

2017

## Mens Rea and Methamphetamine: High Time for a Modern Doctrine Acknowledging the Neuroscience of Addiction

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### Recommended Citation

Meredith Cusick, *Mens Rea and Methamphetamine: High Time for a Modern Doctrine Acknowledging the Neuroscience of Addiction*, 85 Fordham L. Rev. 2417 (2017).

Available at: <https://ir.lawnet.fordham.edu/flr/vol85/iss5/20>

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**MENS REA AND METHAMPHETAMINE:  
HIGH TIME FOR A MODERN DOCTRINE  
ACKNOWLEDGING THE NEUROSCIENCE  
OF ADDICTION**

*Meredith Cusick\**

*In American criminal law, actus non facit reum, nisi mens sit rea, “an act does not make one guilty, without a guilty mind.” Both actus reus and mens rea are required to justify criminal liability. The Model Penal Code’s (MPC) section on culpability has been especially influential on mens rea analysis. An issue of increasing importance in this realm arises when an offensive act is committed while the actor is under the influence of drugs. Several legal doctrines address the effect of intoxication on mental state, including the MPC, limiting or eliminating its relevance to the mens rea analysis. Yet these doctrines do not differentiate between intoxication and addiction.*

*Neuroscience research reveals that drug addiction results in catastrophic damage to the brain resulting in cognitive and behavioral deficits. Methamphetamine addiction is of particular interest to criminal law because it causes extensive neural destruction and is associated with impulsive behavior, violent crime, and psychosis. Furthermore, research has revealed important distinctions between the effects of acute intoxication and addiction. These findings have implications for the broader doctrine of mens rea and, specifically, the intoxication doctrines. This Note argues for the adoption of an addiction doctrine that acknowledges the effect of addiction on mens rea that is distinct from doctrines of intoxication.*

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#### INTRODUCTION

On a cold February day in Northern California, new mother Samantha Green swam across a fifty-five-degree muddy slough while holding her nineteen-day-old son, who was only wearing a thin onesie.<sup>1</sup> After crossing the water with her newborn, Green passed out under a tree.<sup>2</sup> When she awoke along the marsh the next day, she screamed until she was found.<sup>3</sup>

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1. See Lindsey Bever & Amy B. Wang, *Mother Whose Baby Died During a Meth-Fueled Search for Her Lover Is Found Guilty of Murder*, WASH. POST (Sept. 17, 2016), [https://www.washingtonpost.com/news/morning-mix/wp/2016/08/22/it-froze-last-night-mother-accused-in-newborns-death-during-meth-fueled-search-for-lover/?utm\\_term=.9b15e4094ff6](https://www.washingtonpost.com/news/morning-mix/wp/2016/08/22/it-froze-last-night-mother-accused-in-newborns-death-during-meth-fueled-search-for-lover/?utm_term=.9b15e4094ff6) [https://perma.cc/Z6MH-84EZ].

2. See *id.*

3. See *id.*

Her infant son had died of exposure to the cold.<sup>4</sup> When police arrived, their dashboard cameras captured Green shivering and howling at the death of her son.<sup>5</sup> She moaned in grief on the recording, crying out, “I just want my baby,” “he doesn’t deserve this,” and “I love my baby. Why?”<sup>6</sup>

At trial, defense attorneys argued that, while Green was responsible for her infant son’s death, she was not a murderer.<sup>7</sup> Green, a methamphetamine addict who had binged that tragic morning, crossed the slough in search of the father of her child (her fiancé and drug provider) correctly believing him to be with another woman.<sup>8</sup> Defense experts testified that Green was in the grips of a methamphetamine-induced psychosis, experiencing apocalyptic thoughts and hallucinations.<sup>9</sup> Bypassing the lesser charge of involuntary manslaughter, the jury found Green guilty of second-degree murder<sup>10</sup> by concluding that Green satisfied the offense’s mental state requirements: “that 1) she intentionally committed an act that she knew was dangerous to human life, and 2) had a conscious disregard of that risk.”<sup>11</sup> The jury was instructed that voluntary intoxication was no defense to murder.<sup>12</sup> Green was sentenced to fifteen years to life in prison for her role in the death of her nineteen-day-old son named Justice.<sup>13</sup>

In American criminal law, “*actus non facit reum, nisi mens sit rea*” (meaning ‘an act does not make one guilty, without a guilty mind’).<sup>14</sup> Both an act, *actus reus*, and a guilty mind, *mens rea*, are required for criminal liability.<sup>15</sup> The necessity of examining each defendant’s mindset has contributed to the increasing overlap between neuroscience and criminal law.<sup>16</sup> Between 2006 and 2012, the number of “law and

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4. *See id.*

5. *See* Darrell Smith, *Samantha Green Guilty of Murder in Death of Infant Son*, SACRAMENTO BEE (Sept. 16, 2016), <http://www.sacbee.com/news/local/crime/article102222787.html> [<https://perma.cc/2WNX-U9Q2>].

6. *Id.*

7. *See id.*

8. *See id.*

9. *See* Darrell Smith, *Expert Says Drug-Induced Psychosis Led Samantha Green into Slough with Infant Son*, SACRAMENTO BEE (Sept. 7, 2016), <http://www.sacbee.com/news/local/crime/article100532587.html> [<https://perma.cc/XU7F-LM5A>].

10. *See* Smith, *supra* note 5.

11. Jade Wolkansky, *Jury Finds Green Guilty of Second Degree Murder*, DAVIS VANGUARD (Sept. 16, 2016), <http://www.davisvanguard.org/2016/09/jury-finds-green-guilty-of-second-degree-murder/> [<https://perma.cc/CN3U-QKWZ>].

12. *See id.*

13. *See* Lauren Keene, *Samantha Green Sentenced to Prison; Bid for New Trial Denied*, DAVIS ENTERPRISE (Dec. 11, 2016), <http://www.davisenterprise.com/local-news/crime-fire-courts/samantha-green-sentenced-to-prison-bid-for-new-trial-denied/> [<https://perma.cc/E7BN-YMBW>].

14. Elizabeth Bennett, *Neuroscience and Criminal Law: Have We Been Getting It Wrong for Centuries and Where Do We Go from Here?*, 85 *FORDHAM L. REV.* 437, 437–38 (2016) (quoting *BLACK’S LAW DICTIONARY* (5th ed. 1979)).

