

Rutgers Law Record
2011-2012***161 NEUROSCIENCE, BRAIN DAMAGE, AND THE CRIMINAL DEFENDANT: WHO DOES IT HELP
AND WHERE IN THE CRIMINAL PROCEEDING IS IT MOST RELEVANT?****Adam Lamparello** [FN1]Copyright © 2011-2012 Rutgers Law Record; **Adam Lamparello****Introduction**

*“The state attorney in a capital case will emphasize words such as ‘inherent evil,’ ‘psychopath,’ ‘predator,’ and ‘abuse is no excuse,’ while deeming irrelevant alternative explanations of human behavior other than free will. The prosecutor will not acknowledge that human behavior is deterministic in nature and based on biopsychosocial interactions within one’s life ... [f]requently in capital cases [and other cases] there will be a significant history of neuropathology/dysfunction (cognitive impairment) that needs to be examined by a forensic mental health professional ... **What should counsel do with this evidence?**”* [FN2]

Violent offenders with frontal lobe disorder, namely those with damage to the prefrontal cortex which consists of the lateral and medial areas along with the orbitofrontal cortex, are less blameworthy than other offenders and warrant different treatment in our criminal justice system. The critical question facing criminal law jurisprudence is no longer whether we should treat these offenders differently, but how, and at what stages, such differential treatment should be applied.

By way of background, the frontal lobes are responsible for different “executive” or higher level functions of the brain. [FN3] For example, the prefrontal cortex is “associated with cognitive functions including language, working memory, and selected and sustained attention.” [FN4] More importantly, the “global frontal lobe behavior responsibilities,” [FN5] which “potentially have an impact *162 on the outcome of criminality and violence,” [FN6] include: controlling impulses, stopping behavior, inhibiting inappropriate or impulsive behaviors, impaired judgment, using knowledge to regulate behavior, understanding others’ reactions, processing and communicating information, and lacking appreciation of the impact of behaviors onto others.” [FN7]

Consequently, damage to the frontal lobes, which is the most prevalent form of brain damage, [FN8] can result in impulsive behavior, aggression, violence, and rage attacks because it is the responsibility of the frontal lobe to “inhibit behavioral impulses that surge up from other parts of the brain.” [FN9] Indeed, as the “theater of the mind,” [FN10] the frontal lobe is the center of “decision making, judgment, behavioral monitoring, and impulse control.” [FN11]

Accordingly, those with frontal lobe disorder “could commit impulsive or violent acts even though such acts normally would be against that person’s nature.” [FN12] Stated simply, those with frontal lobe disorder “often lose control over their own behaviors,” [FN13] and are “prone to certain types of ‘rage attacks,’” [FN14] that make impulse control extraordinarily difficult. In connection with this, “[i]f these behaviors impact others to some arbitrarily defined degree, then the behavior is termed immoral, unethical, antisocial and/or criminal.”

[FN15] In this way, frontal lobe disorder is “strongly associated ... with violent psychopathology.” [FN16]

It should come as no surprise, therefore, that a significant percentage of criminal offenders suffer from damage to their frontal lobes. For example, in a study examining the prevalence of head injuries among this population, it was discovered that: (1) sixty-one percent of habitually violent offenders had a history of brain injuries; along with (2) sixty-seven percent of convicts on death row; (3) fifty-eight percent of convicts on death row who were sentenced as juveniles; (4) forty percent of severely psychopathic criminals; and (5) thirty-six percent of sexual offenders. [FN17] Another study found brain dysfunction in ninety-four percent of homicide offenders. [FN18] Often, as some scholars argue, the actions of those with frontal lobe disorder are not the product of deliberation and premeditation, but, instead, the loss of “behavioral control.” [FN19] As one scholar explained, “[t]heir capacity to say to themselves, Stop! Don't say or do that. It is not wise,' is damaged.” [FN20] Critically, though, while *163 individuals with frontal lobe disorder may, to some extent, lose control of their behavior, they “retain their overall intellectual capabilities” [FN21] and can “reason rationally about social and moral situations.” [FN22]

Invariably, the question then becomes whether, and to what extent how, frontal lobe disorder and other forms of brain damage should be admitted in a criminal proceeding. Of course, this raises theoretical as well as practical considerations. For example, it can be argued that the concept of “free will” in brain-damaged defendants is compromised. Also, frontal lobe disorder can arguably cause a defect in rational thinking, thus impairing an individual's ability to conform to the requirements of law and/or participate meaningfully in his defense. Moreover, a strong argument can be made that brain-damaged defendants are less culpable than other offenders, and that, for example, they should not be eligible for capital punishment. Finally, it can be argued that rehabilitative rather than retributive sanctions are appropriate.

Importantly, though, the stage at which evidence regarding frontal lobe disorder should or could be used should be closely tied to a discussion of its relevance. To be sure, there is an extraordinary amount of information about the brain that we still do not know. While neuroscience has made groundbreaking advances to guide our understanding of human behavior, the precise causes and processes that are responsible for matters such as our actions, thoughts, beliefs, and emotions remain incomplete. Thus, before brain-related evidence is allowed into the courtroom, there must be a threshold inquiry into admissibility that examines not only the reliability of the science itself, but the nexus between its *use* and *relevance*, namely, the likelihood that it can support or disprove the proposition, i.e., insanity, for which its admission is sought. This inquiry can be made using the standards enunciated in *Daubert v. Merrill Dow Pharmaceuticals*, [FN23] and *Frye v. United States*, [FN24] which remain applicable at the federal and state levels, respectively. However, the courts must demonstrate caution both in whether and when they elect to admit such evidence.

Ultimately, based both upon scientific evidence and criminal law doctrine, this Article sets forth the areas of the criminal proceeding where neuroscientific evidence would be most relevant. The first proposition is straightforward: the only brain-related evidence that should be used is that which, in regard to its accuracy and validity, is generally accepted by the scientific community. For purposes of this article, the only neuroscientific evidence that will be relied upon is that which relates to frontal lobe disorder and damage to the amygdala. Injuries to these areas often result in impulsivity and difficulty controlling behaviors; and, as a result, an individual may be prone to aggression and violence where they would not be under normal circumstances. [FN25]

With these generally accepted principles in mind, this Article will examine four parts of the criminal law proceeding and argue where this evidence should and should not be admitted. These will include: (1) a defense

of diminished capacity; (2) the insanity defense; (3) a lack of *mens rea* defense; and (4) sentencing. The Article will conclude by identifying those aspects of the criminal proceeding where neuroscientific evidence is most relevant, most probative and most valuable.

*164 Part II will provide a brief background concerning frontal lobe disorder, including its effects on human behavior. Part III will then examine the precise stages in the criminal process where admission of this evidence would be most appropriate and beneficial.

