

# WHAT'S ON YOUR MIND? NEUROSCIENCE EVIDENCE AND ITS RELIABILITY THROUGHOUT CRIMINAL PROCEEDINGS

*Andrew B. Wobser*

## INTRODUCTION

What is responsible for human behavior: an individual or their brain? Many questions about human behavior have persisted throughout human history, including how behavior occurs and whether humans are in control of this behavior. Despite intense and extensive study, no definitive answers have arisen, nor are there signs of hope these questions will ever be answered.

Neuroscience is one of the most prevalent fields seeking to understand and explain human behavior. Today's technology makes it easier than ever to study the human brain, the organ responsible for the functionality of the human body.

In seeking to understand human behavior, society is also faced with the question of how to control behavior. Primarily, how society can protect itself against "bad" behavior. The criminal justice system is in place for this very purpose. Criminal law dictates what behavior is undesirable in society and sets out means of punishing individuals that participate in such behavior, all with the goal of protecting society.

Both neuroscience and criminal law are centered around human behavior, so it is no wonder that these fields have intersected. The legal system has become increasingly accepting of neuroscience evidence within the courtroom, primarily with regard to explaining why defendants committed an offense. Defendants specifically have presented such evidence in hopes of excusing their own behavior or lessening their responsibility for the offense by claiming they were not in control of their actions.

While this intersection may seem to be an obvious next step for both fields, there is reason for caution. While scientific fields of study and legal theory may overlap, they are still two completely separate entities and may not be entirely compatible with one another. As these fields continue to overlap, guidance should be provided as to how and when neuroscience evidence can and should be applied to criminal proceedings.

Part I of this note provides a brief explanation of the basic goals of neuroscience and certain methodology used in the study of the brain. The intersection of neuroscience and law is also explored, explaining how neuroscience has been used in the courts as of this point in time. Part II delves into current evidentiary rules courts are obligated to follow when presented with expert evidence and how these rules apply to neuroscience specifically. This section also describes certain concerns among the neuroscientific and legal community

regarding jurors' perceptions of neuroscience evidence. Part III then surveys the use of neuroscience evidence by criminal defendants at various stages of the criminal process and how such evidence often varies in reliability depending on what the evidence is presented to show.

I. CRIMINAL DEFENDANTS UTILIZE NEUROSCIENCE EVIDENCE IN VARIOUS STAGES OF PROCEEDINGS

A. *The Purpose of Neuroscience is to Study the Brain and Determine How it Impacts Human Behavior.*

The goal of neuroscience, put simply, is to understand human behavior by studying the brain and how it functions.<sup>1</sup> “[Neuroscience] gives us an insight into the mental processes that underpin human behavior . . .”<sup>2</sup> Neuroscience is key to understanding the “elusive relationship between brain and behavior.”<sup>3</sup> The science has a deep, complex, and often unsavory history that well exceeds the bounds of this Note.<sup>4</sup> However, advances in neuroscience technology over the years have legitimized the science, affording it more reliability and leading to more possibilities of how such science may impact other facets of society.<sup>5</sup>

A fascinating development in the advancement of neuroscience is whether neuroscience is capable of showing whether humans have “free will”; that is, are individuals actually responsible for their actions or is every action predetermined?<sup>6</sup> The answer to such a question could pose serious implications as to how our legal system operates and whether drastic change to the legal system is necessary to accommodate what neuroscience tells us about human behavior. An in-depth analysis of this argument would far exceed the scope of this Note and a complete understanding of each side is not crucial to understanding the facets of neuroscience explored herein. However, a brief description of the arguments can help understand a couple of crucial perspectives as to whether neuroscience has a place within the legal system and what it could mean regarding our understanding of human behavior.

In one camp is the argument that humans do not have free will and are thus not responsible for their actions.<sup>7</sup> This side argues that while legal doctrine in place

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1. Arian Petoft, *Neurolaw: A Brief Introduction*, 14(1) IRANIAN J. OF NEUROLOGY 53, 54 (2015).

2. *Id.*

3. Lyn M. Gaudet & Gary E. Marchant, *Under the Radar: Neuroimaging Evidence in the Criminal Courtroom*, 64 DRAKE L. REV. 577, 578 (2016).

4. See generally Amanda C. Pustilnik, *Violence on the Brain: A Critique of Neuroscience in Criminal Law*, 44 WAKE L. REV. 183 (2009) (explores the history of neuroscience and impacts discusses application of the science to determinations regarding “violent” individuals).

5. Joseph J. Avery, *Picking and Choosing: Inconsistent Use of Neuroscientific Legal Evidence*, 81 ALB. L. REV. 941, 942 (2018).

6. Adam J. Kolber, *Will There be a Neurolaw Revolution*, 89 IND. L. J. 807, 808 (2014).

7. Joshua Greene & Jonathan Cohen, *For the Law, Neuroscience Changes Nothing and Everything*, 359 PHIL. TRANSACTIONS ROYAL SOC'Y LONDON B 1775, 1776 (2004). This article

may still persist, people's applications and views of these doctrines will change, primarily in terms of punishment.<sup>8</sup> Punishment will shift away from retribution and towards consequentialism and promoting future welfare versus punishing an individual for their actions which they could not control.<sup>9</sup> "[W]ith the rejection of common-sense conceptions of free will comes the rejection of retributivism and an ensuing shift towards a consequentialist approach to punishment, i.e. one aimed at promoting future welfare rather than meting out just deserts."<sup>10</sup>

Meanwhile, the other side of the debate views neuroscience as heavily promoting the idea of free will.<sup>11</sup> This side argues that the legal system should not be altered by the advancement of neuroscience and should remain intact.<sup>12</sup> "Brains do not commit crimes; people commit crimes. This conclusion should be self-evident, but, infected and inflamed by stunning advances in our understanding of the brain, advocates all too often make moral and legal claims that the new neuroscience does not entail and cannot sustain."<sup>13</sup> Overall, as neuroscience technology develops, the way people view this type of evidence must be carefully applied to the legal field as to not confuse the goals of the law; neuroscience technology may place great strain on the legal field as we currently know it.<sup>14</sup>

Legal scholar Adam Kolber summarizes the arguments as such:

The central debate in the field of neurolaw has focused on two claims. On the one hand, Joshua Greene and Jonathan Cohen argue that we do not have free will. We are just mechanisms in the universe subject to the laws of nature who should not be held morally responsible for our actions. They predict that advances in neuroscience will lead to a revolution in which the law stops deeming people responsible for their conduct. On the other hand, Stephen Morse argues that we have free will because moral responsibility is compatible with our mechanistic nature. He argues that the kind of advances in neuroscience that Greene and Cohen envision will not and should not affect the law.<sup>15</sup>

When discussing neuroscience, there is no clear answer to the debate as to whether it shows the existence or lack of free will in human beings.<sup>16</sup> In fact, there may

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argues neuroscience will alter the way individuals view the operation of our current legal system, claiming that punishment will become less retributive and more progressive.

8. *Id.*

9. *Id.*

10. *Id.*

11. Stephen J. Morse, *Brain Overclaim Syndrome and Criminal Responsibility: A Diagnostic Note*, 13 OHIO ST. J. CRIM. L. 397, 402 (2006).

12. *Id.* at 397.

13. *Id.* at 412.

14. *Id.*

15. Kolber, *supra* note 6, at 808.

16. Bahar Gholipour, *A Famous Argument Against Free Will Has Been Debunked*, THE ATLANTIC (Sept. 10, 2019), <https://www.theatlantic.com/health/archive/2019/09/free-will-bereitschaftspotential/597736/>.

never be a clear answer.<sup>17</sup> Even if one arises, such an answer may not be accepted throughout the scientific community. As it stands, this debate should be kept in mind when considering the application of neuroscience evidence to the courts and its potential implications on the legal system.

