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Neuroimaging and Jury Decision Making: In Defense of The Defense?

Alana A. Snyder
The University of Akron, alana.a.snyder@gmail.com

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AUTHOR

Alana Snyder, Bachelors of Science in Biology, The University of Akron 2016

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ABSTRACT

Neurobiological evidence in the form of brain scans (MRI images, PET images, etc.) is being introduced with increasing frequency in the courtroom as potentially mitigating evidence in criminal cases as part of an attempt to show regions of neurological abnormality affecting a defendant's decision-making or emotional control. Empirical studies have shown two biases associated with the presentation of such evidence. One of these biases resides in that laypeople's interpretation of such evidence may be weighted too heavily towards scientific fact – as is DNA evidence – rather than an association between a specific crime, and a brain region and its associated function. The second of these biases resides in jury members' skepticism of expert neutrality, thus discrediting the presented evidence and prohibiting it from being factored into the decision process, as it should. In lieu of previous studies, this review will outline relevant findings that lead to the proposal of a novel delivery of neuroimaging in the courtroom to decrease the layman's perceived bias.

INTRODUCTION

The distinction between right and wrong – or guilty and not guilty – is becoming increasingly difficult to make courtesy of the continuous strides in scientific research. In 1986, DNA evidence was first introduced in the courtroom as admissible evidence. Since then, it has fought a long battle of credibility in order to become the most standard method of identification in our jurisdiction process.[1] In it's early days, before becoming a rather trusted standard, DNA evidence was under pressure to be monitored and further controlled before becoming admissible. The New York Supreme Court enacted a list of requirements for DNA evidence use including, but not limited to, the following: (1) all copies of laboratory results including those that did not suffice the defendant's argument would be presented to the court along with an explanation of statistical probability and all associated calculations, (2) all laboratory errors or defects would be recorded and a copy of such events would be provided to the court, and (3) a list of all those accompanying the lab reports to date would be recorded and provided to the court.[2] These requirements allowed for the admissibility of DNA in the courtroom to be structured and monitored – protecting the prosecutors credibility in jurors' eyes in the presentation of such information, the defendant from the presentation of tainted or insignificant DNA

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[1] Mark Joseph Stern, EVOLUTION OF DNA EVIDENCE FOR CRIME SOLVING - A JUDICIAL AND LEGISLATIVE HISTORY FORENSIC MAGAZINE FORENSIC MAGAZINE,) http://www.forensicmag.com/article/2005/01/evolution-dna-evidence-crime-solving-

evidence leading to unjust sentencing, and the jurors from being exposed to evidence that may not be of credible merit leading to bias decisions and sentencing.

Similar to DNA evidence in its earliest days, neurobiological imagery in the form of Magnetic Resonance Images (MRIs), Positron Emission Tomography Scans (PET), and Functional Magnetic Resonance Images (fMRIs) is slowly making its way into courtrooms as permissible mitigating evidence. Defense attorneys are increasingly presenting this neurobiological imagery as mitigating evidence, that is, evidence to reduce a defendant's sentence in length or severity. The use of such information is on a case-by-case basis; in other words, there is no higher standard or requirement for the use of neurobiological imagery information as there is for the use of DNA evidence. If the scientific evidence conforms to the admissibility standards of Frye and Daubert from the 1990's, neurobiological imagery is accepted as evidence.[3,4] Francis Shen, Professor of Law at The University of Minnesota, clarifies that current methods of brain imaging can easily point out areas of significant brain damage; however, imaging of more minute detailed brain defects in diseases and personality disorders, such as schizophrenia, bipolar disorder, etc., is still a ways off.[5] It is unclear if the science behind this information is

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[2] *Id*

[3] ADMITTING DOUBT: A NEW STANDARD FOR SCIENTIFIC EVIDENCE, 121 HARVARD LAW REVIEW 2021-2042.

[4] Frye and Daubert standards are the archaic mechanism of determining the allowance of expert testimony in the courtroom; these standards aim to regulate the relevance, and soundness of the scientific backing of the information being presented.