Part II

Frontal Lobe Disorder, Damage to the Pre-frontal Cortex and the Role of the Amygdala: Impulsive, Aggressive and Violent Behavior

A. Lack of Impulse Control - A Blueprint for Criminality

The “most common finding ... for the biological basis of psychopathology especially associated with impulsive and violent behavior is that the individual has incurred significant damage to the orbital cortex and adjacent parts of the prefrontal and anterior temporal lobe.” [FN26] Consequently, if these areas are “broadly damaged,” [FN27] then “the individual is much less capable of inhibiting aggression, violence and addictions.” [FN28] Not surprisingly, these and other brain areas “have been implicated in numerous neurological and imaging studies of violent, aggressive and impulsive psychopaths.” [FN29]

B. The Causes and Effect of Frontal Lobe Disorder and Other Brain Impairments

1. Causality

As one scholar explains, “[m]ore often than not, defendants charged with homicide have been exposed to various risk factors in their environment that generate cognitive, neuropsychological and organic brain impairment.” [FN30] Specifically, “[d]amage to the frontal lobes - the largest part of the brain - is the most common form of brain damage.” [FN31] Some of the causes of frontal lobe disorder - and other brain impairments - include:

- Accidents, injuries and assaults;
- Maternal alcohol, nicotine, drug use and poor diet;
- Substance abuse and dependence history;
- Low birth weight;
- Low heart rate at birth;
- Fetal mal-development;
- Exposure to toxins, lead and parasites;
- Experience of violent victimization;
- Parental physical abuse and emotional neglect; and
- Deplorable home conditions. [FN32]

*165 These factors, occurring together or independently of one another, can cause precisely the type of brain

impairments that result in “changes in personality, mood and behavior.” [FN33]

2. The Effects of Frontal Lobe Disorder--Lack of Impulse Control and Other Behavioral Impairments

As a threshold matter, “[f]rontal lobe dysfunction comes in at least two distinct forms, depending upon the location of the frontal lobe damage.” [FN34] Specifically, one form, which involves “damage to the ventromedial prefrontal cortex,” [FN35] causes “impulsivity and impulsive aggression.” [FN36] The other, which relates to “damage to the dorsolateral prefrontal cortex impairs ... judgment and moral reasoning.” [FN37] However, regardless of which part of the frontal lobe is damaged, such individuals “typically do not lack understanding, they lack behavioral control.” [FN38]

Due to its pervasive and ongoing impact on “behavioral control,” frontal lobe disorder has been included in the World Health Organization's Classification of Diseases, and is often referred to as “impulse control disorder.” [FN39] In fact, as Professor Redding explains, the “hallmarks of the disorder” [FN40] are “deficits in planning and foresight, impaired social judgment, impulsivity, and behavioral disinhibition.” [FN41] Other effects include:

- Flat, blunt or labile affect;
- Low conformance to societal values;
- Violence occurring within background of flat affect;
- Low tolerance;
- Spontaneous, florid confabulations with psychotic qualities;
- Defects in goal formulation;
- Impaired ability to modulate or fine-tune complex behavior; and
- Difficulty in reversal of perspective. [FN42]

It is for these reasons that “[f]rontally damaged people often cannot keep their behavior within the general rules of society” [FN43] and “show the patterns of behavioral responses associated with criminality.” [FN44]

3. The Inner Workings of Frontal Lobe Disorder - The Connection with the Amygdala

*166 Importantly, “[i]n the form of FLD [frontal lobe disorder] that causes impulsive behavior, there is a disruption in the neural circuit running between the limbic system (especially the amygdala) and the frontal lobes, which is a brain circuit responsible for fear conditioning, stress responses, mood regulation, impulse control, and ‘the meeting point between thought and emotion.’” [FN45] Stated simply, “[t]he amygdala, which stores emotional memories of past experiences and compares incoming stimuli against those stored memories, is responsible for the rapid evaluation of incoming perceptual stimuli.” [FN46] As one scholar explains, the amygdala is “something like a psychological sentinel, challenging every situation, every perception ... Is this something I hate? That hurts me? Something I fear? If so ... the amygdala reacts instantaneously, like a neural tripwire, telephoning a message of crisis to all parts of the brain and autonomic nervous system.” [FN47] Professor Redding explains the relationship between the amygdala and frontal lobes as follows:

The amygdala proposes, the frontal lobe disposes ... [t]he connection between the amygdala (and related limbic structures) and the [frontal lobes] are the hub of the battles or cooperative treaties struck between the head and heart, thought and feeling ... one could conceptualize the frontal lobes as serving the functions of the Ego, which keeps in check the primitive drives and emotions if the Id. Normally, the

frontal lobes act as a circuit breaker for the reactive emotional responses generated by the amygdala. But the circuit breaker may fail when the frontal lobes are damaged. Frontally damaged individuals may be unable to inhibit quick response reactions generated by the amygdala or to judge the consequences of an aggressive response, particularly in stressful or provocative circumstances ... [thus] in threatening or emotionally-charged situations, the amygdala's evaluation and response occurs before the higher cognitive processes in the frontal lobes can become fully engaged to rationally analyze the situation. [FN48]

Consequently, people “with frontal lobe damage often lose control over their own behavior and are prone to certain types of ‘rage’ attacks as the frontal lobe works as a ‘braking mechanism for human behavior.’” [FN49] In fact, even “minimal frontal lobe dysfunction may cause impulsive aggression in normal populations.” [FN50] Ultimately, therefore, “[t]he link between FLD [frontal lobe disorder] and criminal behavior is not surprising when considering the functions of the frontal lobes.” [FN51] Furthermore, those with damage to the amygdala have shown severe impairments in their ability to “recognize certain emotions in others, such as fear, sadness, anger and disgust.” [FN52]

However, while frontal lobe disorder has ramifications upon “behavioral” functioning, it does not, according to some scholars, affect “rational” thinking. Indeed, because they “do not lack understanding,” [FN53] individuals “with frontal lobe disorder usually retain their overall intellectual *167 capabilities and can reason rationally about social and moral situations.” [FN54] Thus, at least in “isolation,” [FN55] most individuals whose “frontal lobes are damaged or even under-developed generally possess the ability to exercise most cognitive skills ... such as reading, writing, simple computations, verbal expressions and movement.” [FN56] Additionally, “on a cognitive level, they can distinguish between right and wrong.” [FN57] Put differently, “[t]he impaired impulse control reflects “a curious dissociation between knowing and doing ... [f]rontal lobe patients know their errors, but are unable to use that knowledge to modify [their] behavior.” [FN58]

This has direct and substantial implications upon where, and to what extent, evidence of frontal lobe disorder should be admitted in a criminal proceeding. The behavior/cognitive distinction is significant because a defendant's ability to avail himself of certain defenses or evidence in mitigation of a criminal act depends upon a showing of certain specific characteristics or impairments; whether physical, psychological, and/or biological. In this way, the admissibility and evidentiary value of frontal lobe disorder is accessible because it largely implicates behavioral rather than rational thought processes. As such, its probative value, at least for now, should focus in those areas where behavioral impairments can provide value to the Courts in determining culpability and blameworthiness. The inquiry now focuses upon where, and to what extent, this evidence should be used in the criminal process.

Part III

Criminal Defendants with Frontal Lobe Disorder: Where in the Criminal Proceeding is it Relevant and Properly Applicable?

To begin, at both the federal and state levels, “[c]ourts generally admit evidence of FLD [frontal lobe disorder], including neuroimaging and neuropsychological test results.” [FN59] At the federal level, courts rely upon the standard enunciated in *Daubert*, [FN60] which, when considering the admissibility of scientific evidence, examines: “(1) its falsifiability (i.e. whether the hypothesis can be tested empirically), (2) the error rates of the methods used; (3) the extent of peer review and publication of relevant scientific findings, and (4) its general acceptance in the scientific community.” [FN61] At the state level, courts continue to use the *Frye* standard,

which “requires judges to determine if the proffered evidence has gained ‘general acceptance in the particular field in which it belongs.’” [FN62] Significantly, while the effects of frontal lobe disorder are widely accepted, there is much debate concerning where and how that evidence should be used, if at all, in the criminal justice *168 system. [FN63] The issue focuses upon whether frontal lobe disorder can have relevance and value in areas that affect responsibility and/or culpability. [FN64] Below is a discussion of four stages in the criminal proceeding that implicate these principles and of whether evidence of frontal lobe disorder should be admitted at that respective stage. They include: (1) competence to stand trial; (2) the insanity defense; (3) a lack of mens rea defense; (4) sentencing.