One of the most prominent features of neuroscientific study is the ability of scientists to study brain activity through noninvasive means, most significantly in the form of brain scans.<sup>18</sup> Brain-imaging technology has application toward “detecting memory and deception; resting-state functional connectivity analysis of impulsivity in juveniles; risk and information processing in addicts; the effects of neuroimaging evidence on juror decision-making; the cognitive processes supporting third-party legal decision-making; and improved methods for making accurate, individualized assessments of psychopathy.”<sup>19</sup> Much like the history of neuroscience, delving into the various neuroscientific technologies and testing available would take up far too much of this Note. However, it may be helpful to know that the most prominent techniques can be described as either structural or functional.<sup>20</sup> “Structural techniques capture the physical structure of the brain, whereas functional brain scans measure various changes in the brain . . . that are believed to correlate to brain processes.”<sup>21</sup>

*B. Neuroscience Evidence Has Found Increasing Acceptance Within the Courtroom in Both Civil and Criminal Contexts.*

Neuroscience and law have bridged to form a new area of study and scholarship joining scientific and legal scholars: neurolaw.<sup>22</sup> The development of neuroscience and law is not all too surprising; the justice system often relies on determining the mental operations of parties involved and neuroscience seeks to explain those operations.<sup>23</sup> Proponents of neurolaw believe the application of neuroscience to the law will provide society with better and more accurate rules that account for how the brain functions.<sup>24</sup> “[Neuroscience] gives us an insight into the mental processes that underpin human behavior as the law is primarily concerned with regulating people’s behavior.”<sup>25</sup> With respect to the criminal justice system specifically, neuroscience evidence could improve accuracy and decrease errors in situations regarding guilt or innocence, sentencing, competency,

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17. See generally Timothy O’Connor & Christopher Franklin, *Free Will*, STANFORD ENCYCLOPEDIA OF PHILOSOPHY (Aug. 21, 2018), <https://plato.stanford.edu/entries/freewill/> (details the extensive history and debate over whether human beings possess “free will”).

18. Owen D. Jones & Francis X. Chen, *Law and Neuroscience in the United States*, INT’L NEUROLAW 349, 351 (2011).

19. *Id.* at 352; See also *id.* at 365 (“Psychopathy is a personality disorder marked by emotional detachment and antisocial behavior...”).

20. Gaudet & Marchant, *supra* note 3, at 583.

21. *Id.*

22. Petoft, *supra* note 1, at 53.

23. Jones & Chen, *supra* note 18, at 353.

24. Petoft, *supra* note 1, at 54.

25. *Id.*

etc.<sup>26</sup> Meanwhile, critics of neurolaw fear that application of neuroscience within the courtroom, especially in the criminal context, will usurp the role of the jury by applying some objectivity to a justice system that may not be prepared for neuroscience-based evidence.<sup>27</sup> Overall, there is concern over how the legal system as a whole will address certain challenges associated with the use of neuroscience evidence.<sup>28</sup>

Despite any concerns over the use of neuroscience evidence in the courtroom, such evidence has been accepted through various courts and is likely to remain.<sup>29</sup> Studies have indicated a rapid increase in published judicial opinions mentioning neuroscience evidence.<sup>30</sup> One article analyzed 361 criminal cases that involved neuroscience evidence in some capacity, noting a trend of increasing use closer to the end of the study.<sup>31</sup> “Not only is neuroscientific evidence reaching the courts, but it is also – at least in some contexts – directly affecting the administration of justice.”<sup>32</sup>

An indication that neuroscience garnered acceptance within the courts and would likely expand in use occurred in 2010 when the Supreme Court decided *Graham v. Florida*.<sup>33</sup> The case concerned whether a sentence of life without parole for a juvenile constituted cruel and unusual punishment.<sup>34</sup> The Supreme Court received more than 20 amicus briefs for this case.<sup>35</sup> “Several of these briefs, including the ones submitted by the American Medical Association and American Psychological Association, touched upon the relevance of neuroscience and psychology research on juveniles.”<sup>36</sup>

The Supreme Court directly referenced amicus briefs discussing the differences between juvenile and adult minds and used such distinctions to insulate juvenile offenders from life sentences.<sup>37</sup> Using psychology and brain science, the briefs successfully argued how juveniles were more capable of learning from mistakes because their brains were still developing as opposed to an adult with a fully developed brain.<sup>38</sup> Overall, the Court determined a juvenile’s actions could be found as the result of a still-developing brain, and as such, punishing a juvenile

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26. Nita A. Farahany, *Neuroscience and Behavioral Genetics in US Criminal Law: An Empirical Analysis*, J. OF L. AND THE BIOSCIENCES 485, 486 (2016).

27. Bernice B. Donald, *On the Brain: Neuroscience and its Implications for the Criminal Justice System*, 30 CRIM. JUST. 2 (2015).

28. Jones & Chen, *supra* note 18, at 351-52.

29. Farahany, *supra* note 26, at 508.

30. Greg Miller, *The Brain Gets Its Day in Court*, THE ATLANTIC (Mar. 2016), <https://www.theatlantic.com/science/archive/2016/03/neurolaw-brain-scans-court/471615/> (“[A] study, by Nita Farahany at Duke University, found that the number of judicial opinions that mention neuroscientific evidence more than doubled between 2005 and 2012.”).

31. Gaudet & Marchant, *supra* note 3, at 5773.

32. Jones & Chen, *supra* note 18, at 350.

33. *Graham v. Florida*, 560 U.S. 48 (2010).

34. *Id.* at 61.

35. Jones & Chen, *supra* note 18, at 363 (“An amicus brief . . . is a brief submitted to the Court by individuals or organizations who are not parties to the case.”).

36. *Id.* at 363-64.

37. *Graham*, 560 U.S. at 68.

38. *Id.*

to such an extent would be immoral.<sup>39</sup> “As petitioner’s *amici* point out, developments in psychology and brain science continue to show fundamental differences between juvenile and adult minds.”<sup>40</sup> The dissent in *Graham* even cited to these briefs, arguing that the majority did not properly interpret the data presented to them.<sup>41</sup> The Supreme Court directly referencing neuroscience evidence and even debating it within its opinion certainly shows more acceptance of neuroscience evidence within the courts.

## II. ADMISSION OF NEUROSCIENCE EVIDENCE IS GOVERNED BY THE FEDERAL RULES OF EVIDENCE AND *DAUBERT*

### A. *Acceptance of Expert Evidence and Testimony Has Developed Over the Past Century Through Court Cases and the Federal Rules of Evidence.*

All scientific evidence must be entered into evidence through testimony by an expert of the field related to the science in question.<sup>42</sup> Expert evidence must undergo certain procedures prior to admission into evidence to determine reliability,<sup>43</sup> relevance,<sup>44</sup> and potential prejudice.<sup>45</sup> Even the most widely-accepted sciences must go through these procedures; not all scientific evidence will be admissible.<sup>46</sup>

Almost 100 years ago, a “general acceptance” test was established by the D.C. Circuit.<sup>47</sup> In *Frye v. United States*, the defendant introduced evidence of a systolic blood pressure deception test, which was essentially an experimental method of lie detection.<sup>48</sup> The court stated, “[w]hile courts will go a long way in admitting expert testimony, deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.”<sup>49</sup> The court found the systolic blood pressure deception test was merely

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39. *Id.*

40. *Id.*

41. *Id.* at 117. (Thomas, J., dissenting).