15. *See id.*

16. Neuroscience involves the study of the physiology, biochemistry, anatomy, or molecular biology of the brain and nervous system and their relationship to cognition and behavior. *See Neuroscience*, *MERRIAM-WEBSTER’S DICTIONARY*, <https://www.merriam->

neuroscience” publications multiplied by nearly tenfold, and interest in the intersection between these two fields continues to grow.<sup>17</sup> Of interest is the potential for neuroscience to inform the understanding of moral responsibility and criminal liability.<sup>18</sup>

This Note contributes to that body of scholarship by examining criminal law’s approach to the relationship between drug use and mental state. It examines neuroscience research on the effect of addiction on the brain, with a focus on methamphetamine addiction, and considers whether these findings suggest addiction requires a different legal doctrine than that of intoxication.

The history of the intoxication doctrine reflects tensions between criminal law, blameworthiness, and morality.<sup>19</sup> What is not clear is whether addiction should fit within the various intoxication doctrines—and, if so, where—and how criminal law should adjust the mens rea analysis to acknowledge neuroscience findings that drug addiction results in catastrophic damage to the brain.<sup>20</sup> This Note addresses this question with a focus on the mens rea and intoxication provisions of the Modern Penal Code (MPC).

Part I of this Note provides an overview of mens rea and the intoxication doctrine, including an analysis of the three prominent doctrines of intoxication in American criminal law. Next, Part II analyzes methamphetamine abuse and the neurological and behavioral changes associated with methamphetamine addiction. Then, Part III explores difficulties in applying doctrines of intoxication to methamphetamine-addicted individuals. Finally, Part IV makes the case for a separate doctrine of addiction within the MPC and highlights addiction’s relevance to the mens rea analysis.

#### I. MENS REA, THE MODEL PENAL CODE, AND THE COURTS UNDER THE INFLUENCE OF INTOXICATION

The foundation of American criminal law relies on the positive association between criminal liability and a guilty mind.<sup>21</sup> But when an actor has committed a crime while under the influence of a mind-altering substance, there is debate as to whether intoxication should affect the mens rea analysis and, therefore, the imposition of criminal liability.

This part examines the MPC’s approach to the mens rea analysis and the legal doctrines of intoxication. Part I.A focuses on the MPC’s goals of

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webster.com/dictionary/neuroscience (last visited Mar. 25, 2017) [<https://perma.cc/LAT8-HTD9>].

17. See Owen D. Jones et al., *Neuroscientists in Court*, 14 NATURE REVIEWS NEUROSCIENCE 730, 731 (2013) (showing a sharp rise in “neurolaw” field publications in figure 1).

18. See Bennett, *supra* note 14, at 437.

19. See *infra* Part I.B.

20. This Note does not take a position on the general admissibility of neuroscience evidence in court for culpability analyses.

21. See *infra* Part I.A.

simplicity and standardization in adopting the four mental states of purpose, knowledge, recklessness, and negligence. Part I.B discusses the emergence of criminal law's intoxication doctrines, which are often invoked to negate mens rea.

#### A. *Mens Rea in the Model Penal Code*

The MPC, completed in 1962 by the American Law Institute (ALI), sought to bring clarity to criminal common law.<sup>22</sup> Its promulgation “prompted a wave of state code reforms in the 1960s and 1970s, each influenced by the Model Penal Code,” and the MPC is perhaps “the closest thing to being an American criminal code.”<sup>23</sup> In addition to its influence on state code reform, the MPC is frequently cited by courts as persuasive authority.<sup>24</sup> The MPC's commentaries, published in the 1980s, illuminate the reasoning behind code provisions and frequently discuss the adoption or rejection of individual provisions by the states.<sup>25</sup> The MPC's mens rea section, section 2.02, is perhaps its greatest contribution to American criminal law reform.<sup>26</sup>

The drafters of the MPC faced a daunting task in grappling with and codifying the near eighty mens rea terms in use among the states.<sup>27</sup> The MPC predominantly sought to simplify and standardize the mens rea analysis in two ways: (1) by reducing the use of normative terms and (2) by decreasing the number of mental states.<sup>28</sup>

Abandoning terminology that required normative judgments—such as malice aforethought, premeditation, willfulness, carelessness, and wantonness—the drafters sought standardization in adopting “presumably testable phenomena such as ‘conscious object’ or ‘knowledge.’”<sup>29</sup> The commonly held belief that consciousness and voluntariness would involve a more scientific analysis highlights the substantial influence exerted by the contemporaneous science of Freudian psychoanalysis.<sup>30</sup> The MPC treats the conscious, voluntary act as a threshold requirement before a defendant's mens rea can be determined.<sup>31</sup> The mens rea analysis that proceeded was

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22. See MARKUS D. DUBBER, AN INTRODUCTION TO THE MODEL PENAL CODE 2 (2d ed. 2015); see also *id.* at 44 (describing section 2.02 as “the heart of the Model Penal Code”).

23. Paul H. Robinson & Markus D. Dubber, *The American Model Penal Code: A Brief Overview*, 10 NEW CRIM. L. REV. 319, 320 (2007).

24. See *id.* at 327.

25. See *id.*

26. See DUBBER, *supra* note 22, at 44.

27. See Paul H. Robinson, *A Brief History of Distinctions in Criminal Culpability*, 31 HASTINGS L.J. 815, 815 (1980).

28. See Robinson & Dubber, *supra* note 23, at 335.

29. *Id.*

30. See generally Deborah W. Denno, *Criminal Law in a Post-Freudian World*, 2005 U. ILL. L. REV. 601. Freudian psychoanalysis, which dominated psychiatry in the 1950s and 1960s, is rooted in a fundamental distinction between conscious and subconscious thought. See *id.* at 616, 619–20.

31. See *id.* at 621. Interestingly, the MPC does not define the term “voluntary” but instead provides examples of acts that are considered not voluntary. *Id.* at 620. Moreover, while the MPC also fails to define “unconsciousness,” “the MPC's Commentaries do make

then meant to “represent[] a subjective inquiry into a defendant’s mental attitude, not an objective inquiry based upon a reasonable person standard.”<sup>32</sup> The emphasis on subjectivity also reflects the Freudian approach to individualized therapy.<sup>33</sup> The drafters incorporated the science of their times while developing the MPC.<sup>34</sup> While the fields of neuroscience and psychology have changed drastically since Freud’s time, the MPC’s mens rea analysis has not. Still of critical importance to criminal law is the MPC’s most radical change to the law of mens rea, which was the adoption of only four culpability terms: purpose, knowledge, recklessness, and negligence.<sup>35</sup>

The selection of only four mens rea terms may have been necessary to accommodate the MPC’s novel requirement that each element of an offense carry its own mental state.<sup>36</sup> Instead of a typical offense analysis, in which only one state of mind is required by an offense, the MPC adopted criminal offense definitions that contain multiple elements, each of which might require a different culpable mental state.<sup>37</sup> The elements to be examined under the MPC are conduct, attendant circumstance, and result.<sup>38</sup>

By establishing only four culpability terms, the MPC eliminated some of the flexibility and nuance associated with the traditional mens rea analysis. Throughout history, “the process of recognizing additional distinctions [in culpable states of mind] has been through the recognition of additional bases for mitigation. The new distinction creates a new category that will receive less harsh punishment, or limits a more harsh punishment to the old category.”<sup>39</sup> The restriction of culpable mental states has resulted in the formation of doctrines seeking to negate mens rea, such as intoxication, which play a significant role in American criminal law.

