insight into these legal and ethical issues regarding the use of neuroimaging to "read minds" but provides no conclusive determination as to whether the use of this technology will ultimately benefit society, whether medically or legally, or will harm society by infringing upon the privacy rights of already marginalized groups of people. While the book is very interesting in its discussions of neuroimaging and the possibility of one day predicting thoughts, it also demonstrates that fully developed brain reading technology is a matter of future rather than

---

[80] I KNOW WHAT YOU'RE THINKING, *supra* note 1, at 173-81.

[81] *Id*. at 178.

[82] *Id*.

[83] *Id*.

[84] *Id*. at 173-81.

present concern, and that many of the arguments for and against its use are merely speculative, as the breadth of the legal and ethical implications of this technology's use are currently unknown.