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NEUROSCIENCE'S NEW TECHNIQUES FOR EVALUATING FUTURE DANGEROUSNESS: ARE WE RETURNING TO LOMBROSO'S BIOLOGICAL CRIMINALITY?

J. W. Looney[*]

I. INTRODUCTION

Cesare Lombroso, the nineteenth century Italian criminologist, proposed a theory of criminality suggesting that criminal behavior was biologically derived and could be predicted by various physiognomic features.[1] This concept was also promoted by Franz Joseph Gall, who proposed that higher mental functions were localized in specific and distinct areas of the brain.[2] Gall believed these regions were marked by features on the cranium (phrenology), as did Lombroso.[3] Lombroso was so confident in his theory that he proposed that those individuals who exhibited the appropriate physical features be irrevocably detained for life.[4]

Modern localization hypotheses (a phrenology of social cognition) attempt to identify specific areas of the brain associated with personality or social psychological constructs.[5] With the advent of neuroimaging technology, noninvasive brain scans have been used in attempts to identify neural mechanisms involved in romantic love,[6] deception detection,[7] racial prefe-

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1. Steven K. Erickson, *Minding Moral Responsibility: The Supreme Court's Recent Mental Health Rulings*, 8 ENGAGE 59, 59 (2007). *See also* Giuseppe Carrá & Francesco Barale, *Cesare Lombroso, M.D., 1835–1909*, 161 AM. J. PSYCHIATRY 624, 624 (2004).

2. Martin Sarter, Gary G. Berntson & John T. Cacioppo, *Brain Imaging and Cognitive Neuroscience: Toward Strong Inference in Attributing Functions to Structure*, 51 AM. PSYCHOLOGIST 13, 15 (1996).

3. *Id.*

4. T. B. Benning, *Neuroimaging Psychopathy: Lessons from Lombroso*, 183 BRIT. J. PSYCHIATRY 563, 563–64 (2003) (citing STEPHEN JAY GOULD, EVER SINCE DARWIN: REFLECTIONS IN NATURAL HISTORY (1977)).

5. John T. Cacioppo, Tyler S. Lorig, Gary G. Berntson, Catherine J. Norris, Edith Rickett & Howard Nusbaum, *Just Because You're Imaging the Brain Doesn't Mean You Can Stop Using Your Head: A Primer and Set of First Principles*, 85 J. PERSONALITY & SOC. PSYCHOL. 650, 654 (2003).

6. *See id.* at 657–58 (reviewing Andreas Bartels & Semir Zeki, *The Neural Basis of Romantic Love*, 11 NEUROREPORT 3829, 3829–34 (2000)).

7. *See* Stacey A. Tovino, *Functional Neuroimaging Information: A Case for Neuro Exceptionalism?*, 34 FLA. ST. U. L. REV. 415, 426–29 (2007). *See also* Joëlle Anne Moreno, *The Future of Neuroimaged Lie Detection and the Law*, 42 AKRON L. REV. 717, 735 (2009).

rences and prejudices,[8] sexual arousal,[9] ethical decision making,[10] and consumer preferences,[11] among others. More relevant, studies related to neural topographies of aggression suggest that some criminal behavior may be correlated with brain abnormalities.[12] This may be, as some commentators suggest, "phrenological folly," or it may indicate that areas of the brain may, at some point, be identified as predicting violent behavior.[13] Lombroso would be proud.

II. PREDICTING FUTURE DANGEROUSNESS

Predictions of criminal behavior, especially future dangerousness, have become an important function of the legal system. Such assessments are important in bail determinations, parole decisions, capital case sentencing, sexually violent predator assessments, involuntary civil commitments, and in sex offender registration.[14]

Dangerousness is a legitimate concern for courts in any pretrial release decision. The federal Bail Reform Act of 1984 specifically authorizes a court to consider the "nature and seriousness of the danger to any person or the community" that would be posed by pretrial release of those charged with a specific category of serious offenses.[15] In upholding this act, Chief Justice Rehnquist, writing for the majority on the United States Supreme Court, found no constitutional barrier to permitting a court, after an adversarial hearing, from finding that no conditions of pretrial release could assure the safety of the community or of any person.[16] The government would have to present clear and convincing evidence of a "demonstrable danger."[17] Chief Justice Rehnquist quoted a prior case to the effect that "'there is nothing inherently unattainable about a prediction of future criminal conduct.'"[18]

In most states a parole board must assess the likelihood of future offenses in evaluating a prisoner for early release. This evaluation often con-

8. Tovino, *supra* note 7, at 431–34.

9. *Id.* at 434–35.

10. *Id.* at 435–37.

11. *Id.* at 437–39.