### B. *The Law on Drugs*

The MPC and common law differ in their approach to the culpability of an intoxicated criminal defendant. This section highlights the three

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many direct references to . . . psychoanalytic literature to explain why particular conditions were deemed unconscious and involuntary.” *Id.* at 621.

32. *Id.* at 646.

33. *See id.* at 619, 646.

34. *See id.* at 614.

35. *See* Robinson & Dubber, *supra* note 23, at 334; *see also* Robinson, *supra* note 27, at 815. A fifth term—strict liability—will not be discussed in this Note. Strict or absolute liability is “liability imposed for faultless conduct” and, as such, does not involve a mens rea analysis. *Id.* at 820.

36. *See* Robinson & Dubber, *supra* note 23, at 335.

37. *See* Paul H. Robinson & Jane A. Grall, *Element Analysis in Defining Criminal Liability: The Model Penal Code and Beyond*, 35 STAN. L. REV. 681, 683, 688 (1983).

38. *See id.* at 693.

39. Robinson, *supra* note 27, at 850. Robinson concluded by stating:

[N]o matter how stable or advanced we may now feel, we are only part of someone else’s history. . . . A later generation may perceive additional fundamental distinctions in culpability and provide greater application of current ones. . . . [A]s the people of 844 recognized only two, the people of 2548 may feel justice cannot be done with less than eight.

*Id.* at 853.

prominent doctrines of intoxication in American criminal law: (1) MPC section 2.08, (2) the common law doctrine of specific intent, and (3) the Supreme Court's ruling in *Montana v. Egelhoff*.<sup>40</sup>

### 1. The MPC on Drugs: Voluntary Intoxication

The MPC addresses drug use in section 2.08, titled "Intoxication."<sup>41</sup> Although often referred to as a defense or excuse, the MPC's doctrine of intoxication is nearly the opposite.<sup>42</sup> First, even when intoxication is applicable, it is not so much a defense as the absence of an offense, or the failure to establish proof of mens rea.<sup>43</sup> Second, the MPC contracts intoxication's scope as a defense by articulating "what amounts to an intoxication exception to the general rule that criminal liability requires a match between behavior and offense definition."<sup>44</sup> Intoxication is generally not an excuse for criminal conduct under the MPC<sup>45</sup> because it cannot be used to negate recklessness<sup>46</sup> and "recklessness is sufficient to establish mens rea for most offenses."<sup>47</sup>

Reflecting the views at the time it was adopted, the MPC's intoxication section deals almost exclusively with intoxication due to alcohol. Throughout the Comments, drunkenness is frequently substituted for intoxication.<sup>48</sup> But in the last portion of the Comments, the definition of "intoxication" is untethered from alcohol intoxication: "The use of drugs or any other substance is to be treated in the same way as the use of alcohol."<sup>49</sup> A short statement about narcotics is all that follows as the Comment explains that the intoxication doctrine will have little practical bearing on crimes committed under the influence of narcotics, as "[t]he effect of a narcotic is to make the addict less aggressive *without any great interference with mental powers*."<sup>50</sup>

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40. 518 U.S. 37 (1996).

41. See MODEL PENAL CODE § 2.08, at 349 (AM. LAW INST., Official Draft and Revised Comments 1985). The MPC defines intoxication as "a disturbance of mental or physical capacities resulting from the introduction of substances into the body." *Id.*

42. See DUBBER, *supra* note 22, at 69.

43. See MODEL PENAL CODE § 2.08, at 349 ("Intoxication of the actor is not a defense unless it negates an element of the offense."); DUBBER, *supra* note 22, at 69.

44. DUBBER, *supra* note 22, at 69.

45. See MODEL PENAL CODE § 2.08, at 349. Exceptions are involuntary intoxication, which is not self-induced, and pathological intoxication, which is "intoxication grossly excessive in degree, given the amount of the intoxicant, to which the actor does not know he is susceptible." *Id.* § 2.08(5), at 349.

46. See *id.* § 2.08(2), at 349. "When recklessness establishes an element of the offense, if the actor, due to self-induced intoxication, is unaware of a risk of which he would have been aware had he been sober, such unawareness is immaterial." *Id.*

47. *Id.* § 2.08 cmt. 1, at 354.

48. See *id.* § 2.08 cmt. 1, at 352–59.

49. *Id.* § 2.08 cmt. 4, at 366.

50. *Id.* (emphasis added). "Opiates are quieting drugs that repress hostile urges, create a passive, dreamy state and depress sexual drives. . . . They allay anxieties and, therefore, supply a kind of a 'dutch courage' which . . . is achieved without any great deterioration in mental ability or manual dexterity . . ." *Id.* (quoting COUNCIL ON MENTAL HEALTH, AM. MED. ASS'N, REPORT ON NARCOTIC ADDICTION 24 (1957)).



Although devoting little space to drugs other than alcohol, the Comments discuss at length how the MPC's intoxication doctrine (allowing negation of purpose and knowledge) is clearer than—yet substantively equal to—the common law's approach.<sup>51</sup>

## 2. The Common Law on Drugs: Specific Intent Negation

Prior to the nineteenth century, the common law did not allow any concession for intoxication in determining criminal liability.<sup>52</sup> Due to the harsh effects of this standard, judges sought a workable compromise by which they might consider intoxication without undermining the entirety of the traditional mens rea analysis.<sup>53</sup> Judge John Coleridge articulated this compromise in 1849 in noting that “evidence of voluntary intoxication was relevant only if it deprived the defendant of ‘the power of forming any specific intention.’”<sup>54</sup> From here, the distinction between general and specific intent offenses originated, providing the basis for the intoxication doctrines followed by many states and courts.