[5] Greg Miller, THE BRAIN GETS ITS DAY IN COURT THE ATLANTIC (2016), http://www.theatlantic.com/science/archive/2016/03/neurolaw-brain-scans-court/471615/ (last visited Oct 18, 2016).

advanced enough to be used in a trial that could possibly determine life or death, as many cases do which present neurobiological mitigating evidence. Because these technologies can not create an image of specifically outlined diseases and disorders, instead, gross neurobiological images are used and interpreted by expert analysis in order to determine if there is a biological basis for a defendant's decreased culpability of guilt. Experts are to interpret neurobiological evidence and propose an association between brain function or structure as indicated in the images and the defendant's level of culpability. While the scientific evidence backing neurobiological imagery remains speculated and the significance of such evidence left only to interpretation, such evidence is nevertheless being presented as possible mitigating evidence in order to decrease the perceived culpability of guilt of the defendant.

The difference between DNA evidence and these neurobiological images is the association between such evidence and a defendant's perceived guilt; DNA evidence has become a trusted method of determining guilt with definitive certainty and scientific significance while neurobiological imagery remains questionable in certainty and significance and – importantly – is not being used to determine guilt, but rather culpability. This is an essential differentiation to make in the analysis of neurobiological evidence. A defendant's guilt is not in question, it is his/her level of mental responsibility *for* their guilt that the neurobiological evidence is relevant towards.

While Frye and Daubert standards may caution that the images presented as evidence follow scientific standard and are generally accepted within the field of neuroscience, the standards do not take into account the limited and often insignificant association between defects in imaged brain regions and an individual – or defendants – culpability of actions in question.[6] To clarify this association in layman's terms, if DNA evidence is properly tested, the results can be trusted to a specific degree of certainty; even if neuroimaging is properly measured and imaged, the results still need to be interpreted by an expert without certainty for the jury to understand and then integrate into their decision at their own interpretation of the science.

Neurobiological evidence, to date, is presented to the jury by the defense team's appointed expert and followed by the prosecutorial team's cross-examination. In continuing with this delivery, the scientific impact of such evidence on the justice system is limited by a few distinctive biases. Previous jurors that were surveyed responded that while they believed experts to be knowledgeable on the subject matter at hand, they also believed than an expert would provide biased information due to influence by the side that called them to testify.[7] Due to this preconceived perception of experts, the information they present is not always factored into a decision with as much weighing factor as it merits because the persuasiveness of expert analysis is scrutinized and labeled

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[6] *Id* at 3, Neuroimaging is subject to being misconstrued by jury's previous experience, background knowledge, understanding, and attitude towards neuroscientific information.

[7] Shari Seidman Diamond, Beyond Fantasy and Nightmare: A Portrait of Frye the Jury , 54 BUFF . L. REV. 717, 746 (2006).

as possibly biased by jurors.[8] Conversely, jurors who are completely trusting of an expert's neutral relationship to both the defense and prosecution may be affected by a bias of different sort. Presentation of neurobiological information from an expert is presented with guided questions from the defense team – in terms of a mitigating hearing. By the time a jury sees and hears even pseudo-scientific seeming evidence from a trusted source, it is observed that juries do not always interpret the information reasonably considering the scientific merit of the evidence.

Peter Neufeld, cofounder of the Innocence Project and expert in jury response to scientific data, stated in an interview that after a jury is presented this information for the first time, it is too late for a cross-examination of nearly any strength to make the science seem any less infallible.[9] Considering these biases, the reasoning behind admission of neuroimaging into the courtroom must be strong. MRI, PET scans, and fMRI images are the court's first look into the defendant's brain. Previously, the status of the defendant's brain, including psychiatric and behavioral attributes, was speculated solely based on previous actions and clinical observations in order to determine the current level of culpability or responsibility for a specific crime. Brain scans provide the irreplaceable

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[8] Shari Seidman Diamond & Jonathan D. Casper, Blindfolding the Jury to Verdict Consequences: Damages, Experts, and the Civil Jury , 26 LAW & SOC 'Y REV . 513, 558 (1992).