12. Dean Mobbs, Hakwan C. Lau, Owen D. Jones & Christopher D. Frith, *Law, Responsibility, and the Brain*, 5 PLoS BIOLOGY e103.0693, e103.0695 (2007), *available at* http://www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0050103 [hereinafter Mobbs et al].

13. *Id.*

14. Predictions of future behavior are of consequence to psychiatrists and psychologists, given the growing concern for potential tort liability as illustrated in decisions such as *Tarasoff v. Regents of the Univ. of Cal.*, 551 P.2d 334 (Cal. 1976). The implications of new techniques of neuroscience for such considerations are beyond the scope of this paper.

15. 18 U.S.C. § 3142(g)(4) (2006).

16. United States v. Salerno, 481 U.S. 739, 759 (1987).

17. *Id.* at 750.

18. *Id.* at 752 (quoting Schall v. Martin, 467 U.S. 253, 278 (1984)).

siders dangerousness as one factor in this decision.[19] An important consideration in some states with death penalty provisions is the necessity of a jury finding that a defendant charged with a capital crime is likely to repeat the act. In other states, the likelihood of repetition is at least an "aggravating factor" that the jury may consider. Expert testimony about future dangerousness was approved in *Barefoot v. Estelle*, a 1984 decision of the Supreme Court of the United States.[20]

Some states have enacted sexually violent predator acts that allow for civil commitment of persons found likely to engage in future acts of sexual violence due to a current mental abnormality or personality disorder.[21] Such acts require an assessment of future dangerousness by a court similar to the evaluation required for any other involuntary civil commitment. The added factor for consideration in such cases is proof of a current mental condition that creates a likelihood of such conduct in the future.[22]

Ordinary involuntary civil commitment statutes in most states require a finding by a court that the person is a danger to himself or to others.[23] Once the person is committed, reevaluation is usually left to the medical authorities.[24] However, if the person is committed following criminal proceedings in which the person was found to be either incompetent to stand trial or not guilty by reason of insanity, some states require follow-up hearings by the court to determine if the person should be released.[25] One factor to consider is the likelihood of future dangerousness.[26]

Most states have enacted sex offender registration legislation requiring those convicted of specified sex offenses to register upon release from incarceration or if placed on probation.[27] These registration statutes normally

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19. *See, e.g.*, NEV. REV. STAT. ANN. § 213.1214(1)(c) (1999) (requiring a panel, including a psychologist or psychiatrist, to certify that a prisoner "does not represent a high risk to reoffend," in order to be eligible for parole in Nevada, when convicted of specified offenses); Sultenfuss v. Snow, 35 F.3d 1494, 1506 (11th Cir. 1994) (Clark, J., dissenting) (noting that Georgia's State Board of Pardons and Paroles uses a "Parole Success Likelihood Score," which was developed using large samples of parolees and considers prior and current incarceration for violent offenses).

20. 463 U.S. 880, 900–01 (1984), *superseded by statute on other grounds*, 28 U.S.C. § 2253(c)(2) (2000), *as recognized in* Slack v. McDaniel, 529 U.S. 473, 474–75 (2000).

21. *See, e.g.*, KAN. STAT. ANN. § 59-29a01 et seq. (Furse 2005). This legislation was found to be constitutional in *Kansas v. Hendricks*, 521 U.S. 346 (1997). At least fifteen other states and the District of Columbia have similar provisions. *See* Erica Beecher-Monas & Edgar Garcia-Rill, *Genetic Predictions of Future Dangerousness: Is There a Blueprint for Violence?*, 69 LAW & CONTEMP. PROBS. 301, 309 n.40 (2006).

22. Beecher-Monas & Garcia-Rill, *supra* note 21, at 308–09.

23. *See, e.g.*, ARK. CODE ANN. §§ 20-47-207, -210 (LEXIS Repl. 2001).

24. *See id.* § 20-47-207; *id.* § 5-2-310 (LEXIS Repl. 2006).

25. *See id.* § 5-2-310.

26. *See id.* §§ 20-47-207, -210; *id.* § 5-2-310.