The distinction between general and specific intent “is a device, conceived at common law, to achieve a certain result rather than reflecting a coherent theory.”<sup>55</sup> As a result, it is not possible to accurately frame general and specific intent within a complete, unitary theory.<sup>56</sup> The most simple formulation is this: specific-intent offenses are those that require proof that the defendant intended to bring about some additional consequence or social harm.<sup>57</sup> The new common law rule allows negation of specific intent, but not general intent, offenses.<sup>58</sup>

The ambiguous and “perhaps incoherent” specific intent doctrine developed in response to the harshness of a rule that prohibited consideration of intoxication in the mens rea analysis.<sup>59</sup> The common law formulation is substantively equivalent to the Model Penal Code's intoxication doctrine because crimes of recklessness and negligence are usually considered general intent offenses.<sup>60</sup> Just as intoxication does not

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51. *See id.* § 2.08 cmt. 1, at 353–56 (describing the distinction between specific and general intent as “obscure” and “vague,” but stating that the net effect of the MPC's formulation and the usual formulation seems to be the same).

52. *See* Eric A. Johnson, *Understanding General and Specific Intent: Eight Things I Know for Sure*, 13 OHIO ST. J. CRIM. L. 521, 529 (2016).

53. *See id.*

54. *Id.* (quoting *Regina v. Monkhouse* (1849) 4 Cox C.C. 55, 56).

55. *Id.* at 522 (quoting PAUL ROBINSON, CRIMINAL LAW DEFENSES § 65(e), at 298 (1984)).

56. *See id.*

57. *See id.* at 524–25. Johnson's illuminating article on general and specific intent describes a second category of offenses that qualify as specific intent offenses: statutes that require “proof that the defendant ‘intended to commit some further act.’” *Id.* at 527–30.

58. *See id.* at 529.

59. *Id.* at 521, 529–30.

60. *See* MODEL PENAL CODE § 2.08 cmt. 1, at 353–56 (AM. LAW INST., Official Draft and Revised Comments 1985) (describing various offenses and how the net effects of the

negate a general intent offense under the common law, it does not negate recklessness or negligence under the MPC, whatever the effect the intoxication may have had on the awareness or knowledge of the actor.<sup>61</sup> At the heart of both doctrines is an attempt to acknowledge the potential for intoxication to alter one's mens rea or mental culpability.

### 3. The Supreme Court on Drugs: *Montana v. Egelhoff*

The leading U.S. Supreme Court case on voluntary intoxication, *Montana v. Egelhoff*,<sup>62</sup> embodies a decidedly different approach. In this case, a divided Court upheld a state law prohibiting consideration of voluntary intoxication in the determination of mens rea.<sup>63</sup> The Court determined that such a law does not violate the Due Process Clause of the Constitution, because the new common law rule—that intoxication may be considered for intent—is not “so rooted in the traditions and conscience of our people as to be ranked as fundamental.”<sup>64</sup> The *Egelhoff* decision revealed a Court fragmented over whether states may bar consideration of voluntary intoxication.<sup>65</sup> With only a plurality decision, the narrow grounds on which Justice Ginsburg concurred established the holding of the Court.<sup>66</sup> As discussed in *Tidwell v. Cash*,<sup>67</sup> the Court “clearly established that when a state law barring consideration of voluntary intoxication can be characterized as a rule ‘[d]efining mens rea to eliminate the exculpatory value of voluntary intoxication,’ rather than as a rule of evidence, the statute does not offend the Due Process Clause.”<sup>68</sup> In light of this ruling, a state does not have to prove purpose or knowledge in “a purely subjective sense” but may prove “circumstances that would otherwise establish knowledge or purpose ‘but for’ [the defendant’s] voluntary intoxication.”<sup>69</sup> Thus, a defendant’s voluntary intoxication may be irrelevant to the mens rea analysis.<sup>70</sup>

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common law and MPC formulations are generally the same); Johnson, *supra* note 52, at 532–38 (stating that “[c]rimes of recklessness and negligence are general-intent offenses”).

61. See MODEL PENAL CODE § 2.08(2), at 349.

62. 518 U.S. 37 (1996).

63. See *id.* at 56.

64. See *id.* at 47–48; see also U.S. CONST. amend. V (“No person shall . . . be deprived of life, liberty, or property, without due process of law.”); *id.* amend. XIV, § 1 (“[N]or shall any State deprive any person of life, liberty, or property, without due process of law.”).

65. See *Egelhoff*, 518 U.S. at 37.

66. See, e.g., *Marks v. United States*, 430 U.S. 188, 193 (1977) (“When a fragmented Court decides a case and no single rationale explaining the result enjoys the assent of five Justices, ‘the holding of the Court may be viewed as that position taken by those Members who concurred in the judgments on the narrowest grounds.’” (quoting *Gregg v. Georgia*, 428 U.S. 153, 169 n.15 (1976))).

67. No. EDCV 10-1883-AG RCF, 2012 WL 1570038 (C.D. Cal. Mar. 29, 2012), *report and recommendation adopted*, No. EDCV 10-1883-AG RCF, 2012 WL 1570032 (C.D. Cal. Apr. 30, 2012).

68. *Id.* at \*10 (alteration in original) (quoting *Egelhoff*, 518 U.S. at 58–59 (Ginsburg, J., concurring)).

69. *Egelhoff*, 518 U.S. at 58 (Ginsburg, J. concurring).

70. See *id.*

The Court's approach differs significantly from both the MPC's intoxication doctrine<sup>71</sup> and the specific-intent common law doctrine, which had been adopted by a majority of states before *Egelhoff*.<sup>72</sup> While the MPC and common law doctrines of intoxication may limit the consideration of voluntary intoxication in the mens rea analysis, neither doctrine allows its complete elimination.<sup>73</sup>

After *Egelhoff*, there is no clear prevailing doctrine among the states.<sup>74</sup> The diversity in approaches to the relationship between intoxication and mens rea, as emphasized by Justice Antonin Scalia in *Egelhoff*, reflects tensions between criminal law and virtues.<sup>75</sup> The doctrine of mens rea "historically provided the tools for a constantly shifting adjustment of the tension between the evolving aims of criminal law and changing religious, moral, philosophical, and medical views of the nature of man."<sup>76</sup> Evolved understanding of the differences between intoxication and addiction—in particular, neuroscience findings that drug addiction results in catastrophic damage to the brain—may suggest such an adjustment for the mens rea analysis for drug-addicted criminal defendants.