[9] Mark Joseph Stern, SERVING ON A JURY? THE SCIENTIFIC FORENSIC EVIDENCE YOU'LL HEAR ISN'T SCIENTIFIC. SLATE MAGAZINE (2014), http://www.slate.com/articles/health_and_science/science/2014/06/forensic_science_is_biased_and_inaccurate_but_juries_believe_it_and_convict.html (last visited Oct 19, 2016).

evidence that some brains are more capable than others of higher processing, decision-making, and future planning of actions that are "right" or "wrong." [10]

Neurobiological imagery has provided the scientific backing for legal differentiation of mentally disabled and adolescent persons and physiologically "normal" adult persons.[11,12] On MRI, we see that an adolescent brain is underdeveloped affecting the ability to make these decisions of right and wrong that require higher processing.[13] This inability of processing due to underdeveloped brain regions provides adolescents a safeguard from receiving the death penalty. Cases like Miller v. Alabama and Roper v. Simmons have upheld the standard that adolescents cannot be tried and charged as adults for receipt of the death penalty thanks to a better understanding of the neuroscientific differences of these individuals.[14,15] By courts recognizing the relationship between

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[10] Adolescence, Brain Development and Legal Culpability, AMERICAN BAR ASSOCIATION (2004)

[11] *Id at* 10

[12] *Atkins v. Virginia*, 536 U.S. 304 (2002) Before this case, the courts did not categorize mentally disabled as ineligible for the death penalty. By 2002, the courts recognized that this was not in code with the standard of decency they unhold.

[13] Carroll, Jenny E. "Brain Science and the Theory of Juvenile Mens Rea."*North Carolina Law Review, Forthcoming* (2015)

[14] Miller v. Alabama 567 U.S. ___ (2012) While this case does not specifically use neuroimaging to differentiate adults and adolescents, it highlights the inability for children and minors to be tried as adults convicted of similar crimes.

[15] *Roper v. Simmons*, 112 S.W.3d 397 (Mo. 2005) Prior to this case, the death penalty was recognized as constitutional by the 8th amendment for persons over the age of 15. Considering the evolving standards of decency, this case established that capital punishment is only constitutional for persons of age 18 at the time of the

neurobiological characteristics and the cognitive responsibility of adolescents, the need for comparable recognition among adults with similar neurobiological characteristics becomes evident. This is why the use of such neuroimaging evidence is imperative to the proper sentencing of individuals who may not be fully responsible for their actions.

In order to protect the integrity of the judicial system against these presumed biases without losing the irreplaceable information provided by neuroimaging, the presentation of neurobiological information needs to be controlled and monitored by a particular standard – as is DNA evidence - that is not yet in place. Given the nature and influence of scientific information on jury decisional outcomes, this review will suggest a method of reform within the courtroom to address this problem. Rather than being presented by a defense appointed expert, followed by prosecutorial cross-examination, neurobiological evidence should be presented from a neutral court appointed expert. It is my contention that there may be a certain degree of bias that enters into the presentation of neurobiological information, thus affecting the way criminals are tried and sentenced. By conferring to this method of neurobiological evidence delivery, it is presumed that such biases will be weakened. It is expected that the suggested reform of a more neutral delivery of neurobiological information will make the scientific analysis less prone to jury's biases.

I. NECESSITY OF BRAIN IMAGERY WITHIN THE COURTROOM

Why do you think you can resist the impulse to attack your coffee shop barista when he/she takes 20 minutes and finally hands you the wrong drink? Or to resist stealing money from a clerk when you have no money to pay for your own lunch? Is it a moral

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crime.

dilemma? Are you just morally superior to people who think and react this way? Does everyone who reacts this way have something wrong with the physiology of the brain that can explain these actions? Agreeably, the answer to these last two questions is no. This shows the apparent discrepancy in the use of neuroimaging as mitigating evidence in the courtroom.[16]