27. *See id.* § 12-12-906 (LEXIS Repl. 2003); N.J. STAT. ANN. § 2C:7-2 (West 2005). This registration requirement is known informally as "Megan's Law" in New Jersey and was enacted on the federal level by the Jacob Wetterling Crimes Against Children and Sexually Violent Offender Act in 1994. *See* Pub. L. No. 103-322, 108 Stat. 2038 (codified as amended

require a risk assessment to determine the exact registration requirements.[28] This risk assessment evaluates the likelihood of reoffending.[29]

The proliferation of these statutes illustrates our criminal justice system's subtle shift in focus away from punishment and onto prevention.[30] Although this legislation has passed constitutional muster when tested, the difficulty of accurately predicting future dangerousness has raised the question of whether this statutory focus is based on a dubious premise. For this reason, a claim of violation of due process might provide for a successful challenge in the future.[31]

III. DIFFICULTIES IN ASSESSING FUTURE DANGEROUSNESS

In 1983, the United States Supreme Court, in the case of *Barefoot v. Estelle*, considered future dangerousness as an aggravating factor in capital cases.[32] Writing in dissent, Justice Blackmun expressed concern about the ability of mental health professionals to reliably predict long-term future dangerousness.[33] He cited the amicus brief of the American Psychiatric Association that suggested such predictions were wrong two out of three times.[34] At that time such predictions were based on clinical assessments.[35] In the intervening years, actuarial or statistical methods have emerged which purport to be much more accurate. These methods evaluate a number of risk factors which are scored to yield an objective measure and are claimed by some researchers to be reliable predictors of future dangerousness.[36] Other researchers believe these methods are only "moderately predictive."[37]

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at 42 U.S.C. § 14071 (2006)).

28. *See* ARK. CODE ANN. § 12-12-906.

29. *See id.* § 12-12-913(c)(2)(A) (requiring that "factors relevant to a sex offender's future dangerousness" be identified in the assessment); N. J. STAT. ANN. §§ 2C:7-1 to -11.

30. *See* Paul H. Robinson, *Punishing Dangerousness: Cloaking Preventive Detention as Criminal Justice*, 114 HARV. L. REV. 1429, 1429 (2001). *See also* Christopher Slobogin, *A Jurisprudence of Dangerousness*, 98 NW. U. L. REV. 1, 2–5 (2003) (providing case examples).

31. *See* Stephen J. Morse, *Preventive Confinement of Dangerous Offenders*, 32 J. L. MED. & ETHICS 56, 66–67 (2004). *See also* Eric S. Janus, *Closing Pandora's Box: Sexual Predators and the Politics of Sexual Violence*, 34 SETON HALL L. REV. 1233, 1233 (2004) (presenting specific examples).

32. Barefoot v. Estelle, 463 U.S. 880 (1983).

33. *Id.* at 920 (Blackmun, J., dissenting).

34. *Id.* Justice White, writing for the majority, dismissed this concern and indicated that juries could competently evaluate any shortcomings of expert testimony. *Id.* at 899–903.

35. *See id.*

36. *See generally* JOHN MONAHAN et al., RETHINKING RISK ASSESSMENT: THE MACARTHUR STUDY OF MENTAL DISORDER AND VIOLENCE (2001) (addressing how clinical tools can help anticipate violent behavior).

37. *See* Beecher-Monas & Garcia-Rill, *supra* note 21, at 302 n.5. *See also* O. Carter Snead, *Neuroimaging and Capital Punishment*, 19 THE NEW ATLANTIS 35, 38–39 (2008) ("The use of cognitive neuroimaging data to diagnose psychological conditions relies entire-

Thomas R. Litwack reviewed the literature on the relative merits of clinical and actuarial assessments and concluded that the latest research does not demonstrate that actuarial assessments are superior, especially with regard to dangerousness.[38] He points out that such assessments are frequently used to determine whether confinement should occur or continue.[39] This makes the clinical determination (or judicial determination) a "judgment" as to whether the patient poses a risk of harm to himself or others within a future time span.[40] However, it is not a prediction of violence.[41] This point is illustrated by *Jones v. United States*, where the Court found that confinement could be justified on proof of something less than the likelihood of a violent act.[42] A nonviolent act of attempted theft (a finding of dangerousness) could justify confinement.[43]

Litwack points out that clinical practitioners may consider available actuarial data if they are relevant and meaningful.[44] Likewise, actuarial instruments are based on clinical assessment of clinical variables (i.e., psychiatric diagnosis).[45] He concludes that actuarial methods are not yet superior to clinical assessments.[46]

Because the "unaided abilities of mental health professionals to perform [the] task [of violence risk assessment] are modest at best," the MacArthur Violence Risk Assessment Study helps evaluate risk factors for violence and develop a risk assessment tool for use by clinicians.[47] Using 106 risk factors commonly available in hospital records or clinical assessments, the MacArthur Study places its patients into one of five risk classes.[48] There was a seventy-six percent probability of violence within twenty weeks of discharge for the highest risk group, and a one percent probability for the lowest risk group.[49] The approach is claimed to be highly accurate (compared to other actuarial methods), and it involves a complex computational model for which software has been developed.[50]

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ly on the soundness of the diagnostic criteria—which, given the absence of specific biological markers for any psychiatric disorder, can be hotly contested.").