42. Fed. R. Evid. 702.

43. *Id.* See also PAUL C. GIANNELLI, UNDERSTANDING EVIDENCE 320 (5th ed. 2018) (“The reliability of evidence derived from a scientific theory or principle depends upon three factors: (1) validity of the underlying theory, (2) the validity of the technique applying that theory, and (3) the proper application of the technique on a particular occasion.”).

44. Fed. R. Evid. 402. See also Fed. R. Evid. 401 (“Evidence is relevant if: (a) it has any tendency to make a fact more or less probable than it would be without the evidence; and (b) the fact is of consequence in determining the action.”).

45. Fed. R. Evid. 403. See also GIANNELLI, *supra* note 43, at 122 (“The federal drafters described unfair prejudice as ‘an undue tendency to suggest decision on an improper basis, commonly, though not necessarily, an emotional one.’”).

46. See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 589 (1993).

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

48. *Id.* at 1013-14.

49. *Id.* at 1014.

experimental with no basis of acceptance from the scientific community, and was thus inadmissible.<sup>50</sup>

In 1975, the Federal Rules of Evidence codified guidelines regarding when expert testimony may be admitted into evidence.<sup>51</sup> Rule 702 sets out four requirements that must be met prior to an expert being permitted to testify. First, the expert's knowledge must help the trier of fact understand the evidence presented to them or determine a fact at issue. Second, sufficient facts and data must support the testimony. Third, the testimony and evidence must be derived from reliable methods and practices. Lastly, the expert must have reliably applied those methods and practices.<sup>52</sup>

The Supreme Court addressed a discrepancy between the *Frye* "general acceptance" test and the Federal Rules of Evidence in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*<sup>53</sup> A split among the courts existed in which some courts applied the "general acceptance" test while others rejected such a test as conflicting with the Federal Rules of Evidence.<sup>54</sup> The Supreme Court ruled Rule 702 did not incorporate the "general acceptance" test and was never intended to incorporate such a test.<sup>55</sup> "That austere standard, absent from, and incompatible with, the Federal Rules of Evidence, should not be applied in federal trials."<sup>56</sup>

Not only did the Court in *Daubert* do away with the "general acceptance" test established in *Frye*, but it also clarified Rule 702's requirement that testimony be based on "scientific knowledge."<sup>57</sup> "[I]n order to qualify as 'scientific knowledge,' an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation . . ."<sup>58</sup> The primary concern often surrounds the theory or technique used to reach the conclusion to which the expert is testifying. Courts should consider whether such theory or technique has been subjected to peer review and publication, the method's potential error rate, and acceptance within the scientific community.<sup>59</sup> While the *Frye* "general acceptance" test focused solely on a scientific method's acceptance within the community, this is now only a factor courts consider when evaluating scientific evidence.<sup>60</sup>

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50. *Id.*

51. Fed. R. Evid. 702.

52. *Id.*

53. *Daubert*, 509 U.S. at 579 (1993).

54. *Id.* at 585.

55. *Id.* at 588.

56. *Id.* at 589.

57. *Id.* at 589-90.

58. *Id.* at 590.

59. *Id.* at 593-94.

60. *Id.* at 594.

B. *Expert Evidence Must be Relevant to be Admissible but Must Not Unduly Prejudice the Opposing Party.*

Expert scientific evidence is also governed by two general rules pertaining to all evidence. Rule 402 of the Federal Rules of Evidence states that relevant evidence is admissible, unless inadmissible according to some other body of law<sup>61</sup>, while irrelevant evidence is not admissible.<sup>62</sup> Relevant evidence makes a “material fact more probable with the evidence *than without the evidence*.”<sup>63</sup> Generally, evidence is relevant in criminal proceedings if it has some tendency to prove or negate the defendant’s guilt.<sup>64</sup> Relevancy is not a high standard to meet and most evidence presented will likely be deemed relevant, though this does not mean it is automatically admissible.<sup>65</sup>

Even if expert evidence is relevant and admissible under Rule 702, such evidence may be excluded under Rule 403 of the Federal Rules of Evidence.<sup>66</sup> Rule 403 allows courts to exclude relevant evidence if the probative value of the evidence “is substantially outweighed by a danger of one or more of the following: unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence.”<sup>67</sup> While all evidence is prejudicial to a defendant, such evidence is “unfairly prejudicial” only if relevant evidence has the capacity to lead the factfinder to declare guilt on a ground different from the proof displayed at trial.<sup>68</sup> Juries can often be misled and might afford undue weight to certain evidence when they should not.<sup>69</sup>

C. *As a Complex Science, Neuroscience Must be Relayed to the Jury Through Expert Testimony and is Thus Subject to Expert Evidence Rules.*

All the rules discussed above apply to neuroscience evidence. To begin, the evidence must be relevant to the current inquiry according to Rule 402. Next, the evidence must meet all of the requirements of Rule 702. Lastly, such evidence must not be unduly prejudicial or mislead the jury. Despite having these rules in place, judges have a difficult task in determining the admissibility of neuroscience evidence in the court room, especially depending on the stage of proceedings. “First, [the court] must consider the inferential chain that leads from the brain scan to the relevant legal issue and ask whether there are too many suspect links.”<sup>70</sup> If a

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61. Such as the United States Constitution, federal statutes, other Rules of Evidence, or other rules from the Supreme Court. Fed. R. Evid. 402.

62. *Id.*

63. GIANNELLI, *supra* note 43, at 112 (emphasis in original).

64. *See generally* United States v. Bear Killer, 534 F.2d 1253, 1261 (8th Cir. 1976) (holding that evidence defendant owned certain weapons was relevant to proving his guilt in case of involuntary manslaughter).

65. GIANNELLI, *supra* note 43, at 112-13.

66. *See* Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 595 (1993).

67. Fed. R. Evid. 403.

68. Old Chief v. United States, 519 U.S. 172, 180 (1997).

69. GIANNELLI, *supra* note 43, at 124.

70. Avery, *supra* note 5 at 943.



jury is involved, the court must then determine whether jurors “are capable of assessing this chain, albeit with the aid of expert witnesses, for themselves.”<sup>71</sup>

A Sixth Circuit case, *United States v. Semrau*, provides an in depth analysis of how a court may conduct a Rule 702 analysis.<sup>72</sup> In *Semrau*, the defendant was charged with healthcare fraud and attempted to introduce the results of an fMRI lie detection test to show lack of intent to defraud.<sup>73</sup> This case presented an issue of first impression regarding the admissibility of fMRI lie detection test results.<sup>74</sup> The court found in favor of the defendant regarding the first two factors described in *Daubert*: (1) whether the theories underlying fMRI lie detection are capable of testing and (2) whether these theories have been subjected to peer review and publication.<sup>75</sup>

The third and fourth factors of *Daubert* are where the court took issue with the fMRI lie detection tests.<sup>76</sup> The test in question was conducted in a real world setting for which there were no known or potential rates of error for fMRI lie detection, unlike such tests in a laboratory setting.<sup>77</sup> The court noted issues with whether fMRIs were capable of actually determining real lies as no studies could be shown for practical application of such tests.<sup>78</sup> Because there had been no real world testing of this technology, there were no standards as to testing that could be compared to the conducted tests nor was there any sense of general acceptance from the scientific community as to how such tests should be conducted.<sup>79</sup> The doctor conducting the tests also conducted this test differently from how he conducted laboratory tests in the past.<sup>80</sup> The court ultimately ruled that expert testimony about the fMRI lie detection results was properly excluded.<sup>81</sup>

A primary concern regarding neuroscience evidence is its presentation to the jury. If the court finds the evidence admissible and it survives the various above-described rules and tests, the jury must then assess the evidence for themselves, attempting to understand it and apply it to the case at hand. Unfortunately, jurors are often capable of three undesirable reactions when presented with neuroscience evidence: misunderstanding, captivation, and interpretation.<sup>82</sup> While a full analysis of juror’s reactions to neuroscience evidence would be too broad, general

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71. *Id.*

72. *United States v. Semrau*, 693 F.3d 510 (6th Cir. 2012).