## II. METHAMPHETAMINE ADDICTION AND THE BRAIN

Methamphetamine is a particularly addictive stimulant, abuse of which is associated with significant neurological damage and severe effects on cognitive and behavioral functioning.<sup>77</sup> Popular use of methamphetamine has increased substantially in the last twenty years, in part due to the simplicity of producing the drug.<sup>78</sup> In contrast to cocaine, which is derived naturally in Central and South America and then processed elsewhere,

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71. See *supra* Part I.B.

72. See *Egelhoff*, 518 U.S. at 48 (plurality opinion) (noting that only one-fifth of states either never adopted the common law intoxication rule or had recently abandoned it).

73. See *supra* Part I.B.1–2.

74. Even a cursory search through statutes and court rules shows that some states use the common law rule, some the MPC's, and some *Egelhoff*'s. For example, California, New Mexico, and South Dakota follow the common law distinction between general and specific intent, while Connecticut, Maine, and Tennessee have a formulation similar to that of the MPC. See CAL. PENAL CODE § 29.4 (West 2016); CONN. GEN. STAT. ANN. § 53a-7 (West 2017); ME. REV. STAT. ANN. tit. 17, § 37 (2017); S.D. CODIFIED LAWS § 22-5-5 (2016); TENN. CODE ANN. § 39-11-503 (West 2016); N.M. CT. R. 14-5105 (providing an updated uniform jury instruction with committee commentary). Arizona, Indiana, and Montana do not allow evidence of voluntary intoxication to negate state of mind. See ARIZ. REV. STAT. ANN. § 13-503 (2016); IND. CODE ANN. § 35-41-2-5 (West 2016); MONT. CODE ANN. § 45-2-203 (West 2017). Hawaii "follows the position taken by Judge Learned Hand and a minority of the Model Penal Code Advisory Committee that the fact of intoxication 'should be admissible to prove or to disprove . . . mental state[] . . . whenever it is logically relevant,'" including recklessness. HAW. REV. STAT. ANN. § 702-230 (West 2016) (quoting MODEL PENAL CODE § 2.08 cmt. 3, at 6–7 (AM. LAW INST., Tentative Draft No. 9, 1959)).

75. See *Egelhoff*, 518 U.S. at 56.

76. *Id.* (quoting *Powell v. Texas*, 392 U.S. 514, 536 (1968)).

77. See Bruce D. Homer et al., *Methamphetamine Abuse and Impairment of Social Functioning: A Review of the Underlying Neurophysiological Causes and Behavioral Implications*, 134 PSYCHOL. BULL. 301, 301 (2008).

78. See Alasdair M. Barr et al., *The Need for Speed: An Update on Methamphetamine Addiction*, 31 J. PSYCHIATRY & NEUROSCIENCE 301, 301 (2006).

methamphetamine can be manufactured on a large scale in the United States.<sup>79</sup> The 2004 determination that methamphetamine was “the fastest-growing illicit drug in North America”<sup>80</sup> prompted Congress to pass the Combat Methamphetamine Epidemic Act of 2005.<sup>81</sup> This act initially decreased methamphetamine availability by limiting access to its precursor chemicals, but production and use has been on the rise since 2011.<sup>82</sup>

This part focuses on methamphetamine as a model drug through which to examine the relationship between drug addiction and mental states implicated in the mens rea analysis.<sup>83</sup> Part II.A explains why this Note focuses on methamphetamine addiction, and Part II.B discusses the unique pattern of methamphetamine use and abuse, which illuminates the dramatic effect this addiction has on an individual’s life. Part II.C then examines some of the significant neurophysiological changes associated with methamphetamine addiction and the correlative influence on behavior and mental state.

#### A. *Why Focus on Methamphetamine?*

Methamphetamine tests the boundaries of criminal law because it can feature prominently in crimes unrelated to possession, use, and trafficking.<sup>84</sup> Although the use of heroin, a narcotic, has skyrocketed in America,<sup>85</sup> any amount of methamphetamine abuse remains critically important to the criminal justice system because its abuse drives violent crime.<sup>86</sup> Where its abuse is prevalent, this stimulant’s relationship to

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79. See Arthur K. Cho, *Ice: A New Dosage Form of an Old Drug*, 249 SCIENCE 631, 633 (1990). Methamphetamine can be manufactured in a simple one-step process, in which either ephedrine or pseudophedrine is reduced. See *id.* This method creates what is known colloquially as “crystal” or “ice,” due to the drug’s heightened purity as compared to the market’s previous methamphetamine. See *id.* Prior to the emergence of “crystal meth,” synthesis was more commonly achieved through a condensation reaction between phenylacetone and methylamine, which resulted in a higher proportion of contaminants. See *id.*

80. Barr et al., *supra* note 78, at 308.

81. Pub. L. No. 111-268, 120 Stat. 192 (codified at 21 U.S.C. § 830 (2012)).

82. See Jane Carlisle Maxwell & Mary-Lynn Brecht, *Methamphetamine: Here We Go Again?*, 36 ADDICTIVE BEHAVIORS 1168 (2011). Once desired precursors were not available, methamphetamine manufacturers turned to different substrates. When he could no longer obtain pseudophedrine, infamous fictional “cook” Walter White explained, “We’re not going to need pseudophedrine. We’re going to make phenylacetone in a tube furnace, then we’re going to use reductive amination to yield methamphetamine.” *Breaking Bad: A No-Rough-Stuff-Type Deal* (AMC television broadcast Mar. 9, 2008).

83. This Note uses methamphetamine as a paradigmatic drug. The conclusions of this Note are not limited to methamphetamine addiction but focus on issues of drug addiction generally.

84. See *infra* notes 87, 95 and accompanying text.

85. See Pete Williams, *DEA Finds Heroin Use Skyrocketing Across U.S.*, NBC NEWS (Nov. 4, 2015), <http://www.nbcnews.com/news/us-news/dea-finds-heroin-use-skyrocketing-n457336> [<https://perma.cc/AP2K-3GGB>].