38. *See* Thomas R. Litwack, *Actuarial Versus Clinical Assessments of Dangerousness*, 7 PSYCHOL. PUB. POL'Y & L. 409, 409 (2001).

39. *See id.* at 425.

40. *See id.*

41. *See id.*

42. 463 U.S. 354, 369 (1983).

43. *Id.* at 380.

44. Litwack, *supra* note 38, at 412–13.

45. *Id.* at 412–13.

46. *Id.* at 437–38.

47. The MacArthur Research Network, The MacArthur Violence Risk Assessment Study: Executive Summary, April 2001, http://www.macarthur.virginia.edu/risk.html (last visited on Mar. 9, 2010).

48. *Id.*

49. *Id.*

50. *Id.*

One criticism of these risk-assessment approaches, regardless of accuracy, is that they are based on group data and not on an individualized assessment of dangerousness.[51] Although risk assessments based on group data "may help identify populations that are likely to demonstrate an elevated recidivism rate and the judgment of dangerousness may thus be informed by this information, the dangerousness judgment cannot be reduced to a score on an assessment device or to the diagnostic assessment of an expert."[52] Nor do these assessments address the normative component of the dangerousness judgment—the "moral inquiry that determines what particular threshold of risk justifies a particular legal consequence."[53]

IV. EMERGING TECHNOLOGY

In spite of the confidence expressed in recent studies that the psychiatric and psychological communities can accurately predict future dangerousness, the search for new tools to aid in that endeavor continues. Recently, new developments in behavioral genetics have raised the question of whether more accurate predictions of future dangerousness might be revealed in genetic codes.[54] Research on the "biology of violence" suggests that genes may influence behavior.[55] But, as stated by Beecher-Monas and Garcia-Rill, "[a]ll behavior is a complex intermingling of nature and nurture."[56] Behavior also affects genes.[57]

Beecher-Monas and Garcia-Rill advise caution in reading too much into the conclusions of "Neo-Darwinian hardliners," who would explain flaws of human behavior in purely genetic terms.[58] They point out that, "[u]nfortunately, another easy answer to the problem of crime control—finding a genetic basis for executing or locking up a violent individual and throwing away the key—is similarly unsupported by evidence,"[59] and their research findings forcibly conclude that "[g]enetic determinism is simply unfounded when it comes to complex behavior."[60]

The latest developments are from neuroscience. Functional Magnetic Resonance Imaging (fMRI) is capable of measuring brain function and has been proposed as a technique for studying everything from lie detection, sexual arousal and ethical decision making, to racial preferences and preju-

51. *See* Aletha M. Claussen-Schulz, Marc W. Pearce & Robert F. Schopp, *Dangerousness, Risk Assessment, and Capital Sentencing*, 10 PSYCHOL. PUB. POL'Y & L. 471, 484 (2000).

52. *Id.*

53. *Id.*

54. Beecher-Monas & Garcia-Rill, *supra* note 21, at 303–04.

55. *Id.* at 302–03.

56. *Id.* at 324.

57. *Id.* at 333–34.

58. *Id.* at 338–39.

59. *Id.* at 340.

60. Beecher-Monas & Garcia-Rill, *supra* note 21, at 340.

dices.[61] A second type of technology in development is the so-called "brain fingerprinting" technique, which uses electroencephalography (EEG) to record electrical signals from the brain.[62] A third type is the computed tomography (CT) scans, which depict a difference in density of various types of brain tissue.[63]

While it does not seem out of the ordinary to use such technology to evaluate brain structure and, to some degree, brain function, it is less likely that such technology will be used in the immediate future to explain behavior or to predict future behavior.[64] Nevertheless, such technology could be used in the types of proceedings outlined above—to predict future dangerousness.[65] In a dramatic expression of faith in such technology, the British Home Secretary indicated in 2007 that convicted pedophiles would be required to undergo brain scans by MRI to aid in assessing the likelihood of reoffending.[66] Such potential uses are based on the premise that "some kinds of criminal behavior are associated with dysfunction of different regions of the brain."[67] Studies demonstrate that violent individuals and convicted criminals do have prefrontal cortex abnormalities and that other areas of the brain may have dysfunctions as well.[68] Neuroimaging may reveal these dysfunctions.

> To be clear, there is at present no reason to believe that all criminal behaviours, or indeed even all violent criminal behaviours, are the result of organically dysfunctional brains. However, there is ample evidence to suggest that some kinds of dysfunction are likely to increase the probability of some kinds of behaviours that society labels as criminal.[69]

One of the frequently cited studies was performed by Raine, Lencz, Bihrle, LaCasse, and Colletti, using magnetic resonance imaging to study brains of subjects identified with antisocial personality disorder (APD).[70]

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61. Jane Campbell Moriarty, *Flickering Admissibility: Neuroimaging Evidence in the U.S. Courts*, 26 BEHAV. SCI. & L. 29, 30–35 (2008).

