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The Application of Neuroscience Evidence on Court Sentencing Decisions: Suggesting a Guideline for Neuro-Evidence

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ABSTRACT

Recently, neuro-evidence has been increasingly accepted in courtrooms. In 2010, the U.S. Supreme Court accepted its first quantitative electroencephalography (qEEG) evidence, which was used to reduce a death penalty to a life-in-prison sentence in a heinous homicide case. However, sentencing decisions differ even when there are similar neuroscientific mitigators. This article compares and analyzes why similar cases result in different final sentences. This comparative analysis sheds light on how neuroscience should be applied, interpreted, inferred, and generalized in a variety of legal contexts. I offer seven suggestions to regulate the use of neuro-evidence and potentially decrease its erroneous influence in court sentencing decisions. Furthermore, I point out several neuro-challenges for future research and debate. I am optimistic about the interconnection between neuroscience and law in future legal reform.

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INTRODUCTION

Neuroscientific evidence has challenged traditional methods of determining an offender's *mens rea* and final sentencing decisions, especially

in capital cases.[1] The battle between the mitigating and aggravating effects of neuro-evidence in the courtroom, as well as its weight, compared to other circumstances, is pronounced and complicated.[2] More intriguing, similar capital cases that use neuro-evidence as a mitigator may result in different sentencing decisions (*i.e.*, the death penalty versus life in prison without parole). Therefore, questions about (1) how judges and jurors evaluate neuro-evidence and are influenced by its mitigating effects in legal contexts, (2) whether all types of neuro-evidence have the same weight and mitigating effects, and (3) why final sentencing decisions differ certainly require more attention and analysis.

This review consists of four sections. The first section provides an overview of the trends of the application and developments of neuroscience in legal contexts. It also points out several philosophical challenges that neuro-evidence faces in the evidentiary and sentencing stages of court cases. In the second section, this review introduces two capital cases in which neuro-evidence was presented as a mitigating factor, but which had two different final sentencing decisions. In addition, this article provides a compare-and-contrast analysis of why there are different mitigating effects of neuro-evidence. The third section offers three cautions and limitations on how to apply, interpret, and make inferences from neuro-evidence in legal contexts. In section four, this article proposes a guideline to regulate the mitigation and maximize the interpretive accuracy of neuro-evidence. Further, it argues that there are other challenges for the applications of neuro-law and neuro-ethics that need to be considered and researched. A brief conclusion follows. Although many cautions and critical considerations need to be addressed, the application of neuro-evidence still holds promise for the future of the interconnection between neuroscience and law.

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[1] 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 (2015).

[2] Owen D. Jones & Francis X. Shen, *Law and Neuroscience in the United States*, INT'L NEUROLAW 349, 380 (2011).

I. OVERVIEW OF THE APPLICATION OF NEUROSCIENCE IN COURTS

A. The Trends of Neuroscience in Courts

"Neuroscience" here primarily refers to the study of brain structures, functions, developments, and abnormalities. It is often used to help practitioners make references to people's cognitive functions and explain behavioral patterns, such as criminal behaviors.[3]

Neuroscientific evidence has been used increasingly in both U.S. courts and other legal contexts during the past decade.[4] In 2010, *United States v. Semrau* involved the first evidentiary hearing on the admission of functional MRI (fMRI) lie-detection evidence in federal court.[5] *State v. Nelson* was the first case to admit quantitative electroencephalography (qEEG) evidence, which had a mitigating effect on a sentencing decision.[6] Furthermore, *Graham v. Florida* explicitly endorsed using brain development research in courtrooms, particularly for sentencing decisions.[7] In 2016, the applications of neuroscience in legal contexts further expanded. *State v. Montgomery* brought up the retroactivity of legal rulings related to neuroscience and adolescent brain development.[8] In addition to these examples, a preliminary

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[3] Stephen J. Morse, *Neuroscience, Free Will, And Criminal Responsibility*, U. PA. L.: LEGAL SCHOLARSHIP REPOSITORY 251, 256 (2015).

[4] *Id.*

[5] *See* United States v. Semrau, 693 F.3d 510 (6th Cir. 2012) (In late 2009, Dr. Semrau's attorney and Dr. J. Houston Gordon contacted Dr. Laken to inquire about having an fMRI-based lie detection test conducted on Dr. Semrau in hopes of bolstering the defenses that Dr. Semrau lacked intent to defraud and undertook actions to ensure proper billing compliance).

[6] Florida v. Nelson, No. F05-0846 (11 Fla. Cir. Ct., 2010); Owen D. Jones et al., *Law and Neuroscience*, 33 J. NEUROSCIENCE 17624, 17625 (2013).

[7] Graham v. Florida, 560 U.S. 48 (2010) (ruling that life without parole is unconstitutional for individuals under the age of eighteen years convicted of crimes other than homicide).

[8] State v. Montgomery, 194 So. 3d 606 (La. 2016) (individuals sentenced to life without parole as juveniles prior to Miller v. Alabama, 567 U.S. 460 (2012), were entitled to resentencing or a parole hearing).

analysis by Nita Farahany reveals that the number of reported cases involving neuroscientific evidence in 2012 was more than twice what it was in 2005.[9]

As neuroimaging techniques have advanced in the twenty-first century, there has also been an exponential increase of important developments on the intersection between neuroscience and law and the emergence of new neuro-disciplines, such as "neuro-law" and "neuro-ethics."[10] In 2009, more than 200 published academic articles mentioned neuroscience, with the law review articles related to neuroscience having a fourfold increase.[11]

Although this inter-discipline between neuroscience and law sparks vivid interest from both researchers and practitioners, whether and how to apply and expand neuro-evidence in the legal system is still an open and widly debated topic. Based on its scientific applications on normative and legal systems, a large number of critiques focus on how different bio-technologies and analytic methods can apply to legal contexts and ultimately foster a more effective and fair criminal justice system.[12] Many empirical studies and research projects have explored the impacts of brain-image technologies on a variety of social and legal problems, such as lie-detection in the courtroom, functional connectivity analysis of impulsivity, risk assessment for people with substance use disorder, the effect of neuroimaging on jury's decisions, and third-party legal decision-making processes.[13] Nonetheless, it is still theoretically and empirically unclear how the legal system, especially at the courtroom level, should or should not evaluate the mitigating or aggravating effects of neuro-evidence on sentencing decisions.

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[9] Nita A. Farahany, *Neuroscience and Behavioral Genetics in US Criminal Law: an Empirical Analysis*, 2 J.L. & BIOSCIENCES 485, 485–509 (2015).
[10] Stephen J. Morse, Neuroethics: Neurolaw (2016), *in* Oxford Handbooks Online (2017), U of Penn Law School, Public Law Research Paper No. 17-9. (2016).
[11] Francis X. Shen, *The Law and Neuroscience Bibliography: Navigating the Emerging Field of Neurolaw*, 38.3 INT'L J.L. INFO. 352 (2010).
[12] *See* Jones & Shen, *supra* note 2.
[13] *Id.*, at 352–53.