86. See *id.*

murders and armed robberies has been described as “truly frightening,” appearing to lead to “utterly irrational violence.”<sup>87</sup>

Methamphetamine is a highly potent and addictive psychostimulant but is unique even among stimulants.<sup>88</sup> It is easily manufactured with modest equipment and knowledge and is thus more widely available than most drugs.<sup>89</sup> While cocaine predominantly affects one biological pathway,<sup>90</sup> methamphetamine “exerts multiple pharmacological effects via different molecular processes.”<sup>91</sup> In addition, because methamphetamine’s elimination half-life is substantially longer than cocaine’s, methamphetamine exerts behavioral and psychological effects for significantly longer periods of time.<sup>92</sup> In comparison to its parent compound, amphetamine, methamphetamine is lipophilic, which allows it to better penetrate the central nervous system.<sup>93</sup> These characteristics have made the effects of methamphetamine abuse an area of focused study in several scientific fields.<sup>94</sup>

Methamphetamine-addicted individuals are in prisons and on death row for committing crimes unrelated to drug possession, distribution, or manufacturing.<sup>95</sup> In prosecuting these offenses, the state has the burden of proving that the defendant satisfies the required mens rea for each element of the offenses with which he has been charged.<sup>96</sup> Thus, it is necessary to inquire whether these defendants’ methamphetamine addiction has any

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87. *Number of Crimes Committed by Methamphetamine Addicts ‘Truly Frightening,’ WA’s Top Judge Says*, ABC RADIO PERTH (Feb. 25, 2015), <http://www.abc.net.au/news/2015-02-25/wa-chief-justice-says-ice-problem-truly-frightening/6261310> [<https://perma.cc/4U4L-GQTW>]. In Western Australia, where methamphetamine is the “drug of choice,” Chief Justice Wayne Martin states that 95 percent of armed robberies and nearly half of murders could be attributed to methamphetamine abuse. *Id.* Contributing to the spread of methamphetamine addiction is the ease with which it can be manufactured. *See id.* As Chief Justice Martin said, “[You can] make it in about two hours out of the boot of your car, using a recipe you can get off the internet.” *Id.*

88. *See generally* J. Cobb Scott et al., *Neurocognitive Effects of Methamphetamine: A Critical Review and Meta-Analysis*, 17 NEUROPSYCHOLOGY REV. 275, 275 (2007).

89. *See supra* note 79.

90. Cocaine “works principally by blocking plasma membrane transporters that reuptake monoamines.” Barr et al., *supra* note 78, at 302.

91. *Id.*; *see also infra* Part II.C.

92. *See* Barr et al., *supra* note 78, at 302. Cocaine has an elimination half-life of 1–3 hours, while methamphetamine’s elimination half-life is 8–13 hours. *See id.*

93. *See* Homer et al., *supra* note 77, at 301.

94. *See infra* Part II.C.

95. *See, e.g.,* Aja Goere, *Murderer Who Traded Another Man’s ‘Life for Methamphetamine’ Sentenced to Life in Prison*, KPAX.COM (Dec. 6, 2016), <http://www.kpax.com/story/33941625/murderer-who-traded-another-mans-life-for-methamphetamine-sentenced-to-life-in-prison> [<https://perma.cc/DQ9H-UQG9>]; Amy Renee Leiker, *Oral Arguments Set in Death-Row Inmate’s Appeal*, WICHITA EAGLE (Dec. 7, 2016), <http://www.kansas.com/news/local/crime/article119462028.html> (listing the status of death-row inmates, including Scott Cheever, a methamphetamine addict whose sentence was upheld by the Kansas Supreme Court in July 2016) [<https://perma.cc/VPE7-WHQ8>]; Laura Zuckerman, *Mother Sentenced to 12 Years in Baby’s Meth Death*, POST REG. (Dec. 22, 2016), <http://www.postregister.com/articles/news-daily-email-todays-headlines-west/2016/12/22/mother-sentenced-12-years-baby’s-meth> [<https://perma.cc/ZM5G-8RWT>].

96. *See supra* note 37 and accompanying text.

significance within the mens rea analysis. As the mens rea analysis requires a subjective determination of mental state, the effects of methamphetamine on the addicted user must first be examined for their potential to influence mental state.

*B. The High, Binge, Tweak, and Crash:  
An Introduction to Methamphetamine Use and Abuse*

Methamphetamine addicts' distinctive pattern of drug use highlights the drug's dramatic effect on individual's lives and informs a methamphetamine user's experience over the course of four stages: the high, the binge, the tweak, and the crash.<sup>97</sup>

When methamphetamine first enters the body, the person experiences "the high," which is characterized by an immediate rush of pleasure lasting for a matter of minutes, "followed by a euphoria that lasts for up to 12 hours."<sup>98</sup> During the high, the user may experience heightened confidence, assertiveness, productivity, energy, attentiveness, and curiosity, but he may also experience increased aggression, anxiety, and insomnia.<sup>99</sup> As the high fades, most users will continue to consume methamphetamine every few hours to maintain feelings of euphoria in "the binge" period. A typical user may dose between one and six times a day, but with each dose of methamphetamine, there is less of a rush in response until, eventually, there is no rush at all.<sup>100</sup> Users will typically self-administer methamphetamine until they either run out of the drug or choose to stop dosing, usually due to the lack of a rush as a result of tolerance.<sup>101</sup> Users may not eat or sleep at all during the binge, which can last from three to fifteen days.<sup>102</sup>

It is the detrimental physical effects of "the tweak" that most people associate with methamphetamine use and abuse.<sup>103</sup> In this stage, high adrenaline causes the user to engage in obsessive behavior.<sup>104</sup> The user

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97. See Stephanie C. LoConto, *Methamphetamine: The Physical Effects*, PROSECUTOR, Mar.–Apr. 2007, at 30, 30–31 (providing a broad overview of the physical effects of methamphetamine).

98. *Id.* at 30 (explaining that the neurotransmitters dopamine, epinephrine, norepinephrine, and serotonin modulate the user's experience of the high due to methamphetamine's inhibition of neurotransmitter reuptake into the nerve terminal).

99. See *id.*; see also Homer, *supra* note 77, at 301.

100. See LoConto, *supra* note 97, at 30–31; see also Homer, *supra* note 77, at 302.

101. See Barr et al., *supra* note 78, at 303.

102. See LoConto, *supra* note 97, at 31. Interestingly, recent historical research has revealed that Nazi soldiers were regularly supplied with methamphetamine, sold in Germany as a pill named Pervitin, throughout World War II for this purpose. See David Segal, *High on Hitler and Meth: Book Says Nazis Were Fueled by Drugs*, N.Y. TIMES (Dec. 9, 2016), <http://www.nytimes.com/2016/12/09/books/high-on-hitler-and-meth-book-says-nazis-were-fueled-by-drugs.html> [https://perma.cc/FR3C-TF4P]. "Hopped-up soldiers would sprint tirelessly through the Ardennes at the onset of war, an adrenalized performance that left Winston Churchill 'dumbfounded,' as he wrote in his memoirs. A German general would later gloat that his men had stayed awake for 17 straight days." *Id.*

103. See *Meth's Devastating Effects: Before and After*, CBS NEWS, <http://www.cbsnews.com/pictures/meths-devastating-effects-before-and-after/> (last visited Mar. 25, 2017) [https://perma.cc/6RZ2-P66C].