73. *Id.* at 515. *See also* Gaudet & Marchant, *supra* note 3, at 585-86 (“fMRI measures changes in blood oxygenation in the brain. The magnetic field reveals the relative oxygenation of the areas in the brain, and that data is used to create maps that identify which areas of the brain are [active]. From the maps, inferences about brain processes can be made.”).

74. *Semrau*, 693 F.3d at 516.

75. *Id.* at 521.

76. *Id.* at 522.

77. *Id.* at 521.

78. *Id.* at 522.

79. *Id.*

80. *Id.* at 522-23.

81. *Id.* at 523.

82. E. Spencer Compton, *Not Guilty by Reason of Neuroimaging: The Need for Cautionary Jury Instructions for Neuroscience Evidence in Criminal Trials*, 12 VAND. J. ENT. & TECH. L. 333, 344 (2010).

understanding of certain reactions can be helpful in exploring concerns about when and how neuroscience is applied and admitted into evidence.

Misunderstanding often occurs because jurors do not understand the limitations behind neuroscience technology.<sup>83</sup> While often advanced and reliable, neuroscience is subject to many limitations. One such limitation is differentiating between “normal” and “abnormal” brain functioning.<sup>84</sup> Because the brain can be influenced by numerous external factors and circumstances, “there is no reliable baseline for determining whether one individual’s brain functioning qualifies as ‘normal.’”<sup>85</sup> Further, while data collected in an experimental setting can be enlightening, there is no way to truly assess an individual’s brain activity during real-life situations.<sup>86</sup> Many types of scans can only fixate on specific aspects of the brain at one singular time, meaning there is not yet a way to explore interconnectedness between various regions of the brain.<sup>87</sup> Because the brain and its functioning are so complex, neuroscience is not capable of boiling everything down to a simple answer or description.<sup>88</sup> Understanding limitations to neuroscience can assist jurors in assessing such evidence and affording it due weight.

Captivation occurs when jurors afford neuroscience evidence undue weight simply by the way it looks.<sup>89</sup> Neuroscience evidence can be fascinating to view and, in some instances, jurors can be persuaded simply by what they are presented instead of what it means.<sup>90</sup> For example, scans that produce colorized three-dimensional models of the brain are sometimes afforded more weight than a black and white two-dimensional image.<sup>91</sup> Expert testimony of the science alone can be enough to sway jurors toward affording the evidence more weight than it should.<sup>92</sup> “Even if the expert witness is completely straightforward about the significance of the results (whereas some witnesses could attempt to overstate the significance of the results), a juror may overestimate their importance because they are impressed by the sophistication.”<sup>93</sup>

Problems of interpretation occur when the application of certain neuroscience evidence is overemphasized by the jury.<sup>94</sup> “[N]euroimaging is often introduced for the purpose of making a psychiatric diagnosis, and the testifying psychiatrist (who may be an expert in mental illness rather than neuroscience technology) may not have a thorough understanding of the technical limits and problems of clinical application . . .”<sup>95</sup> Even attorneys can play a role in leading an expert to potentially

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83. *Id.* at 345.

84. *Id.* at 344.

85. *Id.*

86. *Id.*

87. *Id.*

88. *Id.* at 344-45.

89. *Id.* at 345.

90. *Id.*

91. *Id.*

92. *Id.* at 346.

93. *Id.*

94. *Id.* at 347.

95. *Id.* at 346-47.

overemphasize what the evidence shows; for example, examination of the witness may lead to indications of the evidence relating to a defendant's guilt versus a mere diagnosis of a psychological or mental issue.<sup>96</sup>

While such concerns are certainly present and should be addressed, proponents of neuroscience in the courtroom feel safe with the present rules in place governing admissibility.<sup>97</sup> Primarily, Rule 702 and *Daubert* provide sufficient safeguards to ensure the methodology behind acquiring the evidence is reliable.<sup>98</sup> Further, opposing attorneys are free to cross-examine experts or put on his or her own expert to refute the methodology and call into question the reliability of the evidence.<sup>99</sup> Often experts must provide the data to the opposing party, allowing that party to use their own expert to review the data and come to their own conclusions.<sup>100</sup> "It is simply not accurate to portray forensic imaging as a black box where the expert's word must be taken for granted."<sup>101</sup> Attorneys are not required to become experts in neuroscience on their own and are allowed to utilize experts for the purpose of reviewing data and coming to their own conclusions because neuroscience evidence can often be subject to multiple interpretations depending on the expert analyzing the data. Even concerns over influence on jurors may be overstated; jurors are capable of analyzing the neuroscience evidence presented to them and properly applying such evidence to the matter at hand.<sup>102</sup> Courts certainly must take proper precautions to assure neuroscience evidence is properly understood and applied by the jury, but jurors should also be trusted as to such matters.

### III. NEUROSCIENCE EVIDENCE MAY BE ADMISSIBLE IN VARIOUS STAGES OF PROCEEDINGS, BUT ITS RELIABILITY VARIES

Neuroscience evidence is most often applied in criminal proceedings and more commonly offered by criminal defendants.<sup>103</sup> Courts have allowed defendants to present neuroscience evidence for various purposes, including: to show incapacity, to mitigate or show lack of culpable mental state, determine insanity, or use as a mitigating factor in sentencing.<sup>104</sup>

Reliability of neuroscience evidence can often vary depending on the stage of proceedings where the evidence is admitted. Primarily, the farther a brain scan is taken from the time of the mental state at issue may limit the use of the

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96. *Id.* at 347.

97. Gaudet & Marchant, *supra* note 3, at 589-92.

98. *Id.* at 589-90.

99. *Id.*

100. *Id.*

101. *Id.* at 590.

102. N.J. Schweitzer et al., *Neuroimages as Evidence in a Mens Rea Defense: No Impact*, 17 PSYCHOL. PUB. POL'Y & L. 357 (2011).

103. Erin Murphy, *Neuroscience and the Civil/Criminal Daubert Divide*, 85 FORDHAM L. REV. 619, 632 (2016) ("[T]he successful proponents of this evidence tend, at this time, to be criminal defendants.").