62. *Id.* at 31.

63. *Id.*

64. *See id.* at 47–49 (explaining that the images portrayed are reliable and that the problem is in the *meaning and interpretations* of the images).

65. *See* Mark Pettit, Jr., *FMRI and BF Meet FRE: Brain Imaging and the Federal Rules of Evidence*, 33 AM. J.L. & MED. 319, 322 (2007). The author suggests such uses may be offered just as they might be used to suggest a person is not responsible for his or her actions, for example, in an insanity defense. *Id.* at 334–36.

66. Neil K. Aggarwal, *Neuroimaging, Culture and Forensic Psychiatry*, 37 J. AM. ACAD. PSYCHIATRY & L. 239, 239 (2009).

67. *See* Mobbs et al., *supra* note 12, at e103.0695.

68. *Id.* at e103.0695–e103.0696 (citing studies indicating that alternations in blood flow have been noted by neuroscientists in the frontal lobes of violent individuals and convicted criminals).

69. *Id.* at e103.0696.

70. Adrian Raine, Todd Lencz, Susan Bihrle, Lori LaCasse & Patrick Colletti, *Reduced Prefrontal Gray Matter Volume and Reduced Autonomic Activity in Antisocial Personality Disorder*, 57 ARCH. GEN. PSYCHIATRY 119, 119 (2000).

Raine and the others observed a reduction in prefrontal gray matter volume in patients with APD, suggesting that the volume deficit may be related to antisocial, psychotic behavior.[71] Similar studies of violent offenders indicate dysfunction in the frontal cortex.[72] Furthermore, neuroimaging studies confirm that amygdala dysfunction is associated with psychopathy in violent offenders.[73]

These attempts to identify the neuropsychiatric basis for violent behavior have caused some to question the relevance of these studies to the issue of criminal responsibility.[74] Criminal responsibility is a legal concept, but understanding the nature of causes of psychiatric-based disabilities can "inform us about the proportionate role that a biological deficit or a person's choices may have had in generating a behavior."[75] The new technology of fMRI may offer a path to applied forensic imaging in the future.[76]

V. LEGAL QUESTIONS

The use of this emerging technology for the evaluation of future dangerousness for any of the purposes outlined above raises a number of legal questions. First, there is the basic issue of whether the present state of the science can meet the standards for admissibility in judicial proceedings. Second, Fifth Amendment, self-incrimination issues might be raised if prosecutors use these techniques in a criminal proceeding. Third, questions as to whether a reasonable search was conducted may arise if these techniques are deemed to constitute a Fourth Amendment search. Beyond these basic legal considerations, there are right-to-privacy issues that arise when an individual is held responsible for thoughts instead of actions.[77]

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71. *Id.* at 123.

72. James R. Blair, *Neurobiological Basis of Pyschopathy*, 182 BRIT. J. PSYCHIATRY 5, 5 (2003).

73. *Id.*

74. *See* J. Arturo Silva, *The Relevance of Neuroscience to Forensic Psychiatry*, 35 J. AM. ACAD. PSYCHIATRY & L. 6, 6–9 (2007) (outlining the views of Michael Gazzaniga, a neuroscientist, and Stephen Morse, a legal scholar, on the subject of neuroscience's relevance to legal doctrine).

75. *Id.* at 7.

76. Daniel D. Langleben & Frank M. Dattilio, *Commentary: The Future of Forensic Functional Brain Imaging*, 36 J. AM. ACAD. PSYCHIATRY & L. 502, 502–04 (2008).

77. Stacey A. Tovino, *Current in Contemporary Ethics: The Confidentiality and Privacy Implications of Functional Magnetic Resonance Imaging*, 33 J.L. MED. & ETHICS 844, 847 (2005).

A. Evidentiary Problems

Generally, courts have been willing to accept future dangerousness testimony based on clinical judgment alone. This raises questions as to whether this relaxed approach, without any judicial inquiry as to scientific validity, meets the evidentiary standards of *Daubert v. Merrell Dow Pharmaceuticals, Inc*,[78] informally known as the *Daubert* test.[79] Beecher-Monas and Garcia-Rill argue that it cannot meet those standards because it is "entirely subjective, ungrounded in empirical data, and therefore unfalsifiable; has been overwhelmingly castigated by the profession, and thus fails peer review, publication, and general acceptance; has no standards for its methodology; and cannot meet the requirements for an acceptable error rate."[80] They argue that even actuarial predictions, while more accurate, are tenuous as a basis for depriving life and liberty.[81]