Theoretically, some may consider neuroimaging evidence as a mitigating factor because it challenges the *mens rea* and thus the legal culpability of criminals. In contrast, others may use it as a predictive tool for future offenses and people's inability to be rehabilitated, and hence consider it an aggravating factor. Although empirically testing the use of neuroscience in courtrooms is difficult, a few studies have performed experiments.[14] Findings are generally mixed and inconclusive.[15] However, a recent empirical analysis by Deborah Denno reveals this seemingly double–edged sword to be a myth by stating that neuroscience evidence used in traditional criminal courts usually mitigates punishments, particularly for death penalty sentences.[16]

Neuroscience has been used in a variety of legal and criminal contexts, such as constitutional law, contract law, and disability benefit claims. For example, the Supreme Court stated that violent video games are associated with adolescent aggression by citing a "cutting-edge neuroscience study."[17] A defendant was able to void a land contract by providing brain scans to show his mental incompetency.[18] Additionally, a professional football player offered his brain images to demonstrate his eligibility for neuro-degenerative disability benefits.[19] Undeniably, the fundamental concern related to neuro-law is at the guilt-or-innocence determination phase of a case. Since neuro-evidence utilization in sentencing has received less academic and public attention, this article discusses neuro-evidence as a mitigation instrument in the sentencing stage and its implications, causations, and future challenges.[20]

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[14] Darby Aono, Gideon Yaffe & Hedy Kober, *Neuroscientific evidence in the courtroom: a review*, 4 COGNITIVE RES.: PRINCIPLES & IMPLICATIONS 40 (2019).
[15] *Id.,* at 5.
[16] Denno, *supra* note 1, at 493.
[17] Brown v. Entm't Merchs. Ass'n, 564 U.S. 786 (2011) (holding that video games were protected speech under the First Amendment as other forms of media).
[18] Van Middlesworth v. Century Bank & Tr. Co., No. 215512, 2000 Mich. App. LEXIS 2369 (Mich. Ct. App. 2000).
[19] Boyd v. Bell, 410 F.3d 1173 (9th Cir. 2005).
[20] Stephen J. Morse, *Criminal Law and Common Sense: An Essay on the Perils and Promise of Neuroscience*, 99 MARQ. L. REV. 39 (2015).

B. The Challenges of Neuroscience on Sentencing Decisions

Although neuro-evidence is often used to challenge the underlying assumptions of voluntariness and mental state in criminal law, it has been much less helpful for determinations of guilt or innocence.[21] Some proponents, including researchers, defense lawyers, defendants, and the media, have endorsed neuro-evidence and advocate for the use of such evidence by juries, prosecutors, and judges to establish criminal responsibility.[22] On the other hand, opponents argue that the reliability, validity, and psychological inferences of neuroscience in criminal decisions are far from obvious and determinant because researchers can never find a brain region explicitly indicating *mens rea* and responsibility.[23] Schweitzer and colleagues have conducted a series of experiments to examine the influence of neuro-evidence on several aspects of criminal proceedings in support of a *mens rea* defense.[24] They found no consistent impact of neuro-evidence on jury verdicts, sentence recommendations, or other legal decision-making processes.[25] With a brief overview of how neuro-evidence functions in determining guilt or innocence, this review focuses on its impact at the sentencing phrase.

Neuro-evidence has also been involved in, and will continue to influence, sentencing decisions with its general mitigating effect, especially in death penalty cases.[26] Determining sentences for criminals is complex, depends on

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[21] Farahany, *supra* note 9, at 501.
[22] Eyal Aharoni et al., *Can Neurological Evidence Help Courts Assess Criminal Responsibility? Lessons from Law and Neuroscience*, 1124.1 ANNALS N.Y. ACADEMY SCI. 145 (2008).
[23] *Id.*
[24] Nicholas J. Schweitzer et al., *Neuroimages as Evidence in a Mens Rea Defense: No Impact*, 17 PSYCHOL.
PUB. POL'Y & L. 357 (2011).
[25] *Id.*
[26] Farahany, *supra* note 9, at 486.

various factors, and varies by states.[27] In capital punishment cases, although the jury decides to recommend either death or life in prison, judges are generally the ones to make final sentencing decisions.[28] In criminal law and the philosophy of punishment of a crime, proportionality to the severity of the crime itself is crucial to ensure justice, also referred to as proportional justice.[29] When determining a proportional punishment for a crime or a criminal, judges evaluate both mitigating and aggravating circumstances, at least considering *mens rea* (criminal intent) and *actus reus* (actual behaviors).[30] Therefore, the argument, "I didn't do it—my brain made me do it," challenges the severity of *mens rea* and the culprit's criminal responsibility, as well as the principle of proportional justice, in the sentencing phase.[31]

Generally, neuroscientific evidence is used in cases where defendants are facing a severe sentence, such as the death penalty, a life sentence, or a substantial prison sentence.[32] One of the best-known uses of neuroscience in criminal trials is *Roper v. Simmons*,[33] which ruled out the death penalty for adolescents younger than eighteen who committed crimes due to brain developments and dysfunctions.[34] Since then, the use of brain imaging data

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[27] NEAL B. KAUDER & BRIAN J. OSTROM, STATE SENTENCING GUIDELINES: PROFILES AND CONTINUUM (2008), https://www.issuelab.org/resource/state-sentencing-guidelines-profiles-and-continuum.html [https://perma.cc/MD79-AEEW].

[28] Lisa G. Aspinwal et al., *The Double-Edged Sword: Does Biomechanism Increase or Decrease Judges' Sentencing of Psychopaths?* 337 SCI. 846–849 (2012) (in supplementary materials).

[29] John Deigh, *Punishment and Proportionality*, 33 CRIM. JUST. ETHICS 185, 199 (2014).

[30] Barry C. Field, *Adolescent Criminal Responsibility, Proportionality, and Sentencing Policy: Roper, Graham, Miller/Jackson, and the Youth Discount*, 31 L. & INEQ. 263 (2012).

[31] Farahany, *supra* note 9, at 494.

[32] Although there is a debate between capital punishment and its proportional nature, it is not the current focus of this review. *See generally* Andrew von Hirsch, *Proportionality in the Philosophy of Punishment: From "Why Punish" to "How much?"*, 1 CRIM. L.F. 259, 266 (1990).

[33] Roper v. Simmons, 543 U.S. 551 (2005).