104. *Id.* at 629.

evidence.<sup>105</sup> “Because the most legally relevant thoughts are likely to be those that occurred in the past (such as those reflecting the mental state of a defendant at the time of an alleged transgression) brain scans taking place long after the behavior may be of limited diagnostic or forensic use.”<sup>106</sup>

A. *Neuroscience in Competency Hearings can be Valuable Because Evidentiary Standards are Lessened and the Inquiry Revolves Around the Defendant’s Current State of Mind.*

Defendants must be competent to stand trial and undergo criminal proceedings if the current legal system is to properly function. Competency is concerned with the defendant’s ability to comprehend and understand the nature of the proceedings brought against them.<sup>107</sup> The defendant, or even the court itself, may make a motion for a competency hearing if there is reasonable cause to believe the defendant suffers from some mental disease or defect that would prevent him or her from reasonably understanding the proceedings before them.<sup>108</sup> A hearing is likely to occur and the court will often order a psychiatric or psychological evaluation of the defendant prior to the hearing.<sup>109</sup> The court will find the defendant incompetent if, by a preponderance of the evidence, “[the defendant] is unable to understand the nature and consequences of the proceedings against him or to assist properly in his defense . . . .”<sup>110</sup>

Competency hearings are the second most common usage of neuroscience evidence in criminal proceedings.<sup>111</sup> Expert testimony and evidence is usually welcome in competency proceedings because “competency determinations often turn on the result of the psychiatric or psychological evaluation (or evaluations).”<sup>112</sup> The inquiry surrounding a competency hearing often revolves around the presence of a mental disorder and whether such disorder impairs the defendant’s ability to comprehend the proceedings.<sup>113</sup> If presented in a competency hearing, neuroscience evidence is most frequently used to directly support a diagnosis of a brain injury or disorder to determine the defendant’s current mental capacity.<sup>114</sup> Both the court and those conducting neuroscientific tests of the defendant are not subject to the strict requirements of evidentiary rules and are afforded the opportunity to make broad considerations.<sup>115</sup> Competency hearings

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105. Jones & Chen, *supra* note 18, at 356.

106. *Id.*

107. *Dusky v. United States*, 362 U.S. 402 (1960).

108. 18 U.S.C. § 4241(a) (2020).

109. *Id.* § 4241(b).

110. *Id.* § 4241(d).

111. Farahany, *supra* note 26, at 491.

112. John B. Meixner Jr., *Neuroscience and Mental Competency: Current Uses and Future Potential*, 81 ALB. L. REV. 995, 1000 (2017).

113. *Id.* at 998.

114. *Id.* at 1009.

115. *Id.* at 999-1000.

present less reliability issues because the focus is on the defendant's mental capacity at the time of the proceedings versus at the time of the offense.<sup>116</sup>

In *United States v. Kasim*, the defense argued the defendant was incompetent and used a SPECT (Single Photon Emission Computed Topography) scan<sup>117</sup> to support this conclusion.<sup>118</sup> The inquiry into the defendant's competency began with testimony from multiple physicians discussing communication difficulties witnessed on the part of the defendant.<sup>119</sup> The SPECT scan was then conducted and supported findings of a disability, indicated by functional impairment in the defendant's front temporal lobes.<sup>120</sup> "This scan corresponds to the diagnoses of vascular dementia from four testifying medical specialists."<sup>121</sup> Overall, credible expert testimony accompanied by the SPECT scan led the court to conclude the defendant was incompetent to stand trial, despite the Government's expert testimony indicating otherwise.<sup>122</sup>

*Kasim* is a prime example of how neuroscience evidence can and should be used in determining a defendant's competency. The SPECT scan was reliable in indicating the defendant's current mental capacity and ability to understand the proceedings brought against him. Further, the scan was not used on its own to determine incompetency; the scan was used to bolster the testimony of multiple experts that used the scan to come to similar conclusions regarding the defendant's mental capabilities.

In contrast, the court in *United States v. Gigante* rejected a defendant's argument of incompetency despite the presentation of a PET (Positron Emission Tomographic) scan.<sup>123</sup> At the time of the case, PET scans were described as "tools fairly new to science."<sup>124</sup> An expert witness for the defense interpreted the scan to show the defendant suffered from organic brain dysfunction due to either Alzheimer's disease or multi-infarct dementia, supporting the defendant's claim of incompetency.<sup>125</sup> Along with the PET scan, a second expert witness conducted a number of neurological tests and reached the conclusion the defendant suffered from severe cognitive impairment and was not feigning his incompetency.<sup>126</sup>

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116. Farahany, *supra* note 26, at 495-96, 503.

117. *United States v. Kasim*, 2008 WL 4822291, at \*4, \*10 (N.D. Ind. Nov. 3, 2008) ("SPECT (Single Photon Emission Computed Tomography): . . . a nuclear medicine procedure in which a gamma camera rotates around the patient and takes pictures from many angles, which a computer then uses to form a cross-sectional image.").

118. *Id.* at \*7.

119. *Id.* at \*17.

120. *Id.* at \*18.

121. *Id.*

122. *Id.* at \*18, \*19, \*20.

123. *United States v. Gigante*, 982 F. Supp. 140, 147-4848 (E.D.N.Y. 1997). *See also Kasim*, WL 4822291 at \*4 ("PET (Positron Emission Tomography): a type of nuclear medicine imaging; measures functions such as blood flow, oxygen use, and glucose metabolism in evaluations of organ and tissue function . . .").

124. *Gigante*, 982 F. Supp. at 147.

125. *Id.*

126. *Id.*

The court was unconvinced of the defendant's incapacity despite the PET scan and expert testimony.<sup>127</sup> The court primarily took issue with the methodologies presented by expert witnesses.<sup>128</sup> Specifically regarding the PET scan, the court noted the expert's failure to compare the defendant's current PET scan with a scan taken before the crime, as the defendant could have had such dysfunction or abnormality while committing the crime.<sup>129</sup> All the expert did was compare the scan with a control group to determine whether the defendant's brain was functioning normally, yet this control group had characteristics markedly different from that of the defendant.<sup>130</sup> Neither expert witness in their testing and analysis of the defendant accounted for the fact the defendant was on numerous medications at the time of testing, nor was there an indication as to how such medications would impact the results.<sup>131</sup>

Presentation of neuroscience evidence alone, whether identifying an abnormality or not, does not determine a defendant's competency in a definitive manner.<sup>132</sup> Even though neuroscience evidence may be admissible according to Rule 702 and *Daubert*, admissibility has no bearing on the probative value of the evidence.<sup>133</sup> The credibility of experts testifying about neuroscience evidence is a key factor courts must consider in conducting a competency analysis, which often correlates with the methodology behind neuroscience testing.<sup>134</sup>

*B. While Neuroscience Evidence May be Useful in Showing the Presence of a Mental Disease or Defect, the Evidence May Not Always Be Able to Show How Such a Defect Impacted the Defendant's State of Mind at the Time of the Crime.*

An available defense to a criminal offense charge in multiple jurisdictions is the insanity defense.<sup>135</sup> To successfully assert this defense and receive a verdict of not guilty by reason of insanity, the defendant must show he or she suffered from some mental disease or defect preventing them from appreciating the nature and quality or wrongfulness of their actions resulting in the offense.<sup>136</sup> The inquiry into the defendant's insanity revolves around the defendant's mental state "at the time of the commission of the acts constituting the offense . . . ."<sup>137</sup>

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127. *Id.* at 148.

128. *Id.* at 147-48.

129. *Id.* at 147.

130. *Id.*

131. *Id.*

132. *McMurtrey v. Ryan*, 539 F.3d 1112, 1119-27 (9th Cir. 2008) (holding defendant was incompetent to stand trial despite neurological testing showing no evidence of abnormalities).

133. *United States v. Gigante*, 982 F. Supp. 140, 148 (E.D.N.Y. 1997).

134. *United States v. Merriweather*, 921 F. Supp. 2d 1265, 1300-01 (N.D. Ala. 2013) (holding brain imaging results to be ambiguous and subject to multiple interpretations so could not be conclusive of a diagnosis of schizophrenia).

135. Hugh McGinley & Richard A. Pasewark, *National Survey of the Frequency and Success of the Insanity Plea and Alternate Pleas*, 17 J. PSYCHIATRY & L. 205, 207 (1989).

136. 18 U.S.C. § 17 (2020).