Before the use of neuroimaging, most juries who reach a guilty decision assumed that people who committed these actions consciously made the decision to act in such a way and were thus morally wrong and guilty. Upon presentation of neuroimaging that shows a decrease or deficit in some brain region with a specific action, however, juries may still reach a guilty decision, but the question of how responsible the defendant is for such actions is called into question and has been shown to lead to a decrease in sentencing. As previously stated, these discrepancies are not *always* associated with actions that deviate from normal, and people who commit crimes or exhibit criminal behavior do not *always* show abnormalities in brain physiology as can be seen on neuroimaging.[17]

How, then, can courts choose to allow or disallow the use of neuroimaging if the results most commonly reflect a correlation rather than a direct causation? To answer this question, we will look towards the state of Ohio, as an example, at the two groups that are exempt from the death penalty, the highest form of punishment. These two groups are

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[16] The interpretation of neurobiological evidence is often hindered due to the fact that it is not definitive evidence of whether or not a brain region's structure or function had any significant impact on defendant's actions.

[17] *Id* at 3

defendants with mental disability/illness and peoples under the age of 18.[1819] The Supreme Court decisions to protect these groups from the death penalty shows that neurobiological differences are recognized and lead to a decrease in overall culpability when compared to other persons. To show the necessity of such information, despite its errors in confidence, we will revisit our scenarios from the beginning of this section. If someone with known mental disabilities lost their temper and threw the hot coffee back at the mistaken barista, should they be held at equal responsibility and thus receive equal sentencing compared to someone without such disability committing the same act? If a 13 year old steals money from a classmate to buy lunch, should they be held at equal responsibility and thus receive equal sentencing compared to someone over age of 18 with a (nearly) fully developed brain committing the same crime? Reading these questions, the answer is obviously no, and the Supreme Court supports this differentiation.[20]

Lets take a look at an artist rendition of a neuroimage that encompasses just one difference between the adolescent and adult brain. Figure 1 shows the development of the human brain from age 5 to age 20, with areas of red representing the most

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[18] *Id* at 14

[19] *Id* at 15

[20] The Supreme Court ruled that these groups of people are ineligible for the death penalty, which is the highest degree of culpability of guilt. By being ineligible for this, they are innately held less culpable. This will be used interchangeably from this point on.

underdeveloped and areas of blue representing the most fully developed areas. Notice the regions that remain underdeveloped well into adolescence encompass the ever important prefrontal cortex, a region that is essential in decision making, future planning, and determining right from wrong.[21]

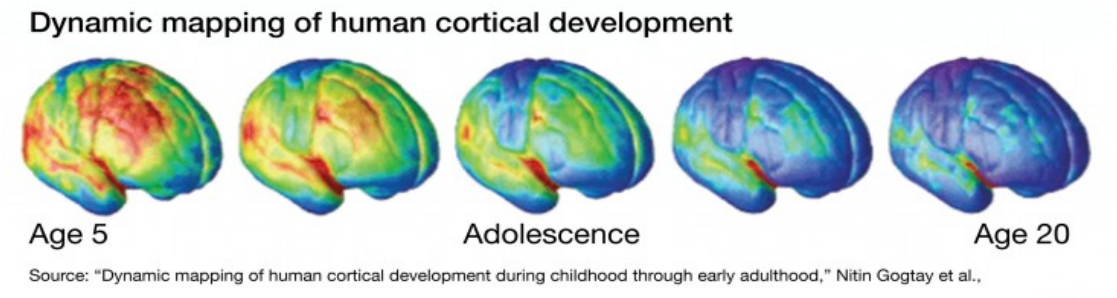

Figure 1.

This neuroscientific evidence shows that the adolescent and teenage brain is structurally different from adults, specifically in the region of the prefrontal cortex. The structural differences in the prefrontal cortex between adolescent and adult brains along with the association of this region with decision-making and planning has proved sufficient for the Supreme Court to recognize a decrease in culpability of adolescents. Does this mean that all adolescents and teens with underdeveloped prefrontal cortexes commit crimes or exhibit criminal behavior? Of course not; however, the relationship is enough for courts to recognize the overall decreased culpability of such persons due to

[21] Shazia Veqar Siddiqui et al., NEUROPSYCHOLOGY OF PREFRONTAL CORTEX INDIAN JOURNAL OF PSYCHIATRY (2008), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2738354/(last visited Nov 2, 16ADAD).