The question arises as to whether brain-imaging technology, which on the surface gives an imprimatur of "scientific," would improve the accuracy of future dangerousness predictions and more nearly meet the *Daubert* standards.[82] The current state of brain-imaging technology for purposes of predicting future dangerousness would likely fail either the *Daubert* test, or the much earlier and more permissive test for admissibility of evidence established in *Frye v. United States*,[83] informally known as the *Frye* test.[84] The technology has only been tested in laboratory conditions, and there is no standardization in the testing techniques.[85] Moreover, error rates have not been established,[86] and it has yet to be proven that the technology has individualized reliability.[87] Overall, there are significant doubts as to the general acceptance of brain-imaging technology.[88] Not the least of the admissibility

78. 509 U.S. 579 (1993).

79. *See id.* at 589–95. In order for expert scientific testimony to pass the *Daubert* test and be admitted into evidence, the testimony must be considered (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. *Id.* at 592–93. The reasoning or methodology underlying the testimony must be scientifically valid, and capable of being applied to the facts in issue. *Id.* at 593. Two factors to consider are (1) whether the scientific theory or technique can be tested, and (2) whether it has been subjected to peer review and publication. *Id.* at 593.

80. Beecher-Monas & Garcia-Rill, *supra* note 21, at 307 n.26.

81. Erica Beecher-Monas & Edgar Garcia-Rill, *Danger at the Edge of Chaos: Predicting Violent Behavior in a Post-*Daubert *World*, 24 CARDOZO L. REV. 1845, 1900–01 (2003).

82. Moreno, *supra* note 7, at 735–37 (citing studies that suggest that brain scans and cognitive neuroscience explanations enhance perceived validity).

83. 293 F. 1013 (D.C. Cir. 1923), *superseded by* FED. R. EVID. 702.

84. *Id.* at 1014 (requiring that the admissibility of evidence obtained through a scientific technique or process depends upon that technique or process having general acceptance in the relevant scientific community).

85. Joseph R. Simpson, *Functional MRI Lie Detection: Too Good to be True?*, 36 J. AM. ACAD. PSYCHIATRY & L. 491, 495 (2008).

86. *See* Michael S. Pardo, *Neuroscience Evidence, Legal Culture, and Criminal Procedure*, 33 AM. J. CRIM. L. 301, 319–21 (2006); Moriarty, *supra* note 61, at 46–47. *But see* Pettit, *supra* note 65, at 333–34.

87. *See* Pardo, *supra* note 86, at 319.

88. *See* Moriarty, *supra* note 61, at 46–47. *But see* Pardo, *supra* note 86, 321; Pettit, Jr.,

problems is the fact that the technology has not been shown to have individualized reliability.[89]

One of the difficulties with evidence involving neuroimaging is that any evidentiary use involves the interpretation of the images themselves, as well as inferences as to the psychological status of the individual.[90] The neuroimaging expert need not be, and frequently would not be, a psychiatrist. Yet, psychiatric expertise would be necessary for any diagnostic inferences that might be drawn from the brain images. As one scholar points out, "There is cause for concern when a psychiatrist uses an image of a statistically 'abnormal' brain to draw conclusions about a defendant's sanity, criminal responsibility or dangerousness."[91] The imaging evidence may be unduly persuasive in spite of the lack of scientific support for its use to diagnose cognitive or behavioral impairments.[92] As a result, some psychiatric testimony will always be necessary to tie the physiological status of the brain to a mental disorder. Thus, the court will have to evaluate both the validity of the particular brain imaging evidence offered ("technical validity") and the expert's inference ("inferential validity").

As to the technical validity, any evaluation by the court is not likely to be difficult or controversial. The ability of the technology to depict what it purports to depict is already accepted.[93] The more difficult evidentiary issue lies with the inferential validity, given the general skepticism toward psychiatric opinion testimony.[94] Courts will tend to exclude an expert opinion if they find an "unfounded inferential leap" from the image to the behavior.[95]

Kulynych proposes adoption of Walker and Monahan's "social framework" approach to provide a context for such "soft science."[96] The idea is that general conclusions from scientific research may be useful in determin-

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supra note 65, at 333–34.

89. Pardo, *supra* note 86, at 319.

90. Jennifer Kulynych, *Psychiatric Neuroimaging Evidence: A High-Tech Crystal Ball?*, 49 STAN. L. REV. 1249, 1259–64 (1997).

91. *Id.* at 1251.

92. *See* Helen S. Mayberg, *Functional Brain Scans as Evidence in Court: An Argument for Caution*, 33 J. NUCLEAR MED. 18N, 18N (1992); C. Robert Showalter, *Distinguishing Science from Pseudo-Science in Psychiatry: Expert Testimony in the Post-*Daubert *Era*, 2 VA. J. SOC. POL'Y & L. 211, 224–27 (1995).