[34] Field, *supra* note 30, at 272.

as a tool to reduce responsibility, sentencing severity, or both for criminal offenders has not only prevailed but also raised a hot legal debate.[35] The focus of the debate is on how neuro-evidence would and should impact the sentencing decisions of capital cases based on the principle of proportional justice.[36]

The scientific inference of neuro-evidence and its impact on the sentencing stage of a capital case tends to have a few obstacles to overcome. Historically, retribution, rehabilitation, deterrence, and incapacitation are the four corners of sentencing law.[37] When sentencing in criminal court, a judge has to apply a wide range of factors to make appropriate sentencing decisions.[38] The principle of proportionality in sentencing is crucial to balance between rehabilitation and punishment, to achieve fairness and justice when all of the circumstances are taken into account.[39] Since neuro-evidence challenges the notion of criminal responsibility, it inevitably raises concerns for sentencing proportionality and leniency in capital cases.[40]

To decide whether to impose a sentence of death or life in prison, judges, along with jurors, are required to make decisions about whether "the totality of the mitigating factors is sufficiently substantial to call for leniency."[41] Although evidence of brain damage or dysfunctionality may not be sufficient to exculpate an offender from criminal liability (in the guilt phase), it is still highly likely to be used to determine appropriate sentences, specifically in decisions between the death penalty and life without parole.[42] The penal

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[35] Denno, *supra* note 1, at 495.
[36] *Id.*
[37] Doris Layton Mackenzie, *Sentencing and Corrections in the 21st Century: Setting the Stage for the Future,* NCJRS (2001), https://www.ncjrs.gov/pdffiles1/nij/189106-2.pdf [https://perma.cc/C8TU-EVUB].
[38] *Id.*
[39] Elizabeth Bennett, *Neuroscience and Criminal Law: Have We Been Getting It Wrong for Centuries and Where Do We Go from Here*, 85 FORDHAM L. REV. 437, 452 (2016); *see supra* note 9.
[40] Denno, *supra* note 1, at 526.
[41] Bennet, *supra* note 39.
[42] *Id*. at 448.

system has an independent obligation to determine and question whether death is the appropriate punishment for the crime.[43]

Researchers have indicated that brain scans can be used to identify and support defendants' claims of diminished culpability due to circumstances beyond their control or free will in capital cases.[44] Empirically, a jury simulation experiment, which tested the influence of neuropsychological evidence on sentencing recommendations in death penalty hearings, found that neuropsychological evidence reduced the frequency of death penalty recommendations.[45] It seems that attempts to use neuroscientific evidence at the sentencing phase are far more influential than attempts at the liability (guilt or innocence) phase.[46]

II. COMPARISON BETWEEN TWO CONCRETE LEGAL CASES

A. State of Florida v. Hoskins (2007): Sentence of Death

In 1992, Johnny Hoskins was accused of raping and murdering his eighty-year-old neighbor, Dorothy Berger.[47] Both eyewitness accounts and DNA analysis of semen revealed that Hoskins was the suspect.[48] Before the second penalty phase proceeding of his trial, the trial judge denied Hoskins' mental health expert's request for a neurological test to develop mitigating evidence.[49] Hoskins was convicted of first-degree murder, burglary of a dwelling, sexual battery with physical force, kidnapping, and robbery, and

[43] *See generally* Philmore v. State, 820 So. 2d 919, 939-40 (Fla. 2002).
[44] *See* Farah Focquaert, Andrea L. Glenn, and Adrian Raine, *Free Will, Responsibility, and the Punishment of Criminals,* FUTURE PUNISHMENT & RETRIBUTION 247, 259–260 (Thomas A. Nadelhoffer ed., 2013).
[45] Greene, Edith, and Brian S. Cahill, *Effects of Neuroimaging Evidence on Mock Juror Decision Making*, 30(3) BEHAVIORAL SCI. & L. 280 (2012).
[46] Denno, *supra* note 1, at 499.
[47] Hoskins v. State*,* 702 So. 2d 202, 203–204 (Fla. 1997).
[48] *Id.*
[49] *Id.*

was sentenced to death.[50] The Supreme Court of Florida ordered the trial court to order a PET scan on Hoskins and evaluate the results, and because the PET scan showed a brain abnormality, the Supreme Court of Florida remanded the case for a new penalty phase proceeding.[51] In the new penalty phase proceeding, the jury recommended death by a vote of eleven to one.[52] Although Hoskins raised six claims for appeal, his death sentence was ultimately upheld in 2007.[53] This review will focus on his claim about problematic considerations of aggravators and statutory mental mitigators in his sentencing decision.

In the presence of neuro-evidence, the trial court concluded that Hoskins had a hypo-frontal lobe abnormality that could result in a reduced ability to control impulsivity.[54] Still, it was not a "mental or emotional disturbance," so it could not serve as a statutory mental mitigator.[55] Furthermore, Hoskins argued that he lacked the mental and emotional maturity to control his behaviors due to his brain abnormality and his mental age.[56] The trial court found that there might have been evidence to support this argument in terms of rape, but there was clearly no evidence to support this in relation to murder.[57]

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[50] *Id.*
[51] Hoskins v. State, 965 So. 2d 1, 6 (Fla. 2007).
[52] *Id* at 6.
[53] *Id.* at 7 (Hoskins's six claims were as follows: "(1) the trial court erred in overruling his objection to the State's use of a peremptory challenge to an African-American juror; (2) the trial court erred in limiting Hoskins's voir dire examination regarding the potential jurors' ability to consider "gory photographs" which were already in evidence; (3) the trial court erred in failing to give the requested limiting instruction on victim impact evidence at the time of introduction; (4) the trial court erred in denying Hoskins's requested jury instructions; (5) the trial court included improper aggravating circumstances, excluded existing mitigating circumstances, and failed to properly find that the mitigating circumstances outweighed the aggravating circumstances; and (6) Florida's capital sentencing process is unconstitutional").
[54] *Id*., at 17.
[55] *Id.*
[56] *Id.*
[57] *Id.*

The defendant's expert even testified that, while the frontal lobe impairment might explain the rape, there was no link between his brain impairment and his subsequent murder.[58] According to his expert's testimony, trying to avoid detection and covering up his crime showed that Hoskins knew what he did was wrong.[59] Hoskins' behavioral evidence outweighed his mental immaturity and brain dysfunctions; thus, the prosecutor argued that a series of Hoskins' behaviors showed elements of planning, indicating that he had a coherent and well-conceived plan.[60] Even though there were sixteen mitigating circumstances, the court found that low IQ, low mental functional ability, brain abnormalities, and mental age were non-statutory mitigators.[61] Therefore, there was no evidence that he could not have "appreciate[d] the criminality of his conduct" at the time of the murder, and the court, therefore, upheld the rejection of this mental mitigator.[62]

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[58] *Id.* at 18.

[59] *Id.* (Hoskins's purposeful actions in binding and gagging Ms. Berger before placing her in the trunk, driving to his parents' home six hours away, borrowing a shovel, driving to a remote area where he killed Ms. Berger, and then telling his brother he hit a possum when blood was noticed dripping from the rear wheel well were indicative of someone who knows his conduct is wrong).

[60] *Id.* ("Hoskins placed Ms. Berger in the trunk of the car, drove approximately six hours (stopping for gas and to change a fuse), stopped at his parents' house to borrow a shovel, drove to a remote location nearby, and eventually killed Ms. Berger by manual strangulation").