neurobiological differences and protect them from the death penalty.[22] Without neuroimaging, courts may not have reached this decision and minors could still be subject to the death penalty today.[23]

The second group of individuals protected from full culpability of guilt thanks to neuroscience is people with mental disability or mental illness. Figure 2 shows a functional magnetic resonance image (fMRI) of a schizophrenic patient – just one type of mental illness protected by law from the death penalty and thus full culpability.[24] The image shows the difference between a schizophrenic patient's brain activity in the prefrontal cortex compared to a non-schizophenic control. As previously explained in the example of adolescents, the prefrontal cortex is an essential region involved in decision-making and the determination of right and wrong.[25] The activity of the prefrontal cortex is reduced in schizophrenic patients as illustrated in Figure 3 by a decrease of blood flow to this region.

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[22] *Id* at 14

[23] Used as an example of the necessity of neurobiological evidence in the courts, and as an example of how biological evidence has allowed the court to uphold its standard of integrity.

[24] Social Cognitive & Affective Neurosci, DYSFUNCTION OF THE SOCIAL BRAIN IN SCHIZOPHRENIA IS MODULATED BY INTENTION TYPE: AN FMRI STUDY (2009), http://scan.oxfordjournals.org/content/4/2/166/F2.expansion.

[25] Id at 21

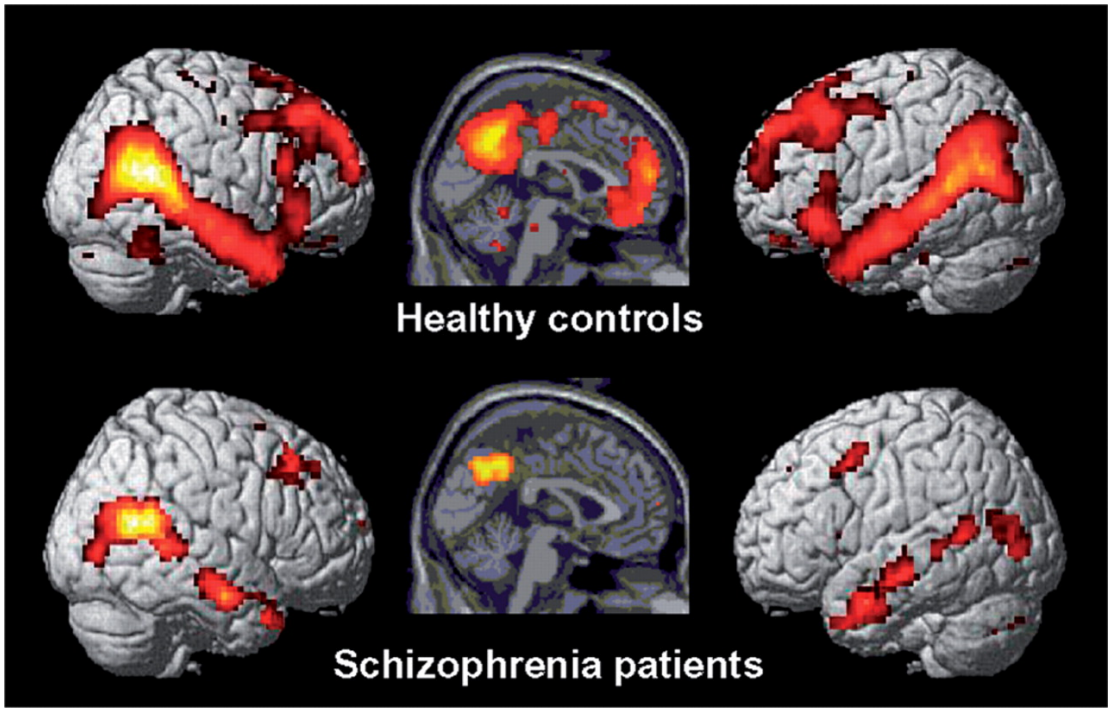

Figure 2

This neuroscientific evidence shows that the functionality of a Schizophrenic brain and a healthy control brain can be quite different, specifically in the region of the prefrontal cortex. As the seat of reasoning and decision-making, the prefrontal cortex, when affected by a condition such as Schizophrenia, may render an individual less culpable of guilt than other non-affected persons.[26] The Supreme Court upholds this distinction by protecting those with mental disability or illness, this example being those affect with Schizophrenia, from the death penalty.