A. Competence to Stand Trial

Courts have admitted evidence of frontal lobe disorder in order to establish that a defendant is incompetent to stand trial. [FN65] The competency doctrine is “fundamental to an adversary system of justice ... [because] the defendant must be meaningfully present as an autonomous actor capable of taking, should she so choose, permissible steps to attempt to protect herself from the assertion of state power.” [FN66] Indeed, prosecution of “an incompetent defendant is thought to be an unfair fight of the worst kind, one that threatens grave harm to the individual, endangers reliability of outcome, and erodes the dignity of the process.” [FN67] As such, competence to stand trial “may be implicated at any stage of the criminal proceeding.” [FN68]

Competency to stand trial has often been called the “younger sibling of the insanity defense,” [FN69] where a court looks at whether “a defendant is possessed of sufficient capacity to defend her own interests within the various stages of an ensuing prosecution.” [FN70] Importantly, “[t]he consequences of an incompetence adjudication are, from a defendant's perspective grave ... such a finding may well translate into long-term confinement, particularly for those defendants deemed dangerous to themselves or others, without [the] opportunity for a finding of guilt or innocence.” [FN71]

In *Dusky v. United States*, the United States Supreme Court held competency to stand trial depends upon whether a criminal defendant “has sufficient present ability to consult with his lawyer with a reasonable degree of rational understanding and whether he has a rational as well as factual understanding of the proceedings against him.” [FN72] In subsequent decisions, the Court attempted to define the term “rational understanding” by focusing upon the decision-making aspect, namely, *169 “whether the defendant has sufficient competence to take part in a criminal proceeding and to make decisions throughout its course.” [FN73] In making the competency determination, courts give weight to a defendant's “history of pronounced irrational behavior,” [FN74] but the defendant's ability, with a “reasonable degree of rationality,” [FN75] to make informed decisions is “the crucial capacity to which the rationality aspect of the competency construct is directed.” [FN76] Accordingly, “decisional competence” [FN77] is the most important inquiry in the competency determination. Also, the Court's competency standard applies to all stages of the criminal proceeding in which the issue is raised. [FN78]

Some scholars argue that, although “[a]ctual or suspected adjudicative incompetence affects a significant percentage of misdemeanor and felony defendants,” [FN79] it is nonetheless a “neglected and ill-defined area of law.” [FN80] Specifically, one criticism against the *Dusky* standard is that it fails to account for the role of emotions in rational decision making. [FN81] This again implicates the frontal lobes and amygdala, which produces an initial and instantaneous reaction to external stimuli. As stated above, the job of the frontal lobe is to moderate this impulsive reaction and thereby create a more reasoned - and rational - response. [FN82] When this neural circuit is damaged, the likelihood of impulsive, aggressive and violent behavior is significantly heightened.

[FN83]

In addition to the problem of impulsivity, commentators argue that damage to the frontal lobes and amygdala affects reasoning itself because the emotional responses produced by the amygdala are inextricably intertwined with an individual's rational decision-making process. [FN84] In other words, emotions are a part of, and not necessarily separate from, an individual's ability to make reasoned judgments in particular situations. [FN85] Consequently, if the amygdala is damaged, the ability to think rationally is compromised. [FN86] This challenges the notion, as stated above, that those with frontal lobe disorder usually retain "their overall intellectual capabilities and can reason rationally about social and moral situations." [FN87]

More specifically, "[a]mygdala injury in humans results in the inability to make value judgments based on an absence of emotional encoding of aversive results." [FN88] To fully understand this, it is important to first recognize that humans with damage to the frontal lobes "show a flattened affect and emotional response leading to a concomitant compromise of their personal and social behavior." [FN89] In the context of clarifying decision-making, Antonio Damasio developed the "somatic marker hypothesis," [FN90] which "involves the emotional loading of the brain," and "adds emotional content to an image to provide it with evaluative significance." [FN91] In essence, these are "the warning signals which enhance the efficiency of a rational decision making process." [FN92] As one scholar explains:

These internal signals provide an awareness of a possible negative result if the proposed actions continue. They are not determinative and may be overridden if the internal cost benefit analysis should cause the individual to decide to do so. The somatic marker emotions enhance and increase the rapidity and correctness of the internal evaluative process. These markers are special feelings generated by outside events as the individual, human or animal, interacts within his culture and environment allowing the individual to predict future outcomes based on learned emotions. [FN93]

Consequently, "[t]he loss of this function results in the social maladjustment of the frontal lobe damaged individual with his inability to appropriately relate to society." [FN94]

Studies of both normal individuals and those with damage to the frontal lobe support these assertions. In one study, individuals "were shown evocative pictures along with banal images." [FN95] Skin conductivity tests, which measure the autonomic nervous system, were "unequivocal in both normal and non-frontal lobe injured individuals." [FN96] However, for those with frontal lobe damage, there was a "lack of emotional feeling." [FN97] Furthermore, in a patient with bilateral amygdala damage, "the subject could recognize the identity of the face ... but the individual had no ability to draw a face showing the emotional content of fear." [FN98] In fact, "[t]he patient further failed to evince any response to a fearful stimulus while still being able to verbally describe what fear was or should be." [FN99] In another study of three individuals with bilateral amygdala damage, they were unable to "correctly judge trustworthiness or approachability of individuals when shown pictures of faces while still being able to correctly verbally describe those faces." [FN100]

A "function of the amygdala may be to orchestrate patterns to various areas of the brain that would encode both the intrinsic, physical features of the stimuli and the value that the stimuli have to the individual (their emotional significance)." [FN101] This is critical because "[s]ocial behavior depends significantly upon the integration of sensory information (such as recognition of faces) with the motivational value of the stimulus, which will serve to guide behavior on the basis of social cues (threats, warnings, [and] submissive gestures)." [FN102] In other words, the amygdala has a role in "memory formation in conjunction with emotional content." [FN103]

This is noteworthy because of “the role that emotions play in learning.” [FN104] For example, one study devised gambling tests to assess decision-making performance. [FN105] The tests were designed so that each person had to develop a strategy to maximize gains and minimize losses. [FN106] The experiment mirrored real life by factoring in “reward and punishment to their emotional decisional loading and cognitive functions in attempting to make an advantageous decision.” [FN107] Significantly, persons with damage to the ventromedial frontal lobes “were aware of the fact that certain choices were ‘bad,’ but repeatedly made those same ‘bad’ choices.” [FN108] It was later determined that the “patients were not insensitive to punishment and although they were responsive to negative stimuli the effect was limited in the brain injured individual, favoring the potential rewards to their detriment.” [FN109] Thus, although these persons “evinced the desire to win ... they returned to the choices that had previously given them an adverse result.” [FN110]