104. See LoConto, *supra* note 97, at 31.

may experience formication—the unnerving feeling that bugs are crawling under the skin—which “causes the user to pick out skin until sores and cuts, known as ‘crank bugs,’ arise. The user can also become physically aggressive, while simultaneously experiencing a psychosis that is characterized by a deluded and paranoid thought process.”<sup>105</sup> The last stage of methamphetamine use is “the crash,” a period of extreme somnolence in which the user may sleep for up to three days.<sup>106</sup>

Repeatedly subjecting the body and brain to this pattern of drug use results in catastrophic damage to bodily systems. Recent neuroscience research has focused on key brain areas damaged by methamphetamine abuse and associated changes in cognition and behavior.

*C. Your Brain on Methamphetamine: Neurophysiological Changes  
and Associated Cognitive and Behavioral Deficits*

Neurophysiological research has revealed that methamphetamine addiction causes global neural impairment, with catastrophic damage to key neural structures and deficits in associated cognition and behaviors.<sup>107</sup> This section discusses one of the severe effects of methamphetamine addiction—damage to a critical neurotransmitter system—and resultant neurocognitive and behavioral deficits.

1. Methamphetamine Addiction Causes Severe Damage  
to the Critical Dopaminergic System

Long-term methamphetamine abuse leads to catastrophic brain changes that are due, in part, to the drug’s neurotoxicity.<sup>108</sup> Methamphetamine has severe neurotoxic effects on neurotransmitter systems, particularly dopamine circuits<sup>109</sup>—which predominate in the striatum of the brain<sup>110</sup>—and serotonin circuits in the frontal cortex and hippocampus.<sup>111</sup> There are several pathways by which methamphetamine might exert its neurotoxic effects.<sup>112</sup> Much of the scientific literature focuses on dopamine pathways because methamphetamine’s ability to regulate dopamine transmission

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105. *Id.*

106. *See id.* at 31.

107. *See, e.g.,* Barr et al., *supra* note 78; Homer et al., *supra* note 77.

108. *See* Barr et al., *supra* note 78, at 304–05; Homer et al., *supra* note 77, at 302.

109. *See* Min Lin et al., *Methamphetamine Regulation of Firing Activity of Dopamine Neurons*, 36 J. NEUROSCIENCE 10,376, 10,376 (2016).

110. *See* Linda Chang et al., *Structural and Metabolic Brain Changes in the Striatum Associated with Methamphetamine Abuse*, 102 ADDICTION 16, 16 (2007) (noting that “striatal structures have the highest densities of dopaminergic synapses, which are the major sites of action for methamphetamine”). Striatal structures, sometimes called the basal ganglia, include the putamen, globus pallidus, nucleus accumbens, and caudate nucleus. *See id.* at 16–17.

111. *See* Barr et al., *supra* note 78, at 306; Thomas E. Nordahl et al., *Neuropsychological Effects of Chronic Methamphetamine Use on Neurotransmitters and Cognition: A Review*, 15 J. NEUROPSYCHIATRY & CLINICAL NEUROSCIENCES 317, 319 (2003); Scott et al., *supra* note 88, at 278–79.

112. *See* Nordahl et al., *supra* note 111 (discussing methamphetamine-induced neurotoxicity).

through multiple mechanisms contributes to the drug's effects as a general neurotoxin.<sup>113</sup>

Methamphetamine causes an initial surge in dopamine levels,<sup>114</sup> resulting in the pleasurable effects of the methamphetamine high. It accomplishes this, in part, by acting as a substrate<sup>115</sup> for the dopamine transporter, which increases extracellular, or active, dopamine levels<sup>116</sup> and increasing the excitability of dopaminergic neurons.<sup>117</sup> In response to this dopamine surge, the brain circuitry compensates by decreasing dopamine transmission.<sup>118</sup> The combined effects of long-term dopamine overexposure and methamphetamine neurotoxicity result in catastrophic degeneration of dopaminergic nerve terminals and depletion of dopamine in the central nervous system.<sup>119</sup> Similar effects are seen on serotonergic neural circuits.<sup>120</sup>

Key brain areas that are impaired by methamphetamine addiction include the striatum, amygdala, and prefrontal cortex, as these areas rely on dopaminergic and serotonergic pathways.<sup>121</sup> The impairment of the functioning of dopaminergic-dense and serotonergic-dense structures in the brain, which is just one of the many neurophysiological effects of methamphetamine addiction, has associated neurological, social-cognitive, and behavioral deficits.<sup>122</sup>

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113. See Lin et al., *supra* note 109, at 10,376.

114. See David Sulzer et al., *Mechanisms of Neurotransmitter Release by Amphetamines: A Review*, 75 NEUROBIOLOGY 406 (2005) (describing how the drug class of amphetamines causes the release of neurotransmitters).

115. A substrate is a substance acted upon by an enzyme. See *Substrate*, MERRIAM-WEBSTER'S DICTIONARY, <https://www.merriam-webster.com/dictionary/substrate> (last visited Mar. 25, 2017) [<https://perma.cc/EC8X-WCZJ>]. As a substrate, methamphetamine directly interacts with the dopamine transporter to stimulate dopamine efflux. See Lin et al., *supra* note 109, at 10,376.

116. See Lin et al., *supra* note 109, at 10,376. Methamphetamine "increases extracellular dopamine levels by competing with dopamine uptake and increasing reverse transport of dopamine via the transporter." *Id.*

117. See *id.* Methamphetamine regulates the excitability of dopaminergic neurons by altering membrane channel activity. See *id.* at 10,387–89. Methamphetamine also stimulates an initial increase in firing activity of dopamine neurons, which is followed by a prolonged decrease. See *id.* at 10,389.

118. See Nordahl et al., *supra* note 111, at 319.

119. See *id.*

120. See Yoshimoto Sekine et al., *Brain Serotonin Transporter Density and Aggression in Abstinent Methamphetamine Abusers*, 63 ARCHIVES GEN. PSYCHIATRY 90 (2006) (discussing the effect of methamphetamine addiction on serotonin transporter density in the brain).