The above are examples that are accepted within the court despite definitive

[26] Id at 15

evidence of any direct causal relationship between brain physiology and behavior.[27] The correlation is merely accepted as strong enough to make these defendants less culpable than others. The neuroimages of those suffering mental illness are supported by psychiatric evaluation – determining whether or not a defendant is legally sane or not. The difference between these people and defendants not claiming insanity, yet still using neuroimaging as mitigating evidence is essential to note. Some defendants are not claiming to be *insane,* they are merely claiming that by reason of brain structure or function, they are less responsible or less in control of their actions than people without such brain structures or functional abnormalities.

Applying the same logic as in the examples above, the courts should recognize other groups of people with brain abnormalities (in structure or function) as potentially less culpable than others. We will examine a neuroimage used in such arguments. This image shows the brain of an individual – Brian Dugan – unequivocally responsible for multiple rapes and murders.[28] An expert in criminal brain physiology and neuroimaging, Dr. Kent Keihl, provided testimony in court regarding Dugan's culpability for his crimes. Keihl provided the following image to the jury, among many others, identified here as Figure 3.

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[27] These examples are accepted and set precedent despite the fact that not all adolescents or people with mental disabilities exhibit criminal behaviors.

[28] Head Case, SCIENCE IN COURT (2010),http://www.nature.com/news/2010/100317/pdf/464340a.pdf (last visited Nov 18, 2016).