Furthermore, on similar “gambling task tests where skin conductance responses were measured,” [FN111] the individual with frontal lobe damage did not develop any “anticipatory skin conductance,” [FN112] which suggests that “knowledge may not be sufficient to maximize advantageous behavior but that unconscious behavior guides choice as to risk aversion.” [FN113] However, “[t]his appears to be localized in such a way that persons with damage to both the amygdala and ventromedial prefrontal cortex are unable to develop anticipatory skin conductivity responses to gambling tasks.” [FN114] Importantly, individuals with “lesions of only the amygdala ... are still not able to generate a skin conditioned response when they receive a reward or punishment ... suggesting that the amygdala is involved with decision making.” [FN115]

Additional studies demonstrate that individuals “could correctly recognize a bad outcome but could not benefit from that recognition to predict adverse consequences of their future actions.” [FN116] Ultimately, therefore, it “appears that the decision-making impairments of value judgment in individuals following injury to the amygdala may be the indirect consequence of their inability to appreciate sufficiently the positive or negative attributes of an emotional situation.” [FN117]

These findings are monumental because they suggest that emotional memory has a significant effect upon rationality. More specifically, “emotion gives a value to the experience *172 allowing for ranking of experience by significance.” [FN118] Thus, while “western philosophy endorsed the concept of rationality being distinct from emotion ... the inner rational self-changes where the person loses the ability to value information.” [FN119] In essence, an “individual with a history of traumatic brain injury may have an underlying neurologic disorder, which when involving the amygdala destroys that individual's ability to emotionally encode information.” [FN120]

Consequently, it has been argued that “[t]his inability, while leaving the individual outwardly normal, may well render him incompetent in a legal sense.” [FN121] In other words, “[i]f an individual may be objectively determined to be unable to form a competent evaluation of the world around him he is incompetent to constructively function in society and to contribute to his own defense.” [FN122] In fact, it has been suggested that “[i]f a person is determined to be incompetent, he would be diverted from the criminal system to a civil institutional format much as would be an insane person.” [FN123] As one commentator has suggested, the “disposition of these individuals when objectively identified should not be penal incarceration, but civil incapacitation.” [FN124] Critics argue that, since “these forms of incompetence are untreatable by current medical standards,” it would “deter persons from unwarrantedly claiming this defense for it may require lifetime societal control.” [FN125]

Based upon the above, it would seem, at first glance, that defendants with frontal lobe disorder and/or dam-

age to the amygdala itself could present a viable claim for incompetence. Certainly, the notion that emotions play a role in decision-making, and are a part of, rather than separate from, the concept of “rationality,” is plausible. However, there are several infirmities in this argument that makes it untenable in most cases. First, with respect to the emotional aspect of rationality being compromised, there is still no data regarding the degree to which rationality itself, or as a whole, is impaired. In other words, the emotional aspect of rationality may be affected, but the ability to reason, at least in certain circumstances, may still be functional. [FN126]

This is relevant because the arguments regarding incompetence do not discuss “situational” effects. [FN127] As we know, individuals with frontal lobe disorder and amygdala damage may suffer from impulsivity and impaired judgment. [FN128] However, this does not mean that these symptoms or effects will manifest themselves in all or even most situations. The responses of frontally-damaged individuals are likely to vary greatly because certain events may or may not trigger the specific behaviors that result from this condition. For example, some situations are predominantly factual in nature and call upon a person's cognitive abilities, while others may implicate a response involving emotion which, as the above research suggests, is compared against past experiences. Now, in the latter situation, a person's decision-making ability may be substantially impaired, but in the former, it may not be because the emotional aspect of “rationality” is not such a critical part of the decision-making calculus. [FN129] Consequently, while it is accurate to say that frontal lobe disorder and damage to the amygdala leads to impulsivity, impaired judgment and potential deficits in rational decision making; it is not accurate to label or categorize a person as impulsive or irrational.

This is critical because of the context within which legal competence is assessed. First, the competence inquiry while focused upon the defendant's rational understanding is related primarily to the facts underlying the proceeding. Furthermore, it is based upon the defendant's present ability to participate meaningfully in his defense. Under this standard, it is likely that a defendant could have a “reasonable degree” of rational understanding to preclude a finding of incompetence. [FN130] As Professor Redding explains, individuals with frontal lobe damage suffer from impulse control problems but “do not lack understanding.” [FN131] Additionally, individuals “with frontal lobe disorder ... can reason rationally about social and moral situations.” [FN132]

Of course, because of emotion's role in decision making, it is certainly possible that a defendant's ability to exercise reasoned judgment can be impaired in some situations. However, it is arguably not impaired in this *situation*. In the legal proceeding, we are not showing defendants pictures comprised of different emotions for the purpose of testing their neurological responses. In other words, we are not, generally speaking, probing their responses to stressful or threatening stimuli.

Instead, we are focusing on a defendant's cognitive ability for the purpose of determining whether he can understand the nature of the proceedings to which he is subject. This will invariably include the charges that a defendant is facing, along with the factual information upon which they are based. Additionally, to participate meaningfully in his defense, the defendant will have to provide his counsel with all relevant information relating to a particular criminal offense. Furthermore, the defendant must assist during the trial process, both as an information provider and decision maker.

Specifically, the defendant must give his attorney pertinent information that can be used both during the trial and as possible mitigating evidence at the sentencing phase. The defendant must also collaborate on concerning decisions such as whether to take a plea bargain, testify, and call character witnesses. These functions require reflection, deliberation, and a degree of calculation. They also require that the defendant have the requisite cognitive and intellectual abilities to make sound choices. Ultimately, however, while these decisions are not easy and,

in some cases, are critical, they are not necessarily compromised by the fact that someone suffers from frontal lobe disorder and/or damage to the amygdala. While emotion does play a significant role in decision making, there is insufficient evidence that flat affect can impair rationality to such an extent that competence, in most cases, will be jeopardized. [FN133]

***174 B. The Insanity Defense**

Courts have similarly allowed the admission of evidence for the purpose of proving that a defendant was insane during the commission of a particular criminal act. [FN134] At the federal level and in most states, the insanity determination is governed by the “*McNaghten* test,” [FN135] which requires a defendant to demonstrate that “due to mental disease,” [FN136] he was prevented “from knowing the nature and quality of his act, or that ... [he] did not know what he was doing was wrong.” [FN137] Additionally, a minority of states use “irresistible impulse” or “control” tests, which “provide an insanity defense to those who committed a crime due to their inability to exercise behavioral control.” [FN138] In jurisdictions that use control tests, “juries are not required to find that the defendant's acts were, in fact, completely irresistible.” [FN139] Instead, the juries must consider “the defendant's capacity for self-control.” [FN140]

The most common formulation of the control test states that “[a] person is not responsible for criminal conduct if at the time of such conduct, as a result of mental disease or defect, he lacks substantial capacity either to appreciate the criminality [wrongfulness] of his conduct or to conform his conduct to the requirements of law.” [FN141] Importantly, however, the “[c]ontrol tests have fallen into disfavor ... with less than one-third of the states currently employing a control test.” [FN142] Those who advocate for adoption of the “control” test argue that they “are needed to ensure that brain disordered defendants have the opportunity to prove that they lacked criminal responsibility for the charged offense - a right that is essential, particularly in our system of retributive justice.” [FN143] In other words, “a limited physiological ability to control his or her criminal behavior” [FN144] should be sufficient to demonstrate “a lack of culpability due to impaired impulse control.” [FN145]

Notwithstanding, in the majority of jurisdictions that use the *McNaghten* test, “insanity defenses based on FLD [frontal lobe disorder] are few in number and have not fared well.” [FN146] Specifically, “it has been difficult to establish that individuals with frontal lobe damage lacked the mental capacity to know the immorality or legal wrong of their acts.” [FN147] This is not surprising because those with frontal lobe disorder “retain their overall intellectual capabilities,” [FN148] and generally possess the ability to exercise most cognitive skills.” [FN149] Thus, defendants claiming insanity under *McNaghten* would likely be unsuccessful.