[61] *Id.,* at 6, 17–18 (The mitigating circumstances were: "(1) the Defendant formed and maintained loving relationships with his family; (2) the Defendant was a father figure to his siblings; (3) the Defendant protected his mother from his father's abuse; (4) low IQ; (5) low mental functional ability; (6) some abnormalities in the brain which may cause some impairment; (7) an impoverished and abusive background; (8) mental age equivalent (between fifteen and twenty-five); (9) the Defendant helped support his family financially; (10) the Defendant had and cared for many pets; (11) no disciplinary problems in school; (12) the Defendant suffered from poor academic performance and left school at age sixteen to work to help his family; (13) the Defendant was not malingering; (14) the Defendant expressed remorse; (15) potential for rehabilitation and lack of future dangerousness; and (16) good jail conduct, including death row behavior").

[62] *Id.* at 18.

The court's weighing of aggravating and mitigating factors was an important part of the process when sentencing Hoskins. Overall, the court discovered one statutory mitigator, fifteen non-statutory mitigators, and three aggravators.[63] The court indicated that any one of the aggravators, standing alone, far outweighed all of the mitigators.[64] In addition, the jury agreed that Hoskins' crime was especially heinous, atrocious, or cruel (HAC) because the victim was conscious before Hoskins hit and strangulated her.[65] The aggravating factor (HAC) of the offender's indifference, indicated by strangulation of a conscious murder victim, outweighed all previous mitigators including the brain scan.[66] The court found the death sentence was proportional.[67] In Hoskins' case, introducing a brain scan did not change the final sentencing decision.

B. State of Florida v. Nelson (2010): Sentence to Life without Parole

In 2005, Grady Nelson, a former county social worker's aide, was convicted of first-degree murder after he brutally stabbed his wife sixty-one times and raped his step-children in Miami-Dade County, Florida.[68] Nelson even left a butcher knife in his wife's head.[69] Despite his heinous crimes, the

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[63] *Id.* at 6, 18 (The three aggravators were as follows: "(1) the capital felony was committed during the course of or in flight after committing the crimes of robbery, sexual battery, or kidnapping; (2) the capital felony was committed for the purpose of avoiding or preventing a lawful arrest; and (3) the capital felony was especially heinous, atrocious, or cruel (HAC)").

[64] *Id.* at 19; *see also* Rogers v. State, 511 So. 2d 526, 533–535 (Fla. 1987) (the court recognizes that one mitigating factor was established but that did not outweigh the two aggravating circumstances).

[65] *See* Hoskins v. State, 965 So. 2d 1, 21 (Fla. 2007).

[66] *Id.* at 19.

[67] *Id.* at 22.

[68] David Ovalle, *Miami-Dade Jury: Man Guilty of Murdering His Wife*, THE PALM BEACH POST (2012), https://www.palmbeachpost.com/article/20100710/NEWS/812024762.

[69] Owen D. Jones et al., *Neuroscientists in Court*, 14 NATURE REVS. NEUROSCIENCE 730, 730 (2013).

jury decided to sentence him to life in prison without parole.[70] One of the major factors influencing this sentencing decision was neuroscientific evidence, quantitative electroencephalography (qEEG), offered by his defense attorney and introduced by a neuroscientist as expert testimony.[71] QEEG is a brain mapping technique that translates a patient's brain wave frequencies into a digital image of their brain.[72] This neuro-evidence revealed that Nelson had a brain abnormality or damage that had the potential to make him prone to impulsivity and violence.[73] His attorney insisted that although the neuro-evidence might not leave Nelson excusable or criminally irresponsible, it should mitigate his punishment.[74]

In order to sentence Nelson to death, the majority of the twelve jurors had to vote in favor of it.[75] However, the punishment vote was evenly split, six to six, which resulted in an automatic life sentence.[76] A follow-up interview with jurors indicated that the neuro-evidence did play a crucial role in their sentencing decisions; two jurors explicitly mentioned that the qEEG evidence changed their minds from favoring execution.[77] One juror said she leaned toward the death sentence until the neuroscience evidence was presented.[78] Similarly, the other juror indicated that he was ready to recommend death for

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[70] Terry Lenamon & Reba Kennedy, *QEEG Brain Mapping Evidence and Mitigation in South Florida's Grady Nelson Trial*, DEATH PENALTY (2010), https://www.deathpenaltyblog.com/qeeg-brain-mapping-evidence-and-mitigation-in-south-floridas-grady-nelson-trial/ [https://perma.cc/PE8P-DPRS].
[71] *Id*.
[72] Rachel Monroe, *A Map That Shows You Everything Wrong with Your Brain*, ATLANTIC (June 29, 2017), https://www.theatlantic.com/health/archive/2017/06/this-is-your-brain-on-qeeg/532035/ [https://perma.cc/5SH9-ZB7A].
[73] Jones et al., *supra* note 69.
[74] *Id.* at 730.
[75] *Id*. at 734.
[76] *Id*.
[77] Greg Miller, *Brain Exam May Have Swayed Jury in Sentencing Convicted Murderer*, AM ASS'N FOR ADVANCEMENT SCI. (Dec. 14, 2010), http://news.sciencemag.org/technology/2010/12/brain-exam-may-have-swayed-jury-sentencing-convicted-murderer [https://perma.cc/LU8X-NJ4Q].
[78] *Id*.

Nelson, but the qEEG swayed his decision.[79] Specifically, he said: "After seeing the brain scans, I was convinced this guy had some sort of brain problem."[80] In Nelson's case, the presence of neuro-evidence diminished his punishment by implying a brain dysfunction and mental incapacity, which ultimately dissuaded the jury from voting for the death sentence.[81]

C. A Comparative Analysis of Different Outcomes

The *Hoskins* and *Nelson* cases have similarities, but the handling of neuroscience evidence has led to different sentencing results. These two cases are comparable because both occurred in Florida, both involved murder and rape, and both had their brain images, revealing frontal lobe impairments, presented as a mitigator. Both defendants are black males and their victims were females.[82] To explain the difference in their sentences, I will analyze the following four aspects: (1) initial acceptance of neuro-evidence; (2) neuro-evidence with ineffective expert testimonies; (3) behavioral aggravators in the commission of a crime; and (4) the presentation of different technologies or brain images.

1. Initial Acceptance of Neuro-Evidence

As time goes by and technology advances, the interconnection between neuroscience and law is developing exponentially, receiving academic, political, and public attention. It seems that the legal zeitgeist of acceptance of neuro-evidence as criminal mitigation in 2007 was quite different than in 2010, with more positive attitudes in 2010. In Hoskins' case, the court initially denied the presence of his PET scan and only later accepted it after

[79] *Id.*
[80] *Id.*
[81] Jones et al., *supra* note 69, at 734.
[82] *Id.* at 730; *See also Sexual Offender and Predator System*, Florida Department of Law Enforcement (2010), https://offender.fdle.state.fl.us/offender/sops/flyer.jsf?personId=73686# [https://perma.cc/U5TV-3ZHW]; For Hoskins case, *see* Juan Ignacio Blanco, *Johnny Hoskins*, Murderpedia, the Encyclopedia of Murderers, https://murderpedia.org/male.H/h/hoskins-johnny.htm [https://perma.cc/4D2P-W3YS].

an appeal and another hearing; but this was not the case in *Nelson*, in which the court allowed the use of neuro-evidence in the first place.[83] Initial reactions to the presence of neuro-evidence as a mitigator reflect the legal culture and the degree of understanding of the relationship between neuroscience and criminal responsibility at that time. Due to an incomplete understanding of Hoskins' brain impairment and reluctant acceptance of his brain scan as a mitigator in the first place, the judge and jurors remained unpersuaded by the argument in favor of diminished criminal responsibility. In contrast, the formal admissibility of Nelson's qEEG result may have increased its perceived credibility in the eyes of jurors, thus increasing its mitigating effect. Therefore, the future admissibility of neuro-evidence, which influences how legal actors evaluate and weigh its persuasiveness, could be dependent on the court's current interpretation of the relationship between law and neuroscience.