137. *Id.*

On the surface, the application of neuroscience in attempts to assert an insanity defense would appear to be quite useful. Much like competency proceedings, an insanity defense relies upon the showing of a mental disease or defect. However, the primary difference between showing incompetency and insanity is the timing of the inquiry. Competency hearings focus on the defendant's current mental capacity at the time of proceedings, whereas insanity focuses on the defendant's mental capacity at the time of the offense. Nonetheless, neuroscience evidence can certainly be relevant to an insanity inquiry because "the presence or absence of mental illness can make it more or less likely that an individual would be able to satisfy the particular requirements of the applicable legal sanity standard."<sup>138</sup>

*People v. Goldstein* is a significant example of a defendant attempting to use neuroscience evidence to prove legal insanity.<sup>139</sup> In *Goldstein*, the defendant pushed a woman in front of a train and raised an insanity defense at trial.<sup>140</sup> At trial, the defendant attempted to introduce a PET scan to show he had schizophrenia, which was intended to support his insanity defense.<sup>141</sup> Among the issues raised by defendant on appeal was whether the trial court erred in precluding the PET scan in support of the insanity defense.<sup>142</sup> The court concluded that the only issue the scan would have been probative for would be supporting the defendant's diagnosis of schizophrenia, but such a diagnosis was already stipulated by the prosecution so the scan was no longer relevant.<sup>143</sup> Even if the diagnosis had not been conceded, the brain scan would have only been probative toward showing an abnormality that may be schizophrenia; the scan would not have been capable of showing the defendant's state of mind at the time of the crime, which is required to raise a successful insanity defense.<sup>144</sup>

For the most part, attorneys have discretion as to whether neuroscience evidence should be presented in support of an insanity defense.<sup>145</sup> In *Bryan v. Mullin*, the defendant appealed his conviction due to his attorney's failure to present evidence that the defendant believed would show he was unable to form an intent to kill.<sup>146</sup> However, the court determined counsel had discretion as to whether neuroscience evidence should be presented and decided against this because the opinions of two doctors indicated the defendant was not legally insane.<sup>147</sup> As there was no support for an insanity defense, counsel decided to utilize the guilt phase of trial to lay the foundation of a mitigation case for sentencing.<sup>148</sup>

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138. Gaudet & Marchant, *supra* note 3, at 611.

139. *People v. Goldstein*, 786 N.Y.S.2d 428 (N.Y. App. Div. 2004).

140. *Id.* at 429.

141. *Id.* at 432.

142. *Id.* at 429-30.

143. *Id.* at 432.

144. *Id.*

145. See Deborah W. Denno, *The Myth of the Double-Edged Sword: An Empirical Study of Neuroscience Evidence in Criminal Cases*, 56 B.C. L. REV. 493, 544 (2015).

146. *Bryan v. Mullin*, 335 F.3d 1207, 1217 (10th Cir. 2003).

147. *Id.* at 1217-18.

148. *Id.* at 1218.

When a defendant's life is at stake in a capital case, "counsel must conduct an adequate investigation" as to potential mental health defenses that can often assist during both the guilt and sentencing phases of trial.<sup>149</sup> Trial courts should also allow funding for certain neurological testing in support of a defendant's insanity defense in capital cases.<sup>150</sup> However, on appeal, defendants have a high standard to meet when showing prejudice due to the denial of neuroscience evidence, either from the court or from counsel's inability to conduct an adequate mitigation investigation.<sup>151</sup>

C. *Proving a Defendant's Guilt or Innocence May be the Least Reliable Instance in Which Neuroscience Evidence is Admitted Because Evidentiary Standards are in Full Force and Even the Most Reliable Evidence Will be Unable to Show the Defendant's State of Mind When Committing the Crime.*

The insanity defense is not the only time a defendant may want to show the presence of a mental disease or defect during a criminal trial. Defendants will often try to show they should not be held criminally responsible for their actions due to a mental disease or defect. Such an assertion may come in the form of arguing the inability to form requisite intent, inability to premeditate the offense, lack of impulse control, etc.<sup>152</sup> Guilt in criminal proceedings requires proof of a criminal act along with a showing the action was performed with the requisite intent (i.e. negligence, recklessness, etc.).<sup>153</sup> The presence of a mental disease or defect can be useful in weakening or abolishing the element of intent.<sup>154</sup>

Courts have allowed defendants to present the argument they lacked the ability to form specific intent outside of severe intoxication or insanity.<sup>155</sup> Lack of intent can be determined by proving a defendant suffered from some mental condition preventing the ability of the defendant to form the requisite intent necessary to be found guilty of a crime.<sup>156</sup> To show the defendant's lack of requisite intent, expert testimony or brain scans can be introduced to show the presence of a defect or abnormality, although this evidence by itself would not be entirely dispositive.<sup>157</sup> Because specific intent is often a key element of certain offenses,

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149. Hurles v. Ryan, 752 F.3d 768, 781 (9th Cir. 2014).

150. *Id.* at 783.

151. United States v. Montgomery, 635 F.3d 1074, 1087-93 (8th Cir. 2011) (holding the denial of various forms of neuroscience evidence to not be prejudicial, even when some would have been admissible, because this evidence was minimal compared with the evidence presented to the jury of aggravating circumstances).

152. Gaudet & Marchant, *supra* note 3, at 598-99.

153. C. Scarpazza et al., *The Charm of Structural Neuroimaging: Guidelines to Avoid Misinterpretation of the Findings*, 8 TRANSLATIONAL PSYCHIATRY 1 (2018).

154. *Id.*

155. United States v. Erskine, 588 F.2d 721, 722 (9th Cir. 1978). *See also* United States v. Dilks, 2009 WL 528615 (W.D. Va. Feb. 27, 2009) (holding defendant had the opportunity to raise issue of brain injury to show he was unable to intentionally defraud a bank).

156. *Erskine*, 588 F.2d at 722.

157. *Id.*



evidence pertaining to a mental condition impacting the ability to form requisite intent is relevant to the proceedings.<sup>158</sup>

While neuroscience evidence may be useful, there is still the hurdle of the defendant's mental state at the time of the offense that must be overcome. "Because the most legally relevant thoughts are likely to be those that occurred in the past . . . brain scans taking place long after the behavior may be of limited diagnostic or forensic use."<sup>159</sup> Temporal limitations commonly plague defendants' attempts to use neuroscience evidence to defeat the element of culpability.<sup>160</sup> Overall, the use of neuroscience evidence has not been entirely helpful to defendants in disputing culpability or to those successfully raising the insanity defense.<sup>161</sup> Neuroscience evidence at the liability stage is often the most difficult time for defendants to admit neuroscience evidence and the least useful given the issues regarding the defendant's mental state at the time of the offense.<sup>162</sup> At most, neuroscience evidence may reveal certain genetic predispositions of the defendant, but there arises an issue as to reliability because a chain of inferences must connect the predispositions in question to the defendant's past mental state.<sup>163</sup> Neurological testing and expert testimony can often be limited because the testing often is not able to predict behavior or correlate to the criminal behavior at issue.<sup>164</sup> Further, experts may only be qualified to testify as to the testing versus delving into a defendant's state of mind.<sup>165</sup>

Defendants cannot mitigate criminal responsibility for an offense solely by showing a brain injury or disorder.<sup>166</sup> Just because an individual has such an injury or disorder does not mean the injury or disorder had any bearing on a defendant's actions at the time of the offense; experts must consider all possible interpretations of the abnormality to determine its effect on a defendant's behavior.<sup>167</sup> Again, at the liability stage of criminal proceedings, the presentation of neuroscience evidence can only do so much; for example, "[t]he correct neuroscientific reasoning is the following: the defendant behaviourally manifested difficulties in behavioural control; the defendant also has a brain lesion in the frontal lobe; thus, the brain lesion might account for the lack of behavioural control."<sup>168</sup> Assertions by a defendant claiming ineffective assistance of counsel have often failed when counsel did not pursue further testing upon a scan showing no brain damage.<sup>169</sup>

In *Jackson v. Calderon*, the defendant argued he lacked the ability to premeditate a murder, nor that he could form the specific intent to kill the victim

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158. *Id.* at 723.