93. Kulynych, *supra* note 90, at 1265 (suggesting that this evaluation is similar to that for other areas of scientific evidence and the model is set out in FEDERAL JUDICIAL CENTER, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE (2000)).

94. *See* Edmund H. Mantell, *A Modest Proposal To Dress the Emperor: Psychiatric and Psychological Opinion in the Courts*, 4 WIDENER J. PUB. L. 53, 75–78 (1994) (suggesting that much clinical testimony is unreliable and inadmissible under the *Daubert* test).

95. Moriarty, *supra* note 61, at 43.

96. Kulynych, *supra* note 90, at 1267 (citing Laurens Walker and John Monahan, *Social Frameworks: A New Use of Social Science in Law*, 73 VA. L. REV. 559 (1987)).

ing factual issues in a specific case.[97] The concept seems to fit here because clinical opinion testimony must "draw from some sort of data base" to render a diagnosis or opinion.[98] Kulynych notes that "[i]n each case, the expert witness attempts to extrapolate from a general corpus of research findings to a prediction about the behavior or cognitive capacity of a particular individual."[99]

B. Fifth Amendment Issues

Neuroscientific evidence gathered for the purpose of predicting future dangerousness may run counter to the Fifth Amendment privilege against self-incrimination. The privilege may prohibit forcing individuals to submit to providing compelled and incriminating testimony.[100] Certainly, some of the uses of the technology outlined above would satisfy the Fifth Amendment privilege. Pardo concludes: "Namely, it would apply when the government compels the tests in order to obtain evidence of the incriminating informational content of subjects' propositional attitudes."[101] What is not clear, however, is whether the information obtained directly from the brain is an "act" of communication or a "product" of communication.[102] The distinction may be of some importance in determining whether the privilege applies, given the Supreme Court's holding in *Schmerber v. California*, involving blood samples.[103] The distinction in *Schmerber* was between "physical" evidence—such as blood tests, which does not raise the issue of the Fifth Amendment privilege—and "testimonial" evidence, which does raise the issue.[104] Physical evidence may be compelled; testimonial evidence may not be.[105] In subsequent cases, the Supreme Court focused on the process by which the evidence was compelled, as opposed to the product of the information revealed.[106] For example, in *Pennsylvania v. Muniz*, in an effort to clarify the distinction, the Court referred back to *Schmerber* and the passive role the defendant played in providing the evidence.[107] In the context of neuroscience evidence, the question arises as to whether an fMRI or EEG is physical or testimonial.[108] Brain imaging measures brain activity that cannot be controlled by the subject.[109] In that sense, the process fits the

97. *Id.*
98. *Id.* at 1268.
99. *Id.*
100. Pardo, *supra* note 86, at 328.
101. *Id.* at 331.
102. *Id.* at 329–33.
103. 384 U.S. 757 (1966).
104. *Id.* at 764. *See also* Dov Fox, *The Right to Silence as Protecting Mental Control*, 42 AKRON L. REV. 763, 779–89 (2009); Sarah E. Stoller & Paul Root Wolpe, *Emerging Neurotechnologies for Lie Detection and the Fifth Amendment*, 33 AM. J.L. & MED. 359, 368–69 (2007).
105. Fox, *supra* note 104, at 780–81.
106. *Id.* at 786.
107. 496 U.S. 582, 592–93 (1990).
108. *See* Stoller & Wolpe, *supra* note 104, at 367.
109. *See id.* at 368–69.

mold of physical evidence.[110] But the extortion of incriminatory thoughts from the brain would seem to make the evidence testimonial, which would then violate the Fifth Amendment.[111]

C. Fourth Amendment Issues

Fourth Amendment issues are also implicated in the use of neuroimaging tests for at least some of the future dangerousness assessments. One can argue that everyone has a "reasonable expectation of privacy" to brain details. Compelling such tests would seem to be a "search" under current interpretations of the Fourth Amendment.[112] Probable cause requirements would be applicable. While the government might not be able to use the techniques as "mental fishing expeditions,"[113] such tests could be compelled without violating Fourth Amendment restrictions provided that probable cause exists to believe the test would reveal evidence and that a warrant is obtained (or a warrant exception is applicable).[114]

D. Privacy Issues

The use of technology for predicting of future dangerousness implicates privacy issues. Tovino poses the question as follows: "Finally, and regardless of the context, do all individuals have the right to cognitive privacy, or the privacy of their own thoughts? Can state action that punishes an individual or holds an individual responsible for thoughts, but not actions, violate the individual's cognitive privacy?"[115] This latter concern has been highlighted in the popular press with questions of how privacy could be threatened by use of this technology.[116] The "fundamental liberty interest" recognized by the Supreme Court as residing in the Due Process Clause has included a right of personal privacy. Surely, this could include "security from unwanted government intrusion into the mind."[117]