***175** In fact, defendants with frontal lobe disorder should be unsuccessful in arguing that they were insane at the time a particular criminal act was committed. First, there is little dispute that those with frontal lobe disorder know that their conduct is both wrongful and unlawful. [FN150] In other words, an individual with frontal lobe disorder has the cognitive ability to understand the nature of his act, the effects this act will have upon another person, and the likely consequences that will follow. In so doing, even if the individual's judgment is impaired, and his ability to process emotional information compromised, he still, at a fundamental level, knows that the conduct within which he is about to engage is contrary to morality, ethics or law. It is the knowledge component, coupled with understanding the import of one's behavior that separates the behaviorally-impaired person from the legally insane individual. [FN151] The insanity defense rests upon cognitive impairment, which is not sufficiently present in those with frontal lobe disorder. [FN152]

In addition, “control tests” for insanity are inappropriate and unworkable. To begin with, it would be ex-

tremely difficult to determine the degree to which an individual was “unable” to control his or her behavior. For some, the impulse to engage in violent behavior may be severe and nearly uncontrollable, while for others it might be modest and manageable. More importantly, though, “control test” advocates fail to acknowledge a more fundamental problem: humans are not simply the product of processes that occur within our brain. While our brains may expose us to certain tendencies, particularly in cases involving frontal lobe disorder, it does not follow that these symptoms will automatically or are even more than likely to occur. To a large extent, humans still retain the ability to make choices in response to the brain's activity. Even in the case of impulse control problems and behavioral disinhibition, humans can still regulate their behavior because the mind arguably exists separately from the brain. Put differently, for those with frontal lobe disorder and/or or damage to the amygdala, there still exists sufficient cognitive ability to moderate a tendency towards impulsive and aggressive behavior. Of course, this does not mean that frontal-lobe disorder is irrelevant in the criminal proceeding. What it does mean is that it cannot - and should not - be used to argue that an individual satisfies the legal definition of insanity.

Accordingly, the courts should re-examine whether evidence of frontal lobe disorder should be admitted in support of an insanity defense. In short, traumatic brain injuries are not relevant to responsibility as much as they are to culpability.

C. The Mens Rea Defense

For many of the same reasons, frontal lobe disorder and damage to the amygdala do not provide the basis for a cognizable *mens rea* defense. The argument in favor of this defense presumes that the decision making capabilities of frontally-damaged individuals are so impaired that they cannot form the requisite intent to commit illegal acts. [FN153] However, this does not take into account the ability of humans to resist or otherwise manage the effects that particular brain injuries may have upon human behavior.

*176 Professor Michael Gazzaniga, who is “troubled by” lawyers using “brain maladies as an all- purpose defense and insisting that their clients lacked the *mens rea*, or guilty mind, necessary to be convicted,” explains that “the mind can still be guilty”:

He notes that most people with brain damage or defects have some ability to restrain their actions. Gazzaniga is convinced that there is a difference between brain and mind -- and, in his conception, the mind almost always has veto power over what the brain decides. He calls this capacity “free won't” and backs up his view by citing brain studies that show that people make decisions before actually carrying them out. Your brain decides to punch someone before your fist moves. In the meantime your hand has the power to stop the operation. [FN154]

Furthermore, “even the brain changes that we know can influence crime aren't dispositive.” [FN155] Gazzaniga's argument underscores the fact that individuals with frontal lobe disorder still have at least some control over the actions, which therefore allows them to make decisions before choosing whether to engage in particular conduct. [FN156] As such, those with brain injuries can act with intent and thus have the requisite *mens rea* for commission of a particular criminal act. Again, this goes to the core of what neuroscience can and cannot show at this point: individuals can still act with the requisite degree of responsibility, but there is, as set forth below, a reduced level of culpability.

D. Neuroscience at the Mitigation/Sentencing Phase

This is the stage at which evidence regarding frontal lobe disorder, damage to the amygdala, or any other brain disorder, is most relevant. As one commentator acknowledges, “the most common method of introducing evidence of brain abnormalities is during the sentencing phase.” [FN157] Specifically, brain injuries can substantially reduce an individual's culpability and lead to a different approach regarding punishment. [FN158] Issues regarding mitigation of punishment are relevant during the sentencing phase of both: (1) capital trials and (2) all other crimes of violence.

1. Sentencing During the Penalty Phase of Capital Trials

In *Lockett v. Ohio*, [FN159] the United States Supreme Court held that “the Eighth and Fourteenth Amendments of the United States Constitution dictate that a Court must, as a matter of law, consider all mitigating evidence in a capital case.” [FN160] In fact, the Federal Death Penalty Act presents virtually no obstacle to the admission of evidence that may mitigate culpability. [FN161] In fact, in *United States v. Fields*, the Court noted that “no circuit we are aware of has applied *Daubert* to sentencing ... and expert testimony is admissible if it ‘is the product of reliable principles and methods’ that are *177 applied ‘reliably to the facts of the case.’” [FN162] Essentially, defendants have substantial discretion to introduce mitigating evidence “bearing on ‘any aspect of [the] defendant's character or record and any of the circumstances of the offense that the defendant proffers as a basis for a sentence less than death.’” [FN163] Indeed, consideration of mitigating evidence is “central to the requirement of individualized sentencing.” [FN164] Accordingly, “a court cannot preclude evidence of frontal lobe dysfunction.” [FN165] Thus, it is appropriate to admit “expert testimony regarding neuroimaging, PET scans, CAT scans, and MRIs of the defendant and their results.” [FN166]

Not surprisingly, “the short term aim [for aiding capital defendants] ... is to bolster ... mitigation claims with cutting edge neuroimaging research that demonstrates a biological disposition to criminality.” [FN167] In fact, “[i]t is typical for defense experts to testify about the mitigating effects of mental illness or brain damage in an attempt to persuade jurors that a defendant is less than fully culpable and should receive a sentence of life imprisonment rather than death.” [FN168] Indeed, “[r]eported cases and public commentary demonstrate that ... neuroscientists are increasingly contributing to the mitigation efforts of capital defendants.” [FN169]

Specifically, they argue that “although it does not provide an excuse for purposes of legal guilt, dysfunction in the violence-inhibitory mechanisms of a defendant's brain sufficiently diminishes his moral responsibility such that he deserves a sentence of life imprisonment rather than death.” [FN170]

Ultimately, courts have consistently admitted neuroimaging evidence. [FN171] Some courts “have even held that the failure to allow neuroimaging evidence to be introduced at the sentencing phase of a trial constitutes reversible error.” [FN172] One court has even provided the resources for a defendant to present neuroimaging evidence. [FN173] However, with respect to “whether defendants receive a life sentence or the death penalty,” [FN174] there are “many cases in which juries were presented with neuroimaging evidence and nevertheless imposed or recommended a sentence of death.” [FN175]

In the death penalty context, admitting evidence of, for example, frontal lobe disorder presents two questions. First, whether such evidence should be admitted and, if so, whether it should serve to mitigate a defendant's sentence to a term of life imprisonment. To the first question, the answer is undoubtedly yes: this evidence directly impacts upon the defendant's culpability. Frontal lobe disorder causes, although it is unclear to what degree, problems with impulse control. [FN176] The ability of the prefrontal cortex to act as the “braking mechanism” upon the immediate responses of the amygdala is impaired, thus often producing violent and aggressive re-

sponses from a *178 person who would not otherwise engage in such conduct. [FN177] In other words, it can be argued that a defendant's "free will" has been compromised and, to an extent, that he was acting under duress or compulsion. At the very least, there is the presence of impaired judgment, impaired reasoning, and flat affect (emotion), which as discussed above, is a part of, and not separate from, rational decision making. This evidence can have strong value because it arguably affects a defendant's blameworthiness.