2. Neuro-Evidence with Expert Testimonies

Defense attorneys have an obligation to conduct a "thorough investigation" of "all reasonably available mitigating evidence" for defendants facing the death penalty.[84] Courts repeatedly emphasize that one important mitigator is the defendants' cognitive and intellectual deficiencies.[85] Generally, a neuro-evidence expert talks about the results of neuropsychological and computerized neurocognitive tests, explains structural and functional imaging, and then draws conclusions regarding the meaning of specific brain impairments.[86] Determining the etiology of

[83] Jones et al., *supra* note 69, at 730; Hoskins v. State, 702 So.2d at 203 (Fla. 1997).
[84] *See* Wiggins v. Smith, 539 U.S. 510, 524 (2003) (stating that defense counsel's decisions in defending a client facing the death penalty must be based on a thorough investigation of all possible mitigating factors); Porter v. McCollum, 558 U.S. 30, 39 (2009) (quoting Williams v. Taylor, 529 U.S. 362, 396 (2000)).
[85] Deborah W. Denno, *How Prosecutors and Defense Attorneys Differ in Their Use of Neuroscience Evidence*, 85 FORDHAM L. REV. 453, 458, n. 26 (2016).
[86] *See* Ruben C. Gur et al., *A Perspective on the Potential Role of Neuroscience in the Court*, 85 FORDHAM L. REV. 547 (2016).

abnormalities or dysfunctions can be difficult because doing so requires clinical evaluation and integration with other medical and neurological histories.[87] When a neuroscientific expert is asked to offer opinions in the legal context, at a minimum, they must testify about what they know, remain updated in the field, and utilize the mitigating factors.[88] Their testimonies on neuroimaging findings must meet standards of scientific validity.[89] As mentioned before, neuroscience evidence is an influential mitigating factor for some jurors, which can lead to life in prison rather than to the death of a defendant.[90]

In Hoskins' case, although a PET scan showing his frontal lobe impairment was presented, the expert neither made an association between brain damage and the murder nor offered the mitigating effect. On the other hand, the defense attorney and the expert for Nelson's case supported the correlation between brain impairment and Nelson's violent behaviors.[91] Since the procedure for preparing expert testimony and reporting the neuroimaging findings is complicated, the expert testimony tends to be persuasive.[92] Non-expert jurors weigh such experts' testimonies alongside other evidence, which is presented by both sides.[93] Therefore, the statements made by neuroscience experts can be influential for both the judge and jury to determine the final sentence.

3. Behavioral Aggravators in the Commission of a Crime

Both the *Hoskins* and *Nelson* case involved an overwhelming number of horrendous aggravators. However, one noticeable difference manifested in

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[87] *Id.* at 565.
[88] *Id.*
[89] *Id.*
[90] Denno, *supra* note 1, at 457.
[91] Jones et al., *supra* note 69.
[92] William A. Woodruff, *Evidence of Lies and Rules of Evidence: The Admissibility of fMRI-Based Expert Opinion of Witness Truthfulness*, 16 N.C. J.L. & TECH 124 (2014).
[93] *See generally* Sanja Kutnjak Ivković & Valerie P. Hans, *Jurors' Evaluations of Expert Testimony: Judging the Messenger and the Messag*e, 28 L. & SOC. INQUIRY 441 (2003).

the type of behavioral aggravators. Hoskins showed a clear intention to avoid detection and tried to cover up his crime, whereas Nelson did not; instead, he confessed the first opportunity. In Hoskins's case, the jury revealed the following three aggravating circumstances:

- The capital felony was committed during the course of or in flight after committing the crimes of robbery, sexual battery, or kidnapping with a vote of twelve to zero;
- The capital felony was committed for the purpose of avoiding or preventing a lawful arrest with a vote of twelve to zero; and
- The capital felony was heinous, atrocious, or cruel (HAC) with a vote of ten to two.[94]

The jury and court indicated that any one of the aggravators alone far outweighed all of the mitigating factors.[95]

It seems that the folk-psychological model of criminal responsibility is still central to explaining human behavior in a legal context.[96] Scientific findings, whether from neuroscience or other sciences, will only be useful if they help to validate and clarify the law's normative-psychological standards.[97] These two different sentencing results are consistent with the notion that we hold people and their behaviors responsible and punishable, not their brains; "therefore, actions speak louder than images."[98] Besides, neuroscience can hardly identify the presence, absence, or diminished level of specific *mens rea*, let alone rely on technology to predict future dangerous or criminal behaviors or recidivism.[99]

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[94] Hoskins v. State, 965 So. 2d 1, 6 (Fla. 2007).
[95] *Id*. at 19.
[96] Morse, *supra* note 3, at 256.
[97] *Id.* at 253.
[98] *Id*. at 268.
[99] *Id*. at 274.

4. The Presentation of Different Technologies

Although it is nearly impossible to conclude that a specific brain region controls a particular behavior or human function, research continues to make relative inferences. A PET scan uses radioactive tracers to detect increased blood activities within the brain.[100] It can pinpoint and evaluate brain abnormalities.[101] However, the brain image is rough and challenging to interpret.[102] As discussed earlier, qEEG is a brain mapping technique using people's brain electrical frequencies to determine a specific pathology, different activity pattern, or deviation from the norm; its visual presentation seems to be quantitative, clear, and compelling for laypeople.[103] Although it is uncertain whether differing visual presentations of neuro-evidence influence qEEG's perceived believability and persuasiveness, its impact, on jury's and judges' evaluations and sentencing recommendations may still have a real effect.[104]

III. CRITICAL CONSIDERATIONS FOR USING NEUROSCIENCE EVIDENCE

A. Reliability and Psychological Inference of Brain-Image Technology

While the interconnection between neuroscience and law is promising and rapidly developing, there are several critical methodological cautions with neuro-technologies and their implications in legal contexts. There are many types of brain imaging techniques, with many accompanying ways to be interpreted and presented.[105] For example, PET scans use radioactive tracers

[100] Cheryl J. Aine, *A Conceptual Overview and Critique of Functional Neuroimaging Techniques in Humans: I. MRI/FMRI and PET*, 9 CRITICAL REV. NEUROBIOLOGY 229, 230 (1995).
[101] *Id.*
[102] Owen D. Jones et al., *Brain Imaging for Legal Thinkers: A Guide for the Perplexed*, 2009 STAN. TECH. L. REV. 5 (2009).
[103] Aine, *supra* note 100.
[104] Gur et al., *supra* note 86, at 568.
[105] Jones et al., *supra* note 102.