159. Jones & Shen, *supra* note 18, at 356.

160. *United States v. Day*, 524 F.3d 1361, 1370 (D.C. Cir. 2008).

161. Jones & Shen, *supra* note 18, at 362.

162. *Id.* at 356, 358.

163. Farahany, *supra* note 26, at 503.

164. *Id.* at 503-04; Gaudet & Marchant, *supra* note 3, at 530.

165. *United States v. Purkey*, 428 F.3d 738, 752-53 (8th Cir. 2005).

166. Scarpazza et al., *supra* note 153, at 4.

167. *Id.*

168. *Id.* at 7.

169. *Ledford v. Warden, Ga. Diagnostic & Classification Prison*, 818 F.3d 600, 620-21 (11th Cir. 2016).

because he was under the influence of the drug phencyclidine (PCP) at the time of the offense.<sup>170</sup> Experts on both sides testified as to the effects of PCP, some declaring individuals are still capable of processing thoughts such as premeditation while others indicating PCP inhibits the ability for individuals to premeditate or specifically intend to kill.<sup>171</sup> The defendant also admitted a PET scan but multiple issues arose as to the scans reliability and relevance.<sup>172</sup> Firstly, “the use of PET scans to diagnose chronic PCP abuse [was] not generally accepted by the scientific community . . . .”<sup>173</sup> Secondly, the PET scan was subject to multiple interpretations and, most importantly, unable to determine premeditation or specific intent at the time of the shooting.<sup>174</sup> The only relevance of the scan was to show that the defendant had a brain abnormality related to PCP use.<sup>175</sup> To overturn the defendant’s conviction, the court needed a showing of insufficient evidence to convict and the defense was unable to make the required showing.<sup>176</sup>

*D. Sentencing is the Most Common Point in Which Defendants Submit Neuroscience Evidence as a Mitigating Factor and the Inquiry Revolves Around the Defendant’s Current State of Mind.*

The most common application of neuroscience by criminal defendants is found in sentencing proceedings, where defendants use the evidence to mitigate potential punishments.<sup>177</sup> Courts have been enthusiastic about the admission of neuroscience evidence at this stage of criminal proceedings and presentation of such evidence is frequently expected.<sup>178</sup> Because of due process concerns, defendants are often allowed to present whatever mitigating evidence they have and evidentiary standards are far more relaxed than during the liability phase of proceedings.<sup>179</sup> Such concerns are especially compounded in capital proceedings and courts are required to consider whatever mitigating evidence is presented by the defendant.<sup>180</sup>

Many ineffective assistance of counsel claims raised by defendants for the failure of counsel to present neuroscience evidence have failed despite the general acceptance of such evidence in sentencing proceedings.<sup>181</sup> To assert a successful ineffective assistance of counsel claim, the defendant must show that counsel’s performance was deficient.<sup>182</sup> “This requires showing that counsel made errors so

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170. Jackson v. Calderon, 211 F.3d 1148, 1165 (9th Cir. 2000).

171. *Id.*

172. *Id.*

173. *Id.*

174. *Id.*

175. *Id.*

176. *Id.*

177. Murphy, *supra* note 103, at 628-29. See also Penry v. Lynaugh, 492 U.S. 302, 320 (1989) (holding evidence of a mental defect can be used to mitigate a death sentence to life imprisonment).

178. Murphy, *supra* note 103, at 629.

179. Gaudet & Marchant, *supra* note 3, at 635.

180. *Id.* at 623-24.

181. Gaudet & Marchant, *supra* note 3, at 620-22.

182. Strickland v. Washington, 466 U.S. 668, 687 (1984).

serious that counsel was not functioning as the ‘counsel’ guaranteed the defendant by the Sixth Amendment.”<sup>183</sup> Then the defendant must show that the deficient performance was prejudicial to them. “This requires showing that counsel’s errors were so serious as to deprive the defendant of a fair trial, a trial whose result is reliable.”<sup>184</sup> While showing deficient performance is often not difficult, defendants often fail on the prejudice prong for ineffective assistance of counsel claims, meaning they were unable to show there was no likelihood the introduction of neuroscience evidence would have resulted in a different outcome.<sup>185</sup>

The Supreme Court has actually addressed a claim of ineffective assistance of counsel regarding neuroscience evidence. In *Sears v. Upton*, the defendant asserted his counsel was ineffective for failure to present evidence he suffered from a brain abnormality that impaired his functioning and reasoning.<sup>186</sup> The lower court had no difficulties finding performance deficient because counsel did not perform an adequate mitigation investigation.<sup>187</sup> However, the Supreme Court found the lower court did not apply the proper prejudice inquiry:

A proper analysis of prejudice under *Strickland* would have taken into account the newly uncovered evidence of Sears’ “significant” mental and psychological impairments, along with the mitigation evidence introduced during Sears’ penalty phase trial, to assess whether there is a reasonable probability that Sears would have received a different sentence after a constitutionally sufficient mitigation investigation.<sup>188</sup>

Overall, the Supreme Court appeared to acknowledge the weight of certain neuroscientific evidence and found the outcome of the defendant’s trial could likely have been different had counsel performed an adequate investigation and presented such evidence.<sup>189</sup> The Supreme Court vacated the lower court’s judgment and remanded the case for further proceedings.<sup>190</sup>

Even though sentencing is the most common use of neuroscience evidence by defendants, such evidence at this stage can often be risky and backfire on the defendant.<sup>191</sup> Defendants may present neuroscience evidence during sentencing in hopes of mitigating criminal responsibility, allowing for a lesser sentence. However, doing so may leave the court with an impression as to the defendant’s dangerousness, causing the court to adjust the sentence in a way the defendant was not hoping for.<sup>192</sup> The primary conflict when presenting neuroscience evidence is

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183. *Id.*

184. *Id.*

185. Gaudet & Marchant, *supra* note 3, at 620-21.

186. *Sears*, 561 U.S. at 945-46.

187. *Id.* at 951-52.

188. *Id.* at 956.

189. *Id.* at 951 (“This evidence might not have made [defendant] any more likable to the jury, but it might well have helped the jury understand Sears, and his horrendous acts . . .”).

190. *Id.* at 956.

191. Jones & Shen, *supra* note 18, at 359.

192. Corey H. Allen et al., *Reconciling the Opposing Effects of Neurobiological Evidence on Criminal Sentencing Judgments*, 14 PLOS ONE 2 (2019).

whether the court considers such evidence as an impaired capacity to mitigate a sentence or as an indication of future dangerousness to aggravate a sentence.<sup>193</sup> This effect is commonly referred to in scholarship as the “double-edged sword” effect.<sup>194</sup> Defendants may still experience mitigation regarding a prison sentence but could end up experiencing a higher overall sentence through involuntary hospitalization, allowing the court to punish the defendant and protect the public, while providing the defendant help with his or her abnormality.<sup>195</sup> This is primarily a concern in capital cases in which the death penalty is at risk and rests on the presentation of aggravating and mitigating factors.<sup>196</sup> While the defense may be confident in presenting evidence as to impaired capacity through neuroscience evidence, the prosecution could very well use such evidence to argue future dangerousness.<sup>197</sup>

Presentation of mental health and neuroscience evidence must be a thought out and strategic decision, as discussed in *Fulks v. United States*.<sup>198</sup> The defendant in *Fulks* asserted counsel was ineffective because counsel allegedly failed to present a meaningful mental health mitigation case, primarily asserting counsel should have called certain expert witnesses that had been retained and were ready to testify.<sup>199</sup> The court ultimately disagreed, stating counsel did present a sufficient mental health mitigation argument while making a crucial strategic decision regarding how much and what type of mental health evidence to present without harming the client.<sup>200</sup> While counsel did not assert every possible mental health argument available, counsel strategically used mock jury consultants and mental health arguments supported with neuroscience evidence including CAT scans<sup>201</sup>, PET scans, and EEGs.<sup>202</sup> Overall, a defendant’s counsel has a lot to consider when

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193. Abram S. Barth, *A Double-Edged Sword: The Role of Neuroimaging in Federal Capital Sentencing*, 33 AM. J. OF L. & MED. 501, 502 (2007).