Of course, this does not mean that the defendant bears no responsibility for his conduct. On the contrary, the defendant remains, in a legal sense, fully responsible. In fact, it is conceivable for an individual with frontal lobe disorder or any other brain injury, to form the requisite intent necessary to justify a sentence of death. The evidence does not yet support the assertion that those with frontal lobe disorder can never act with premeditation. Rather, it demonstrates that such individuals may be predisposed to engage in impulsive and uncontrolled conduct. If such behavior occurs during the commission of a crime, it is relevant to the issue of culpability.

Thus, based upon what we know about traumatic brain injuries such as frontal lobe disorder, its use at the sentencing phase of a capital trial is substantially relevant and probative. Because of the effects that accompany an injury to the frontal lobe (and amygdala), an individual charged with a capital offense is arguably less culpable, and this mitigating evidence should warrant a term of life imprisonment.

2. Sentencing Generally for Non-Capital Violent Crimes - Retribution, Rehabilitation, and Future Dangerousness

With respect to crimes of violence, defendants also enjoy nearly unfettered discretion to proffer mitigating evidence at the sentencing phase. Here, the use of neuroscientific evidence is central to developing the type of "individualized" [FN178] sentence that our criminal justice system envisions. As discussed below, in the case of non-capital crimes, mitigating evidence of brain injuries such as frontal lobe disorder should have an impact not primarily on the length of the sentence, but on its nature.

Specifically, the sentence should be retributive, rehabilitative, and utilitarian. First, because individuals with frontal lobe disorder still retain their intellectual capacities and know right from wrong, they are still responsible for their actions. To say that their behavior is entirely uncontrollable, or that they cannot understand the nature of their conduct, is contrary to what we already know. In accordance with retributive principles, a term of imprisonment is warranted and justifiable. However, a defendant with frontal lobe disorder presents two problems that the "normal" defendant does not, and which directly impact the sentencing determination. First, as already stated, he is arguably less culpable. More importantly, however, because of the frontal lobe disorder, these individuals may be more likely to re-offend upon completion of their sentence. Simply stated, it is precisely the impulsivity and lack of behavioral control that serves to mitigate culpability that can also be the basis for a finding of future dangerousness.

It is for these reasons that the individual's sentence should not consist merely of imprisonment. Instead, part of the sentence should be through civil confinement. This approach is *179 necessary to treat the underlying causes of the criminal behavior. [FN179] Brain injuries, such as frontal lobe disorder, are, to an extent, treatable through both therapy and medical intervention. Specifically, educating the individual and his support structure about the illness and its effects, coupled with making environmental changes, can reduce behaviors associated with frontally damaged individuals. [FN180] In addition, some medications can be helpful. [FN181] Thus, a treatment plan, administered as part of the defendant's sentence, will serve a rehabilitative function in so far as it helps the individual to understand, adapt to, and eventually manage the effects of his disorder. It will also serve

a utilitarian function by addressing the issue of future dangerousness through a process that strives to reduce recidivism. The critical component of any civil confinement proposal is that, to comply with due process, it must contain detailed guidelines as the methods, quality, and time period governing treatment.

Additionally, in *Kansas v. Crane* [FN182] and *Kansas v. Hendricks*, [FN183] the United States Supreme Court provided support for the post-sentence civil confinement of certain criminal offenders. In *Crane*, the Court considered the State of Kansas's Sexually Violent Predator Act, which allowed for the involuntary confinement of a person “who suffers from a mental abnormality or personality disorder which makes the person likely to engage in repeat acts of sexual violence.” [FN184] The term “mental abnormality” is defined as a “congenital or acquired condition affecting the emotional or volitional capacity which predisposes the person to commit sexually violent offenses in a degree constituting such person a menace to the health and safety of others.” [FN185] The Court upheld the statute's constitutionality, stating that “[i]t is enough to say that there must be proof of serious difficulty in controlling behavior.” [FN186]

Furthermore, in *Hendricks*, the Court again upheld the statute, first stating that “commitment under the Act does not implicate either of the two primary objectives of criminal punishment: retribution or deterrence.” [FN187] Second, even though the Act was “tied to criminal activity,” that fact was insufficient to classify the statute as punitive. [FN188] Perhaps most importantly, the Court held that “measures to restrict the freedom of the mentally ill” represented “a legitimate nonpunitive governmental objective.” [FN189] It went so far as to say that confinement of “mentally unstable individuals who present a danger to the public” was a typical example of nonpunitive detention. [FN190] Instead of being punitive, “the confinement's duration is ... linked to the stated purpose of commitment, namely, to hold the person until his mental abnormality no longer causes him to be a threat to others.” [FN191]

The critical aspect of the Kansas statute, which justifies the post-sentence confinement of those with frontal lobe disorder, is that it authorized confinement for those who had the inability to *180 control behavior. As suggested above, a defendant's sentence can be modified so that civil commitment occurs during the sentence. However, it would also be constitutional for those with frontal lobe disorder to face post-sentence confinement if it can be demonstrated that they continue to suffer from impulse control problems. Based on *Crane* and *Hendricks*, this would constitute precisely the type of “mental abnormality” to warrant confinement. [FN192] Moreover, the confinement is neither retributive nor deterrence based, but instead seeks to treat the offender while simultaneously addressing a legitimate threat to public safety.

The critical aspect of such a statutory scheme would be to ensure compliance with procedural and substantive due process. Hypothetically, with respect to post-sentence confinement, there would have to be an initial hearing where the State would be required to demonstrate, by clear and convincing evidence, that: (1) the individual's brain injury continues to cause impulse control problems to such a degree that there is a substantial danger to public safety; (2) there is a specific treatment plan that can directly and successfully address the individual's brain disorder; (3) such plan will be completed within a reasonable period of time; and (4) other, less restrictive treatment methods are not likely to be successful. During this initial hearing, the State would be required not only to demonstrate the efficacy of the treatment plan, but also to set forth a specific time period within which it will be completed. Furthermore, the State should be required to report back to the Court at frequent intervals regarding the treatment process and whether it is proceeding as originally contemplated. Additionally, the individual that is subject to confinement must have the right - at any stage - to request that he be released. The Court may grant such a motion if, among other things, it finds that the individual no longer presents a substantial threat to public safety and can receive treatment in a lesser restrictive manner. [FN193]

Conclusion

Neuroscientific studies are producing groundbreaking evidence about the brain and the impact that it has on human behavior. The principles upon which the criminal justice system are based, free will and individual responsibility, are now being challenged at a fundamental level. However, even though we may not have as much “free will” as we once thought, we still have “free won’t.” We are not prisoners to our brains. We still have the power to resist even the strongest impulses that originate in our brain. As a result, those with brain injuries such as frontal lobe disorder are still legally responsible. However, while they may still be culpable for their crimes, they are less culpable than one who does not suffer from the disorder. Based upon these facts, defendants with brain injuries are competent to stand trial. They are neither insane nor incapable of forming intent.