to detect blood concentrations in different brain regions which are associated with brain functions; an electroencephalogram (EEG) analyzes event-related potentials (ERP) to estimate brain processes underlying perceptual, cognitive, and motor activities; and functional MRI detects changes in hemodynamic properties of the brain which typically occur when engaging in particular mental tasks.[106] Although it is rare, there is a famous example where neuroscientists go "fishing" for results, and there may be more that is uncovered or unreported.[107] The reliability of neuro-technologies can also be compromised by inappropriate experimental protocols, operational incompetence, inaccurate interpretation, and so forth.[108] It is vital to bear in mind that brain images are the result of a process within a process.[109] In other words, many decisions and steps are involved in determining exactly when and what data should be collected and how the data should be analyzed and presented.[110] The room for technical and statistical mistakes and misinterpretations can be significant.[111] Thus, complex neuro-technologies may or may not be reliable, generalizable, and replicable.[112]

Another significant concern is the psychological inference of neuro-images: whether the brain image can make a statement about one's *mens rea* and *actus reus* in legal contexts. First, brain images do not speak the significance and inference for themselves. Even well-designed, well-executed, properly analyzed, and properly presented brain images must be

[106] *Id.*
[107] Craig M. Bennett et al., *Neural Correlates of Interspecies Perspective Taking in the Post-Mortem Atlantic Salmon: An Argument for Proper Multiple Comparisons Correction*, 1 J. SERENDIPITOUS & UNEXPECTED RESULTS 1 (2009). For a crique of the Salmon paper, *see* Louisa Lyon, *Dead salmon and voodoo correlations: should we be skeptical about functional MRI*? 140 BRAIN 1–5 (2017).
[108] Jacqueline Sullivan, *Experimentation in Cognitive Neuroscience and Cognitive Neurobiology*, HANDBOOK OF NEUROETHICS 31–47 (2015).
[109] Jones et al., *supra* note 102, at 10.
[110] *Id.*
[111] *Id.*
[112] *Id.*

interpreted in the correct context.[113] Second, neuro-images only show brain activations for specific tasks but do not indicate particular types of thoughts that require a series of inferential steps.[114] Many brain regions are involved in a wide variety of functions.[115] Correlation between brain abnormalities and violent behaviors is not causation because other explanations can exist.[116] Third, identifying structural abnormalities in the brain, dysfunction, and dysfunctional connectivity is complicated and subject to enormous variation. To say precisely "*how* uncommon a given feature or functional pattern could be, even if it appears to be atypical" is challenging.[117] And we do not know the base rates for the connection between a brain abnormality, mental incapacities, and problematic behavioral manifestations.[118]

Finally, the meaning of brain images is not straightforward or self-evident. Inferring its psychological significance depends not only on the expert analysis but also on the specific context in court.[119] Usually, a brain scan is required long after the criminal activity. People's brains do change with time and interact with experiences.[120] For instance, decreased brain activation may result either from a cognitive impairment or less cognitive effort.[121] Additionally, some brain regions may become structurally or functionally abnormal during the time between crime and arrest.[122] How to make sure the same mindset or brain damage occurs during the criminal activities is unclear, thus making the causal inferences and psychological significance more complicated.

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[113] *Id.*
[114] *Id.*
[115] Jones et al., *supra* note 69, at 734.
[116] *Id.*
[117] Jones et al., *supra* note 102, at 11.
[118] *Id.*
[119] *Id.*
[120] Bryan Kolb & Robbin Gibb, *Brain Plasticity and Behaviour in the Developing Brain*, 20 J. CAN. ACAD. CHILD & ADOLESCENT PSYCHIATRY 265 (2011).
[121] Jones et al., *supra* note 102, at 11.
[122] *Id.*

In sum, methodological cautions, such as voxel detection for statistical significance, estimation of effect size, technology reliability, and the subsequent challenge of making legal and psychological inferences are pronounced.[123] Researchers who specialize in the intersection of neuroscience and law have acknowledged and studied these potential issues.[124] Instead of entirely preventing the use of neuro-evidence, its application should be careful, specialized, and context-specific.[125]

B. Admissibility and the Translation to Courts

The application of neuroscience in the courtroom has, will, and should vary by context.[126] During the last decade, neuro-evidence has been accepted as a mitigator in sentencing decisions of a variety of types, such as fMRI, EEG, qEEG, PET scan, and others.[127] Currently, more brain imaging technologies have developed, but their applications in courts creates difficulties for judges and juries.[128] The criteria for admissibility, appropriate interpretations, proper visual presentations, and potential mitigating impacts on juries and judges are all challenging, uncertain, and require more cautious evaluations.[129] Since the admissibility of neuro-evidence in courts is highly context-specific, more research and evidence are needed to supplement the existing standards.[130]

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[123] Jones & Shen, *supra* note 2; *see also* Stephan Schleim & Jonathan P. Roiser, *fMRI in Translation: The Challenges Facing Real-World Applications*, 3 FRONTIERS HUM. NEUROSCIENCE 63 (2009).
[124] Jones & Shen, *supra* note 3.
[125] *Id.*
[126] *Id.*
[127] *Id.*
[128] Denno, *supra* note 1, at 497.
[129] *See* Walter Sinnott-Armstrong et al., *Brain Images as Legal Evidence*, 5 EPISTEME 359, 360–61, 368, 371 (2008).
[130] At least in the federal system, courts primarily apply Federal Rules of Evidence 403 and 702. FED. R. EVID. 403 (allowing for the exclusion of relevant evidence "if its probative value is substantially outweighed by a danger of… unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence"); FED. R. EVID. 702 (allowing an expert witness to testify if "(a) the expert's

Neuroscience is valuable not because it creates something new but instead because it explains the normative behaviors and folk-psychological concepts within the legally relevant domain. As mentioned in the previous section, the translation of brain, mind, and behavior in legal contexts is one of the most challenging problems.[131] We still do not know how neuro-images, mental states, and actions are related, nor how the brain specializes or works generally.[132] The legal relevance of neuroscience is limited,[133] let alone its translation into capital punishment cases. Consequently, neuro-evidence admissibility may require caution and regulations.

C. Persuasiveness and Neuro-Exuberance

The concept of neuroscience, by its nature, tends to be inherently persuasive and influential.[134] For juries and judges who do not understand the science behind neuro-research, neuroscience tends to have its technological "hotness" which can inflate its persuasive power and legal relevance in sentencing.[135] Some experts believe that neuroscience is attractive because many legal professionals think it can be a useful supplement to traditional social science, and, in some contexts, it is even "more objective and powerful."[136] In this way, neuro-evidence can be potentially over-persuasive and allow juries and judges to draw legal inferences that are mistakenly understood or challenged by specialized researchers.[137] As a result, legal

scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based on sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert has reliably applied the principles and methods to the facts of the case.").

[131] Morse, *supra* note 20.

[132] *Id*., at 58–60.

[133] *Id*., at 60–61.

[134] *Id*., at 66–68.