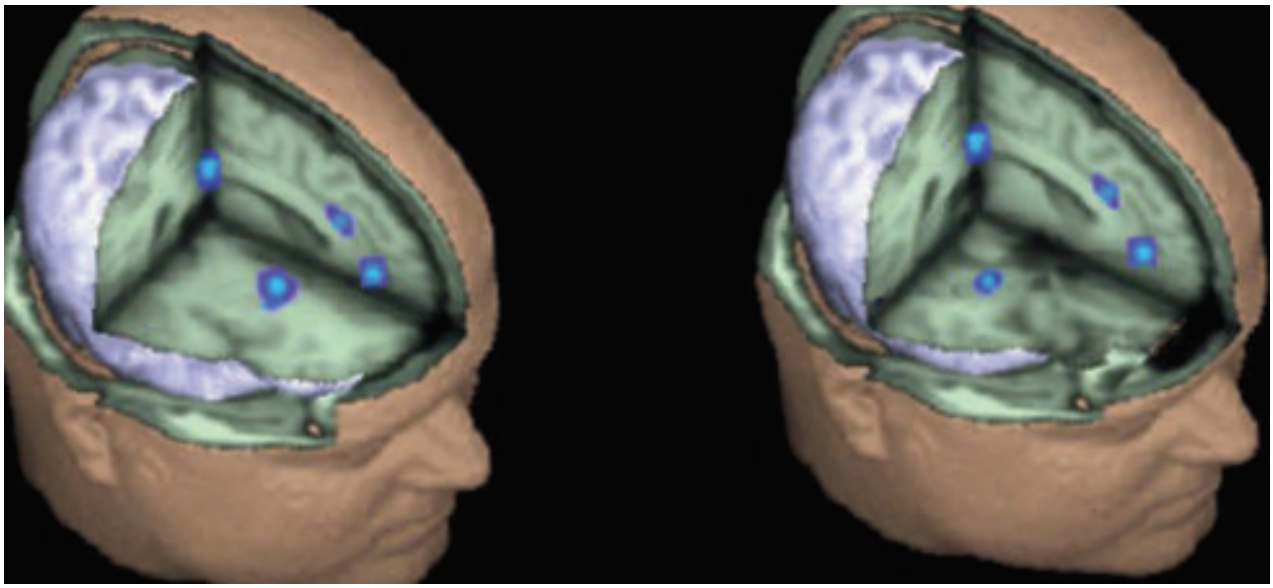

Figure 3

This image illustrates the difference between Brian Dugan's neuroprocessing when compared to normal. The image depicts normal processing shown on the left and Brian Dugan's brain functionality in 1985 shown on the right.[29] It can be seen that Dugan's brain activity, shown as regions lit up blue, is less than that of the healthy control on the left in areas critical for emotional processing – specifically, he is missing indications of normal brain activity in the region of the paralimbic system.[30] This finding is common amongst the criminally insane than Keihl studies.

The presentation of this information to the jury is necessary in the courtroom just as it was necessary to the Supreme Court in handling minors and the mentally ill. While

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[29] *Id* at 28

[30] The prefrontal cortex is one of the many areas associated with higher processing, decision-making, and choosing right from wrong – our standards for determining an area that has potential role in determining culpability of guilt.

Dugan's guilt was not in question, his responsibility of this guilt was. The ability of the defense to show the jury that the defendant's brain is not structured as normal or does not function as normal is essential in defending his or her culpability of guilt.

A critical question posed to a jury, particularly at a sentencing phase of trial, is "how can someone like Dugan or other people with aberrant brain functions similar to him be sentenced as a normal defendant– rather than sentenced as someone with similar brain physiology, like others regarded as protected from the maximum sentence allowable in the United States (death penalty)?" Two defendants with identical neurobiological physiology and thus imagery are often, within today's court, being sentenced rather differently. Thus, the use and presentation of neuroimaging in the courtroom as mitigating evidence for defendants like Dugan is imperative to outlining this necessary discrepancy and protecting appropriate individuals from full culpability of guilt.

The use of neuroimaging in the courtroom may allow juries to determine where on a spectrum of culpability a certain defendant is functioning. As we have seen, the association between brain function and structure and behavior is one recognized by the courts. Defendants and defense teams should then have the right to pose such evidence to the court in an attempt to explain the defendants' actions and remove the preconception of full culpability of certain defendants.

II. INNATE BIASES IN THE USE OF NEUROIMAGERY

Now that my position on the necessity of neuroscientific evidence within the court has been outlined, the biases of the presentation of such information must still be

considered. While the defense should have the right to evidence showing a possible decrease in culpability for their defendant, this evidence is subject to the biases previously mentioned; the evidence is either too seductively scientific and thus taken with too much weight into a decision, or it is not trusted because of a juries weariness towards the neutrality of a defense appointed expert and is not given appropriate weight in the decision.[31, 32] As previously stated, it can often have too seductive effects on the jury – the convincing and rehearsed scientific presentation of the defense panel's appointed expert swaying the jury's opinions as if the information presented is a factual *causation* rather than a factual *association*.[33] This bias is often "resolved" by the courts by the complete disallowance of neuroscientific evidence in the courtroom. Another resolution of this bias the court attempts to make is to allow defense appointed expert testimony to use neuroimaging *only* in the form of diagrams and artist renditions rather than the actual MRI images. It needs to be recognized that this is not a solution to the problem of the initial bias of neuroimaging evidence, but rather just creates another bias. When artist renditions and other drawings are used, the science behind the information may be undermined. A famous example is seen in the aformentioned case of Kent Keihl's testimony regarding the defendant Brian Dugan.[34] Upon presentation of a drawing of

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[31] *Id* at 7

[32] *Id* at 8

[33] Id at 10

[34] Kent Keihl is a world-renounced expert in criminal psychopathy; (rethink this; maybe say he has devoted his career to imaging the brains of criminals and

Dugan's fMRI results with X's marked at significant areas of aberrant activity – because the actual fMRI images were disallowed in the courtroom – the prosecution discounted and belittled the scientific findings, asking, "Are there really X's on this guys brain?"[35] It is unknown if the presentation of actual MRI images to the jury would have changed their ultimate decision of death penalty, however, it is by no stretch of the imagination that actual images may have upheld their scientific merit better than a cartoon depiction in the eyes of jurors during cross examination.