Henry T. Greely raises the question of whether the "forced intrusion into one's mind" might be violative of due process.[118] He raises the issue

110. *See id.*
111. *See id.*
112. Pardo, *supra* note 86, at 325.
113. *Id.* at 327.
114. *Id.* at 325–26.
115. Tovino, *supra* note 77, at 848.
116. *See generally* Jeffrey Rosen, *The Brain on the Stand: How Neuroscience is Transforming the Legal System*, N.Y. TIMES, Mar. 11, 2007, at 50.
117. Sean Kevin Thompson, *The Legality of the Use of Psychiatric Neuroimaging in Intelligence Interrogation*, 90 CORNELL L. REV. 1601, 1633–34 (2005).
118. Henry T. Greely, *Prediction, Litigation, Privacy, and Property: Some Possible Legal and Social Implications of Advances in Neuroscience*, in NEUROSCIENCE AND THE LAW:

beyond the litigation context by speculating about a remote screening device which would require no obvious intrusion.[119] Should such a device be perfected, the privacy issues would be even more significant than those arising from use by consent. While this invasion of "self" raises privacy concerns, Mobbs, Lau, Jones and Frith, remind us that:

> [F]unctional brain imaging is not mind reading. Not only can it not tell us what or how a person was thinking at the time of a legally relevant act, it also cannot tell us with reliable accuracy what a person is thinking while being scanned. In this respect, brain imaging can only provide post hoc explanations.[120]

As Michael S. Gazzaniga emphasizes: "Neuroscience reads brains, not minds." [121]

VI. CONCLUSION

The future of the science of brain imaging is unlimited. As neuroscience develops and the related technology is perfected, calls for its use to predict future behavior will increase. This poses what has been called a "challenge to one of the central principles of Anglo-American jurisprudence: namely, that people are responsible for their behavior, not their proclivities—for what they do, not what they think."[122] A further caveat is offered by Abigail A. Baird:

> While human neuroscience has a great deal to offer with regard to the likely causes of human behavior, it is not yet capable of predicting—or for that matter, explaining—any individual's specific intentions or behaviors. It is tempting to draw great truth from brightly colored pictures of brain activity (which are actually statistical maps of the probability of activity in those regions, not the actual activity), but it would be wrong to do so with regard to the actions of an individual.[123]

Stephen J. Morse, only partially in jest, has characterized those who make moral and legal claims about the relationship of new neuroscience to criminal responsibility as suffering from "Brain Overclaim Syndrome."[124] He is critical of the "[m]onolithic brain explanation of complex behavior"

BRAIN, MIND AND THE SCALES OF JUSTICE 114, 146 (Brent Garland ed., 2004) (drawing a comparison to stomach pumping in *Rochin v. California*, 342 U. S. 165 (1952)).

119. *Id.* at 146–47.

120. Mobbs et al., *supra* note 12, at e103.0698.

121. MICHAEL GAZZANIGA, THE ETHICAL BRAIN 119 (2005).

122. Rosen, *supra* note 116, at 82.

123. Abigail A. Baird, *The Developmental Neuroscience of Criminal Behavior*, *in* THE IMPACT OF BEHAVIORAL SCIENCES ON CRIMINAL LAW 81, 121 (Nita A. Farahany ed., 2009).

124. Stephen J. Morse, *Brain Overclaim Syndrome and Criminal Responsibility: A Diagnostic Note*, 3 OHIO ST. J. CRIM. L. 397, 397 (2006).

and suggests that any correlation between brain states and the criteria for responsibility is a fantasy.[125]

Morse warns that if causation (i.e., some abnormality detected by neuroscience techniques) is to be regarded as *per se* an excusing condition, "no one could ever be responsible for anything."[126] Furthermore, if neuroscience is to be used in criminal responsibility assessments for exculpatory purposes, it could as easily be used to inculpate.

The latter point is illustrated by studies that show that the second most powerful aggravating factor (next to the crime itself) for juries in death penalty cases is evidence of future dangerousness.[127] Taken to the extreme, the use of neuroscience techniques to aid in predicting future criminal behavior, in these or any of the procedures where future dangerousness is an issue, could vindicate the nineteenth century Italian criminologist, Lombroso.

125. *Id.* at 404–05.

126. Stephen J. Morse, *The Non-Problem of Free Will in Forensic Psychiatry and Psychology*, 25 BEHAV. SCI. L. 203, 216 (2007).

127. *See* Snead, *supra* note 37, at 57.