[135] Jones et al., *supra* note 69, at 730.

[136] *Id.*

[137] *Id*. at 731.

agencies should be more cautious about the inherent persuasiveness of neuro-evidence in courtrooms.

Moreover, advances in neuroimaging technologies partially contribute to a source of the neuro-exuberance.[138] Because of the fanciness and the artificial colorfulness of those neuro-technologies, they are more likely to be convincing about their implications within conceptual and legal aspects.[139] Dr. Stephen Morse has termed this phenomenon as "brain overclaim syndrome (BOS)" in order to prevent misuse of the term "neuro-evidence."[140] When facing these neuroscience information, people tend to be fascinated and exaggerate their persuasive power.[141] Since most people are against the ideology and practice of retributive justice, they may hope neuroscience becomes powerful enough to convince law and policymakers that current crime control strategies are not sufficient.[142] Consequently, the only logical solution seems to be that the criminal justice system should turn its attention to prevention programs, social control, and social justice.[143]

Newspapers and other media outlets increasingly report on neuroscience findings and their applications in courts for the public with inaccurate narratives.[144] However, the ways in which the media report this information need to be taken with a large grain of salt.[145] The media may oversimplify or distort the neuroscience knowledge behind the case, thereby leading to a misunderstanding or mis-conclusion by the public.

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[138] Morse, *supra* note 20, at 43.
[139] *Id.*
[140] *Id.*
[141] Deena Skolnick Weisberg, et al., *The Seductive Allure of Neuroscience Explanations*, 20 J. COGNITIVE NEUROSCIENCE 470 (2008).
[142] *See* Morse, *supra* note 20, at 44.
[143] *Id.*
[144] Denno, *supra* note 1, at 497.
[145] Patrick Verel, *Professor Warns of Improper Use of Neuroscience in Courtroom*, FORDHAM NEWSROOM (2019), https://news.fordham.edu/law/professor-warns-of-improper-use-of-neuroscience-in-courtroom/ [https://perma.cc/C9UZ-4SJ7].

In addition, the professional language or jargon used in both law and neuroscience can lead to an epistemic ignorance.[146] This ignorance not only affects people's judgments and evaluation of neuroscientific information, but also makes the neuro-evidence more persuasive, even beyond what is actually merited by the data.[147] Some researchers have even found that neuroscience information containing inaccurate explanations of psychological significance tends to be more satisfying than that indicating guilty verdicts in a mock trial.[148] Thus, the credibility, reasoning, and application of neuro-evidence in the courtroom require critical and cautious evaluations to avoid over-inference because no science, including neuroscience and behavioral genetics, can prove or disprove the existence of free will and *mens rea*.[149]

IV. A NEW WAY FORWARD AND IMPLICATIONS

A. Proposal for Guidelines of Neuro–Evidence

People tend to find neuro-evidence more intriguing and convincing than other types of evidence.[150] Without a formal and standardized protocol, neuro-evidence will likely be misused and misunderstood.[151] Several possible guidelines are offered below to address the foregoing concerns. The application of neuro-evidence to sentencing decisions, particularly for capital cases, may be improved by following these seven suggestions.

Suggestion 1. When requiring neuro-evidence as a mitigator, brain images must be obtained by qualified professionals who must hold their PhD or M.D. in relevant disciplines, such as cognitive psychology, neuroscience, or

[146] Linda Martion Alcoff, *Epistemologies of Ignorance: Three Types*, in RACE AND EPISTEMOLOGIES OF IGNORANCE 39 (Shannon Sullivan & Nancy Tuana eds., State Univesity of New York Press, 2007).
[147] Weisberg et al, *supra* note 141, at 470.
[148] *Id*. at 477.
[149] Morse, *supra* note 20, at 55.
[150] Weisberg et al., *supra* note 141.
[151] Jones et al., *supra* note 102.

psychiatry. They must also have at least five years of experience in doing related research and practice.

Suggestion 2. Due to the salience of visual features, such as the color-coding within brain scan images, brain images should be presented with only dark colors (*i.e.*, greyblack spectrum) in front of juries and judges. Dark-colored images aim to eliminate the potential bias stemmed from visual attractiveness.

Suggestion 3. Brain images also must be analyzed, interpreted, and presented by qualified experts. Because of the adversarial nature of the court system, it is better to ask for expert testimonies from both sides (i.e., prosecutor and defense attorney) to ensure equity and justice. If only one party presented neuro-evidence as a tool for pursuing its favored sentencing outcomes, juries and judges might (even unintentionally) offer biased recommendations and decisions.

Suggestion 4. Before presenting neuro-evidence in court, academic researchers and practitioners must give jurors and judges a brief science education. They should offer, at most, a one-page document or a five-minute talk in plain English to explain the nature of neuroscientific inferences. They should also actively let juries and judges know about the general "promise and potential pitfalls" of neuroscience research and its limited implications in the legal context.[152] After all, people with the same diagnoses or brain damages can behave differently, and ultimately, it is the behavior that is legally relevant, not the brain.[153] Without acknowledging both appropriate inferences and drawbacks of neuro-evidence, jurors cannot make fair and well-informed decisions.

Suggestion 5. When jurors evaluate the neuro-evidence as a mitigator in final sentencing recommendations, the court should recommend that each juror vote on its mitigating effect. As a result, when the judge decides final

[152] *See generally* Morse, *supra* note 20.
[153] *Id.*

sentencing, they will be able to weigh and critically evaluate the mitigating impacts of neuroscientific evidence. The judge can make sentencing decisions based on the vote ratio as sentencing recommendations in criminal trials do not need a unanimous jury vote. This suggestion provides an alternative option for judges to correct observed biases from jurors' decisions.

Suggestion 6. Since the brain changes over time, the court should request new neuro-evidence, or brain images, if the defendant appeals and requests a resentencing hearing. That way, judges and jurors can make judgments informed by either the stability or changes of the brain impairments that were evaluated in previous sentencing decisions. If new brain images reveal significant signs of a reduced risk factor (*i.e.*, more functional connectivity in the prefrontal cortex) or a lesser degree of impairment, judges and jurors may consider resentencing. In addition, to ensure the integrity of the proceedings, attorneys should recruit new experts to analyze and interpret the brain scans. If the same experts are used, they may unintentionally be biased or over-interpret the neuro-evidence due to their previous exposure to the case. Whenever resentencing is mentioned, we should proceed with extreme caution when using either contemporary or outdated evidence.