III. A NEUTRAL RESOLUTION OF BIASES – SUGGESTED REFORM

It appears that with the courts current system there is no fair way of presenting neurobiological evidence. We return to Dugan's case for example. Had Dugan's defense team been prohibited the right to neurobiological evidence, his trial may have been an immediate death sentence – rather than a 10/12 decision ultimately leading to a unanimous death sentence. Had the defense team had the opportunity to provide actual images of Dugan's brain scans, the jury may have respected the scientific merit of such evidence rather than discounting an artist rendition, and the death sentence may have not been settled upon. With that, however, if Dugan's defense were allowed the presentation of actual images, these images may have scientifically seduced the jurors into a decreased perceived culpability of guilt of Dugan that exceeds the reasonable scientific significance, and Dugan could be sentenced lesser than warranted.

Considering the above, and considering it is the goal of the court to decrease as many

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psychopaths.

[35] *Id* at 28

biases as possible in order for the jury to reach the most fair and just decision, it is my contention that the only approach to making the use of neurobiological evidence more fair is by modifying its delivery.[36] By allowing neurobiological evidence to be presented to the jury, but only through a neutral court appointed expert – still at the request of the defense – the integrity of the jury decision-making process may be preserved in the context of such evidence. By presenting evidence through a neutral point of view, jurors will potentially feel the information is less biased because it is no longer being deliviered from a party with any declared allegiance. The fear that expert witnesses, due to their allegiance to either the defense or prosecution, were misconstruing data in any way would be less of a concern, thus allowing the neurobiological evidence to be more clearly interpreted. In addition, the potentially seductive nature of scientific evidence can be reduced by a more neutral and thus comprehensive presentation of neurobiological evidence.

The neutral party presentation of neurobiological evidence also reduces potential biases not previously discussed, but still present within the courtroom. With the neutral court appointed expert, the jurors see the scientific information first – without the rehearsed and directional questioning that defense teams are usually allowed to lead with. This prevents the jury from reacting to information based on its sequential presentation. It is known that information presented early has a significant affect on the jury, whereas information presented later has a decreased affect on the jury. Rather than allowing the

[36] This has been devised as the only reasonable option because neurobiological evidence cannot be restricted without causing more bias.

defense information to be presented earliest and prosecutorial information after, the entirety of neutral scientific information is presented as a whole. This allows the jury's first and often most prominent impression to be neutral, rather than an attractively prepared one-sided questioning directioned by the defense that could potentially weigh too heavily on their opinions and thus sentencing decisions. Lastly, because the use of neurobiological evidence is filtered through loose parameters, the current structure allows defense team the ability to present information that may knowingly be of little significance. By the use of a neutral court appointed expert, defense teams are in choice of whether to present the full story or not to present any neuroimagery story at all. Meaning, they must believe that the association they wish to present of brain structure or function is relevant enough to convince the jury, despite all aspects of doubt also being cast, in order to make the decision to present neurobiological information. This prevents the use of insignificant evidence that may still unjustly effect the jury's decision. [37]

Because there is no cut and dry mechanism of telling the validity of an association between a brain region and a previous action, yet the use of neuroimaging is obviously necessary and still accepted within the courtroom, there needs to be appropriate modification or revision in order to decrease biases and protect the purpose of the courtroom; that is, to give the prosecution the opportunity to present a case and the

[37] By understanding that the entire picture of the neurobiological evidence will be presented by the neutral expert, it would no longer be reasonable for the defense to attempt to present image that is generally accepted as insignificant in an attempt to sway jurors.

opportunity of the defendant to defend against this case. Because this purpose is limited by the structure of presentation of neuroimagery within the courtroom, it is imperative the courtroom sees reform. Neurobiological evidence should only be presented through a neutral court appointed expert.

While reform is difficult, it is completely necessary to the proper functioning of the court system. As the scientific field advances and continues to provide further insight relevant to defense and prosecutorial teams, the court system must also advance alongside it in order to maintain its standards of integrity.