However, they are less blameworthy. They have problems controlling their behavior, and this is undoubtedly a mental abnormality that mitigates culpability. As such, it calls for a different type of sentence, namely, one that utilizes some retributive principles but also contains rehabilitative and utilitarian aspects. This approach is not only consistent with the goal of individualized sentencing - it also accurately reflects where neuroscience is in telling us about the brain and human conduct.

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[FN2]. JOHN MATTHEW FABIAN, FORENSIC NEUROPSYCHOLOGICAL ASSESSMENT AND DEATH PENALTY LITIGATION, DEATH PENALTY LITIGATION, THE CHAMPION, 33 (2009).

[FN3]. *Id.* at 27.

[FN4]. *Id.*

[FN5]. *Id.*

[FN6]. *Id.*

[FN7]. *Id.* at 27-28.

[FN8]. Richard E. Redding, *The Brain-Disordered Defendant: Neuroscience and Legal Insanity in the Twenty-First Century*, 56 AM. U. L. REV. 51, 67 (2006).

[FN9]. *Id.* at 60 (*quoting* Jonathan H. Pincus, BASE INSTINCTS: WHAT MAKES KILLER KILL? 85, 217 (2001)).

[FN10]. Redding, *supra* note 8, at 67 (*quoting* Terence W. Picton, Clause Alain, and Anthony R. McIntosh, *The Theatre of the Mind” Psychological Studies of the Human Frontal Lobes*, in PRINCIPLES OF FRONTAL LOBE FUNCTION 109 (Donald T. Stuss and Robert T. Knight eds., (2002))).

[FN11]. Redding, *supra* note 8, at 67-68.

[FN12]. *Id.* at 60-61; *see also* D. Michael Bitz & Jean Seipp Bitz, *Incompetence in the Brain Injured Individual*,

12 ST. THOMAS L. REV. 205, 230-232 (1999).

[FN13]. Redding, *supra* note 8, at 61.

[FN14]. *Id.* at 66.

[FN15]. James H. Fallon, *Neuroanatomical Background to Understanding the Brain of the Young Psychopath*, 3 OHIO ST. J. CRIM. L. 341, 347 (2006).

[FN16]. *Id.* at 357.

[FN17]. Fabian, *supra* note 2, at 26.

[FN18]. Redding, *supra* note 8, at 56.

[FN19]. *Id.* at 53.

[FN20]. *Id.*; see also Abram S. Barth, *A Double-Edged Sword: The Role of Neuroimaging in Federal Capital Sentencing*, 33 AM. J. L. & MED. 501, 503 (2007) (discussing the “emotionally impulsive actions” caused by frontal lobe disorder.”).

[FN21]. Redding, *supra* note 8, at 68.

[FN22]. *Id.*

[FN23]. 509 U.S. 579, 593 (1993).

[FN24]. 293 F. 1013, 1014 (D.C. Cir. 1923).

[FN25]. *Skilling v. United States*, 130 S. Ct. 2896 (2010).

[FN26]. Fallon, *supra* note 15, at 344.

[FN27]. *Id.* at 347.

[FN28]. *Id.*

[FN29]. *Id.* at 343.

[FN30]. Fabian, *supra* note 2, at 25.

[FN31]. Redding, *supra* note 8, at 59.

[FN32]. *Id.* at 58; Fabian, *supra* note 2, at 25-26.

[FN33]. Redding, *supra* note 8, at 58.

[FN34]. *Id.* at 68.

[FN35]. *Id.*

[FN36]. *Id.*

[FN37]. *Id.*

[FN38]. *Id.* at 53.

[FN39]. *Id.* at 59.

[FN40]. *Id.* at 59.

[FN41]. *Id.*

[FN42]. *Id.* at 59-60.

[FN43]. *Id.* at 60 (quoting JONATHAN H. PINCUS, *BASE INSTINCTS: WHAT MAKES KILLERS KILL?* 217 (2001)).

[FN44]. *Id.* at 60.

[FN45]. *Id.* at 69 (quoting DANIEL GOLEMAN, *EMOTIONAL INTELLIGENCE: WHY IT CAN MATTER MORE THAN IQ* 28 (1994)).

[FN46]. Redding, *supra* note 8, at 69.

[FN47]. *Id.* at 69-70 (quoting Goleman, *supra* note 45, at 16.)

[FN48]. Redding, *supra* note 8, at 70.

[FN49]. *Id.* at 61.

[FN50]. *Id.* at 61-62.

[FN51]. *Id.* at 67.

[FN52]. Peggy Sasso, *Criminal Responsibility in the Age of Mind Reading*, 46 *AM. CRIM. L. REV.* 1191, 1241 (2009).

[FN53]. Redding, *supra* note 8, at 53.

[FN54]. *Id.* at 68.

[FN55]. Peggy Sasso, *Implementing the Death Penalty: The Moral Implications of Recent Advances in Neuropsychology*, 29 *CARDOZO L. REV.* 765, 791 (2007).

[FN56]. *Id.*

[FN57]. *Id.*

[FN58]. Redding, *supra* note 8, at 68.

[FN59]. *Id.* at 75; *see also* Cassandra M. Lamb, *Behavioral Biology: The Impact of Neuroimaging and Brain*

Dysfunction on the Sentencing of Sexual Offenders, 35 NEW ENG. J. ON CRIM. & CIV. CONFINEMENT 421, 432 (discussing the admissibility of frontal lobe disorder in the courts); Sally Terry Green, *The Admissibility of Expert Witness Testimony Based on Adolescent Brain Imaging Technology in the Prosecution of Juveniles: How Fairness and Neuroscience Overcome the Evidentiary Obstacles to Allow for Application of a Modified Common Law Infancy Defense*, 12 N.C. J. L. & TECH. 1, 29-31 (2010) (discussing the admissibility of expert testimony regarding adolescent brain development).

[FN60]. 509 U.S. at 593.

[FN61]. Redding, *supra* note 8, at 76.

[FN62]. *Id.* (quoting *Frye*, 293 F. at 1014).

[FN63]. *See generally* Scott N. MacMillan and Michael S. Vaughn, *Weighing the Evidence: Neuroimaging Evidence of Brain Trauma or Disorder in Courts*, 46 NO. 3 CRIM. L. BULL. ART 5 (discussing the admissibility of neurological evidence in various cases).

[FN64]. *See, e.g.*, Steven K. Erickson, *Blaming the Brain*, 11 MINN. J. L. SCI. & TECH. 27, 29 (2010) (stating that “[m]uch of the recent legal scholarship concerned with criminal responsibility as of late has invested heavily in the notion that the findings of biological sciences promise a fundamental shift away from orthodox notions of criminal liability.”); O. Carter Snead, *Neuroimaging and the ‘Complexity’ of Capital Punishment*, 82 N.Y.U. L. REV. 1265, 1299 (2007) (arguing that the goal of neuroscientists is to support defendants’ “mitigation claims with cutting-edge neuroimaging research that demonstrates a biological disposition to criminal violence.”); *but see* Nicholas Thompson, *My Brain Made Me Do It*, LEGAL AFFAIRS, 2006- FEB 50, 53 (2006) (stating “[r]esponsibility ... is a social idea--one that scientists can inform, but cannot define. ‘The idea of responsibility, a social construct that exists in the rules of society, does not exist in the neuronal structures of the brain.’”) (quoting scholar Michael Gazzaniga).