Suggestion 7. Although neuro-evidence is compelling and persuasive, it must be accompanied by other psychological and behavioral assessments to determine criminal responsibility and sentencing decisions. One example would be the MacArthur Competence Assessment Tool-Criminal Adjudication (MacCAT-CA).[154] Using a vignette of a crime situations, the tool asks a defendant questions about the scenario and his or her own situation.[155] Although the MacCAT-CA is primarily used for assessing competency to stand trial, its ability to capture a defendant's cognitive level

[154] Patricia A. Zapf & Jodi L. Viljoen, *Issues and Considerations Regarding the Use of Assessment Instruments in the Evaluation of Competency to Stand Trial*, 21 BEHAVIORAL SCI. & L. 351 (2003).
[155] *Id.*

and reasoning ability is the primary focus here. In addition, the Minnesota Multiphasic Personality Inventory (MMPI-2) can detect malingering and feigned cognitive impairment.[156] Practitioners should use multiple measurements to evaluate the inferences concluded from neuro-evidence.[157] After all, the application of neuroscience in law should explain the normative and behavioral phenomena.[158]

In short, neuroscience is a vital tool in making decisions in legal contexts. However, only under proper and formal guidelines can neuro-evidence application ensure fairness. These suggestions make sense, given the concerns about over-interpretation and mis-inferences of neuroscience information in courts. It is important to remember that the legal standards for criminal activities existed long before neuroscience studies emerged. Without undermining the normative significance of law, we must keep reasonable skepticism and continue to learn about the mitigating capacities of neuro-evidence in sentencing decisions. Neuro-evidence should be convergent and increase one's confidence in conclusions.[159] Remember, the proffered neuro-evidence is usually additive and indirectly relevant, and the brain-mind-behavior connections still need more research.[160] Consequently, following these suggestions will hopefully minimize the errors of neuro-evidence, neuro-exuberance, and the "brain overclaim syndrome" made in the legal system.[161]

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[156] Allyson J. Sharf et al., *The Effectiveness of the MMPI-2-RF in Detecting Feigned Mental Disorders and Cognitive Deficits: a Meta-Analysis*, 39 J. PSYCHOPATHOLOGY & BEHAVIORAL ASSESSMENT 441 (2017).
[157] Kirk Heilbrun et al., *Principles of Forensic Mental Health Assessment: Implications for Neuropsychological Assessment in Forensic Contexts*, 10 ASSESSMENT 334 (2003).
[158] Morse, *supra* note 20, at 64.
[159] *Id.*
[160] *Id.*
[161] *Id.* at 43.

B. Future Challenges to Neuro-Law and Neuro-Ethics

Neuroscience in the court itself may raise the debate of civil liberties in the big picture, especially without formal guidelines. One of the major problems is that of neuro-prediction, which may influence sentencing decisions in non-capital cases.[162] Neuro-technology has been shown to increase the ability to make accurate predictions of various types of behaviors, which include criminal and antisocial behaviors.[163] If technology can predict socially deviant and criminal behaviors with relative accuracy, there may be a tendency to punish people for crimes that they have yet to commit. Likewise, if neuroscience can predict recidivism, there may be an inclination to use it for public safety by incarcerating certain groups of offenders longer.[164] In order to reduce recidivism, courts may resort to the solution of punishing offenders before they commit another crime. Obviously, both situations may lead to significant civil liberty problems.

According to court's focal concerns perspective, neuro-evidence could potentially be used to show aggravating factors in sentencing decisions in less serious cases.[165] Society already considers certain types of predictions as justifiable and beneficial, and doing so more accurately may be tempting.[166] However, overreliance on neuroscience in legal contexts may threaten people's civil liberties. Labeling effects, stigmatization, and racial or ethnic discrimination will become collateral consequences.[167] In the foreseeable future, neuroscience may not be sufficiently advanced to influence the law or accurately predict future criminal behaviors. Consequently, neuro-prediction

[162] Greely T. Henry & Farahany A. Nina, *Neuroscience and the Criminal Justice System*, 2 ANNUAL REV. OF CRIMINOLOGY 451 (2019).
[163] Stephen J. Morse, *NeuroEthics: NeuroLaw* in OXFORD HANDBOOKS ONLINE 1, 25 (Sandy Goldberg ed., Oxford University Press, 2017).
[164] *Id.*
[165] Alexes Harris, *Attributions and Institutional Processing: How Focal Concerns Guide Decision-Making in the Juvenile Court*, 1 RACE & SOC. PROBS. 243–256 (2009).
[166] Presidential Commission for the Study of Bioethical Issues, GRAY MATTERS: TOPICS INTERSECTION NEUROSCIENCE, ETHICS, & SOC'Y 97 (2015).
[167] *See* Morse, *supra* note 20, at 74.

will not only face large political resistance, but will also be subjected to constitutional challenges.[168]

Furthermore, neuro-ethics has become an academic domain receiving increasing attention.[169] Enormous legal, societal, and ethical issues need to be considered when using neuroscience to inform criminal responsibility, culpability, and sentencing decisions based on neuro-evidence and neuro-predictions.[170] Even though sentencing decisions are the most common context for the introduction of neuro-evidence, the use of neuro-evidence may "continue to be haphazard, ad hoc, and often ill-conceived."[171] Judges and jurors generally are not good at evaluating neuro-evidence, and they may either be too critical or too uncritical for the application of neuroscientific information in sentencing decisions.[172] But in some less severe cases, judges are more likely to ask for neuroscientific evidence to help solve legal problems.[173] This paradox will raise questions about the extent that neuro-evidence could apply to moral, political, and legal analyses, and will thus draw appropriate conclusions within the ethical domain.[174] Neuroscience in a vacuum is a robust form of evidence, but its relevance in law and ethics might not be, even far from having a causal influence on sentencing. New ethical and legal theories and propositions will be needed to address this dilemma and set guidelines to move forward.[175]

CONCLUSION

The interconnection between neuroscience and law generates increasing attention and debate. When neuro-evidence is used to decide whether

[168] *Id.*
[169] Martha J. Farah, *Neuroethics: The Ethical, Legal, and Societal Impact of Neuroscience*, 63 ANN. REV. PSYCHOL. 571 (2012).
[170] *Id.*
[171] Farahany, *supra* note 9, at 488.
[172] Morse, *supra* note 163, at 38.
[173] *Id.* at 40.
[174] *Id*. at 24.
[175] *Id.* at 45.

someone lives or dies, how that evidence is evaluated and inferred matters significantly. From a comparison of two cases, *State of Florida v. Hoskins* and *State of Florida v. Nelson*, it is clear that several circumstantial considerations can make sentencing decisions different. However, the underlying mechanism of how neuro-evidence serves as a mitigator in various stages in determining criminal responsibility, culpability, and proportionality of sentencing is far from conclusive. Instead, neuroscience studies and techniques in their current stages make limited contributions to producing a more fair and accurate criminal justice system.[176] Therefore, we should be skeptical and critical in evaluating the mitigating effects of neuro-evidence in legal contexts to prevent problems such as neuro-exuberance, over-interpretation, and "brain overclaim syndrome."[177]

Although there are reasons to be cautious, the interconnection between neuroscience and law is still promising in understanding criminal behaviors as long as such multidisciplinary research becomes more mature, replicable, ecologically valid, and normatively informative in law. Although it is unlikely to drive a radical reform of the criminal justice system, neuroscience can still influence law in the future.[178] Although the mitigating effect of neuro-evidence in sentencing decisions is multidimensional and complicated, adopting a guideline for how to apply such evidence could disentangle its complexity and formally regulate its application in the legal system.

[176] Morse, *supra* note 20, at 68.
[177] *Id*. at 43.
[178] *Id*. at 59.