194. See generally Allen, *supra* note 191192.

195. Corey H. Allen & Eyal Aharoni, *Brain Scan Evidence in Criminal Sentencing: A Blessing and a Curse*, THE CONVERSATION (April 2, 2019, 6:40 AM), <http://theconversation.com/brain-scan-evidence-in-criminal-sentencing-a-blessing-and-a-curse-113088>.

196. Barth, *supra* note 192193, at 505.

197. Barth, *supra* note 192193, at 511.

198. *Fulks v. United States*, 875 F. Supp. 2d 535 (S.C.D.C. 2010).

199. *Id.* at 555.

200. *Id.* (“Trial counsel had to make difficult strategic decisions concerning the amount and type of mental health testimony to present—sufficient to convince the jury, but not of the type that would open the door to some type of counter-attack by the government.”).

201. *United States v. Kasim*, 2008 WL 4822291, at \*2 (N.D. Ind. Nov. 3, 2008) (“CT scan (aka CAT scan . . .): an x-ray procedure which combines many x-ray images with the aid of a computer to generate cross-sectional views and, if needed, three-dimensional images of the internal organs and structures of the body . . .”).

202. *Fulks*, 875 F. Supp. 2d at 561; See also *Kasim*, 2008 WL 4822291 at \*3 (“EEG (electroencephalogram): a test during which the electrical signals of the brain are recorded. The electrical activity is detected by electrodes placed on the patient’s scalp and transmitted to a polygraph that records the activity.”).

presented with neuroscience evidence and whether such evidence should be used in a mitigation argument.<sup>203</sup>

Just because attorneys are free to make informed strategic decisions, this does not excuse lack of investigation into mental health evidence for mitigation. In *Lockett v. Anderson*, the defendant asserted an ineffective assistance of counsel claim for counsel's failure to investigate mitigating evidence.<sup>204</sup> Among the defendant's evidence was testimony from multiple medical experts that would have been available to testify and perform tests on the defendant to show the presence and potential effects of the defendant's brain abnormalities.<sup>205</sup> The court found counsel's failure to investigate the potential mitigating evidence was deficient performance and did not qualify as an informed strategic decision because counsel was aware of these factors and simply did not investigate them.<sup>206</sup> Further, this deficient performance was actually prejudicial to the defendant.<sup>207</sup> The court acknowledged that the jury's verdict of a death penalty sentence was unanimous, and had mitigating evidence been properly investigated and presented, there was a reasonable probability that the outcome would have been different.<sup>208</sup> Only one juror needs to be swayed by the evidence to defeat a death sentence.<sup>209</sup> However, the court also acknowledged the double-edged sword effect of the evidence, noting that the jury could have also found evidence of defendant's mental state to be an aggravating circumstance justifying the death penalty sentence.<sup>210</sup> Ultimately, the court set aside the death sentence for the defendant because of ineffective assistance of counsel.<sup>211</sup>

*Noel v. Norris* presented an interesting question as to whether a defendant could seek relief from his sentence based on "newly discovered evidence . . . ."<sup>212</sup> In *Noel*, the defendant requested relief five years after his sentence due to the then new technology known as a SPECT scan that could reveal a brain abnormality

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203. See *Philmore v. McNeil*, 575 F.3d 1251, 1262 (11th Cir. 2009) (holding counsel made an informed strategic decision to not present neuroscience evidence from one expert that would have conflicted with other experts' evidence); *Forrest v. Steele*, 764 F.3d 848, 857 (8th Cir. 2014) (holding counsel was not ineffective when deciding not to present neuroscience evidence that may have bolstered other expert testimony or risked undermining it); *United States v. Battle*, 264 F. Supp. 2d 1088, 1164-65 (N.D. Ga. 2003) (holding counsel did not need to provide experts with neuroscience evidence when such evidence was unnecessary to support their testimony).

204. *Lockett v. Anderson*, 230 F.3d 695, 710 (5th Cir. 2000). See also *Littlejohn v. Trammell*, 704 F.3d 817, 862-67 (10th Cir. 2013) (holding that counsel was ineffective when it failed to pursue a neurological evaluation that could have uncovered evidence of a brain injury and this failure resulted in prejudice to defendant).

205. *Lockett*, 230 F.3d at 712-13.

206. *Id.* at 714.

207. *Id.* at 716. But see *State v. Mercer*, 672 S.E.2d 556 (S.C. 2009) (holding exclusion of SPECT scan to be error but defendant was not prejudiced as this evidence was still presented to the jury through another expert).

208. *Lockett*, 230 F.3d at 716.

209. *Id.* at 716.

210. *Id.*

211. *Id.* at 717.

212. *Noel v. Norris*, 322 F.3d 500, 503 (8th Cir. 2003).

which could have constituted mitigating evidence at trial.<sup>213</sup> The court denied sentencing relief as the defendant was not prohibited by the trial court from presenting a mitigation case at trial, the only basis upon which relief could be granted.<sup>214</sup> “[S]tate courts [must] permit a defendant to introduce any relevant mitigating evidence that is available *at the time the defendant is sentenced*, and Mr. Noel does not assert that he was prohibited from presenting any evidence in this case.”<sup>215</sup> Ultimately, defendants are only permitted to utilize neuroscience evidence available to them at the time of sentencing and cannot retroactively apply neuroscience evidence.<sup>216</sup>

### CONCLUSION

Human beings, for better or worse, are obsessed with discovering the unknown and answering the most complicated questions about existence. Such desire for understanding has presented great advancement in technology and science. While we should embrace this technology, we must also be weary and careful in regarding how and where it is applied.

Applying neuroscience to criminal law can be complicated and messy but also helpful and educational. Courts must be careful in applying such evidence as to not use what many see as an objective truth to override our current justice system, which is incapable of determining an objective truth. However, if neuroscience is used to better understand an individual’s behavior and to find a way to best assist that individual, the justice system may find ways to improve how it treats certain individuals.

Neuroscience is within the realm of the courts and looks as if it is here to stay. Legal scholars and scientists should come together to determine how best to apply complex neuroscience into the legal field and what judges can do to ensure it is utilized properly. Further, the legislature may consider enacting new evidentiary rules regarding more modern sciences to enhance protection of both the justice system and individuals subject to neuroscientific study.

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213. *Id.* at 503. *But see* Johnston v. Bowersox, 119 F. Supp. 2d 971, 995-96 (E.D. Mo. 2000) (holding there was no denial of due process rights when defendant alleged the lack of a full and fair postconviction hearing because of the denial of a brain scan but cited no supporting authority).

214. *Noel*, 322 F.3d at 504.

215. *Id.* (emphasis added).

216. *Id.* at 503-04.