[FN65]. Lamb, *supra* note 59, at 432 (suggesting the evidence was allowed in the capital murder context, but there is no reason to suggest that it would not be admitted in other contexts as well.)

[FN66]. Terry A. Maroney, *Emotional Competence, ‘Rational Understanding,’ and the Criminal Defendant*, 43 AM. CRIM. L. REV. 1375, 1382 (2006)(quoting *Drope v. Missouri*, 420 U.S. 162, 171 (1975)).

[FN67]. *Id.* at 1381.

[FN68]. *Id.* at 1382.

[FN69]. *Id.* at 1376.

[FN70]. *Id.* at 1377.

[FN71]. *Id.* at 1378.

[FN72]. 362 U.S. 402 (1960).

[FN73]. Maroney, *supra* note 66, at 1389.

[FN74]. *Id.* at 1386.

[FN75]. Bitz & Bitz, *supra* note 12, at 267.

[FN76]. Maroney, *supra* note 66, at 1388.

[FN77]. *Id.* at 1389.

[FN78]. *Id.* at 1387-1388.

[FN79]. *Id.* at 1377-1378.

[FN80]. *Id.* at 1378.

[FN81]. Bitz & Bitz, *supra* note 12, at 257-259.

[FN82]. *See* Fabian, *supra* note 2, at 27.

[FN83]. Redding, *supra* note 8, at 60.

[FN84]. *See* Bitz & Bitz, *supra* note 12, at 259-260.

[FN85]. *See id.*

[FN86]. *Id.*

[FN87]. Redding, *supra* note 8, at 68.

[FN88]. Bitz & Bitz, *supra* note 12, at 245.

[FN89]. Bitz & Bitz, *supra* note 12, at 251.

[FN90]. *Id.* at 251.

[FN91]. *Id.* at 251-52.

[FN92]. *Id.* at 252.

[FN93]. *Id.*

[FN94]. *Id.*

[FN95]. *Id.*

[FN96]. *Id.*

[FN97]. *Id.*

[FN98]. *Id.* at 253.

[FN99]. *Id.*

[FN100]. *Id.*

[FN101]. *Id.*

[FN102]. *Id.*

[FN103]. *Id.*

[FN104]. *Id.* at 257.

[FN105]. *Id.* at 254.

[FN106]. *Id.*

[FN107]. *Id.*

[FN108]. *Id.*

[FN109]. *Id.*

[FN110]. *Id.*

[FN111]. *Id.*

[FN112]. *Id.*

[FN113]. *Id.* at 255.

[FN114]. *Id.*

[FN115]. *Id.*

[FN116]. *Id.* at 255-56.

[FN117]. *Id.* at 257.

[FN118]. *Id.* at 258; *see also* Maroney, *supra* note 66, at 1404-1408.

[FN119]. Bitz & Bitz, *supra* note 12, at 258-59.

[FN120]. *Id.* at 275-276.

[FN121]. *Id.* at 276.

[FN122]. *Id.* at 277.

[FN123]. *Id.*

[FN124]. *Id.* at 276.

[FN125]. *Id.* at 275.

[FN126]. *Id.* at 211.

[FN127]. *Id.*

[FN128]. *Id.* n. 335.

[FN129]. Bitz & Bitz, *supra* note 12, at 262.

[FN130]. Maroney, *supra* note 66, at 1376.

[FN131]. Redding, *supra* note 8, at 53.

[FN132]. *Id.* at 68.

[FN133]. Bitz & Bitz, *supra* note 12, at 418.

[FN134]. Lamb, *supra* note 59, at 432.

[FN135]. *Id.* (citing M'Naghten's Case, 8 Eng. Rep. 718 (H.L. 1843)).

[FN136]. Lamb, *supra* note 59, at 433.

[FN137]. *Id.*

[FN138]. Redding, *supra* note 8, at 53.

[FN139]. *Id.* at 82.

[FN140]. *Id.*

[FN141]. *Id.*

[FN142]. *Id.*

[FN143]. *Id.* at 53.

[FN144]. *Id.* at 118.

[FN145]. *Id.*

[FN146]. *Id.* at 53.

[FN147]. Lamb, *supra* note 59, at 432

[FN148]. Redding, *supra* note 8, at 68.

[FN149]. Sasso, *supra* note 55, at 791.

[FN150]. *Id.*

[FN151]. *Id.* at 786-87

[FN152]. *Id.*

[FN153]. Thompson, *supra* note 64, at 53.

[FN154]. *Id.*

[FN155]. *Id.*

[FN156]. *Id.*

[FN157]. Lamb, *supra* note 59, at 434.

[FN158]. *Id.*

[FN159]. 438 U.S. 586, 604 (1978).

[FN160]. Lamb, *supra* note 59, at 435.

[FN161]. See **Adam Lamparello**, *Using Cognitive Neuroscience to Predict Future Dangerousness*, 42 COL. HUM. RIGHT L. REV. 481, 526 (2011).

[FN162]. *Id.* at 526 (quoting *United States v. Fields*, 483 F.3d 313, 342 (5th Cir. 2007) (in turn quoting *Fed. R. Evid.* 702)).

[FN163]. Snead, *supra* note 64, at 1300.

[FN164]. *Id.*

[FN165]. Lamb, *supra* note 59, at 435.

[FN166]. *Id.*

[FN167]. Snead, *supra* note 64, at 1298.

[FN168]. *Id.* at 1300.

[FN169]. *Id.* at 1300-1301.

[FN170]. *Id.* at 1302.

[FN171]. *Id.* at 1301.

[FN172]. *Id.* at 1307.

[FN173]. *Id.*

[FN174]. *Id.* at 1307.

[FN175]. *Id.* at 1307-1308.

[FN176]. **Lamparello**, *supra* note 161, at 526.

[FN177]. *Id.* at 509.

[FN178]. Snead, *supra* note 64, at 1307-1308.

[FN179]. **Lamparello**, *supra* note 161, at 528.

[FN180]. *Id.*

[FN181]. *Id.*

[FN182]. 534 U.S. 407, 412-13 (2002).

[FN183]. 521 U.S. 346, 352-53 (1997).

[FN184]. Kan. Stat. Ann. 59-29A02(a).

[FN185]. Kan. Stat. Ann. 59-29A02(b).

[FN186]. *Crane*, 534 U.S. at 413.

[FN187]. *Hendricks*, 521 U.S. at 361-62.

[FN188]. *Id.* at 362 (quoting *United States v. Ursery*, 518 U.S. 267 (1996)).

[FN189]. *Hendricks*, 521 U.S. at 362-63 (quoting *United States v. Salerno*, 481 U.S. 739, 747 (1987)).

[FN190]. *Id.* at 363 (quoting *Salerno*, 481 U.S. at 748-49).

[FN191]. *Id.* at 363-64.

[FN192]. *See id.*; *see also Crane*, 534 U.S. at 413.

[FN193]. A more complete discussion of this issue can be found in **Lamparello**, *supra* note 161, at 528-39.
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