121. See generally Barr et al., *supra* note 78; Homer et al., *supra* note 77.

122. See, e.g., Barr et al., *supra* note 78, at 306; Homer et al., *supra* note 77, at 303; Buyean Lee et al., *Striatal Dopamine D2/D3 Receptor Availability Is Reduced in Methamphetamine Dependence and Is Linked to Impulsivity*, 29 J. NEUROSCIENCE 14,734 (2009); Kyoji Okita et al., *Emotion Dysregulation and Amygdala Dopamine D2-Type Receptor Availability in Methamphetamine Users*, 161 DRUG & ALCOHOL DEPENDENCE 163 (2016).



## 2. Methamphetamine Addiction: Emotion Dysregulation, Aggression, Impulsivity, and Psychosis

The neurological damage caused by methamphetamine addiction is associated with social-cognitive impairments, such as emotion dysregulation, and associated maladaptive behaviors, including impulsivity, aggression, and even psychosis. Emotion dysregulation is the suboptimal modulation of operations that influence responses during emotion processing, particularly in response to provocation.<sup>123</sup> Emotional regulation is a primary function of the amygdala, which is rich in D2-type dopamine receptors,<sup>124</sup> and the prefrontal cortex, which contributes to response inhibition and contains both dopaminergic and serotonergic pathways.<sup>125</sup> Emotion regulation is also influenced by activity in the striatum—rich in D2/D3-type dopamine receptors—which is implicated in controlling delayed gratification and impulsivity.<sup>126</sup> Increased severity of addiction is correlated with increased emotional dysregulation and associated behavioral disturbances.<sup>127</sup>

Emotion dysregulation is associated with impulsivity and increased propensity for aggression and violence.<sup>128</sup> Dopamine influences impulsivity, “a category of behaviors encompassing deficits in the ability to delay immediate gratification for future larger rewards, and in response inhibition.”<sup>129</sup> The loss of striatal dopamine activity in methamphetamine abusers contributes to the high impulsivity and lack of inhibition control observed in these individuals.<sup>130</sup> In addition, the striatal dopamine system is crucial to processing probabilistic information.<sup>131</sup> Therefore, methamphetamine-addicted individuals do not process or learn from the

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123. See Okita et al., *supra* note 122, at 164.

124. See *id.* at 163–64.

125. See Nordahl et al., *supra* note 111, at 319, 321–22.

126. See generally Michael E. Ballard et al., *Low Dopamine D2/D3 Receptor Availability Is Associated with Steep Discounting of Delayed Rewards in Methamphetamine Dependence*, INT’L J. NEUROPSYCHOPHARMACOLOGY 1 (May 2015), <https://academic.oup.com/ijnp/article/675342/Low-Dopamine-D2-D3-Receptor-Availability-is> [<https://perma.cc/P8ZG-DLD2>].

127. See Okita et al., *supra* note 122, at 166. Decreased D2-type dopamine receptor signaling in the midbrain and striatum—in addition to the amygdala—is also associated with high impulsivity in methamphetamine-addicted individuals. See M. Kohno et al., *Midbrain Functional Connectivity and Ventral Striatal Dopamine D2-Type Receptors: Link to Impulsivity in Methamphetamine Users*, 21 MOLECULAR PSYCHIATRY 1554, 1554 (2016).

128. See Okita et al., *supra* note 122, at 164.

129. Lee et al., *supra* note 122, at 14,734.

130. See *id.* at 14,734–35, 14,738 (finding a fundamental negative correlation between impulsivity and striatal D2/D3 receptor in humans and suggesting that methamphetamine’s negative impact on the D2/D3 receptor system promotes impulsivity); see also Kohno et al., *supra* note 127, at 1557–58 (finding upregulation of midbrain activity—likely through the combination of low striatal D2-type receptor availability, reduced dopamine availability, and reduced GABAergic inhibitory feedback in methamphetamine-addicted individuals—to be positively correlated with impulsivity).

131. See Uri Maoz & Gideon Yaffe, *What Does Recent Neuroscience Tell Us About Criminal Responsibility?*, 3 J.L. & BIOSCIENCES 120, 135–36 (2016).

probability of risk in the same way as nonaddicted individuals.<sup>132</sup> This lack of inhibition and failure to perceive risk is associated with increased aggression and violence<sup>133</sup> but is not the sole factor behind these behaviors.

Aggression and violence are associated with disturbances in emotional regulation, response inhibition, facial affect recognition, self-awareness, and theory of mind, all of which have been demonstrated in methamphetamine-dependent individuals.<sup>134</sup> Methamphetamine addicts themselves perceive the drug as contributing to their violence, specifically attributing this to the drug decreasing their ability to empathize and its tendency to dominate every aspect of their life.<sup>135</sup> Neurobiologically, aggression is associated with defects in the emotion-processing circuitry between the amygdala and prefrontal cortex.<sup>136</sup> Methamphetamine addicts show severe structural, neurochemical, and metabolic abnormalities in this circuitry.<sup>137</sup> Scientific models of aggression suggest that aggression is increased where there is failure of either emotional regulation or emotional insight.<sup>138</sup> Methamphetamine addiction impairs both these processes, which contributes to methamphetamine addicts' aggression, as they may misinterpret stimuli as hostile and threatening.<sup>139</sup>

The effects of methamphetamine addiction can become so severe as to result in methamphetamine-induced psychosis. Acute methamphetamine intoxication may have transient psychosis-inducing effects that are “almost indistinguishable from acute paranoid schizophrenia,” including hallucinations and delusions.<sup>140</sup> The high drug doses associated with

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132. *See id.*

133. *See* Doris E. Payer et al., *Neural Correlates of Affect Processing and Aggression in Methamphetamine Dependence*, 68 ARCHIVES GEN. PSYCHIATRY 271, 272 (2011).

134. *See id.*

135. *See* Mary-Lynn Brecht & Diane M. Herbeck, *Methamphetamine Use and Violent Behavior: User Perceptions and Predictors*, 43 J. DRUG ISSUES 468, 477–78 (2013); *see also* Payer et al., *supra* note 133, at 277 (replicating findings that methamphetamine-dependent individuals self-report higher aggression than controls do).

136. *See* Payer et al., *supra* note 133, at 272.

137. *See id.*; Sekine et al., *supra* note 120, at 90 (“Protracted abuse of methamphetamine may reduce the density of the serotonin transporter in the brain, leading to elevated aggression, even in currently abstinent abusers.”).

138. *See* Payer et al., *supra* note 133, at 278–79. Scientific models of aggression translate internal states into either impulsive aggression or thoughtful action, both of which may be influenced by methamphetamine addiction. *See id.* at 271.

139. *See id.* at 279. This study found a particular region of the prefrontal cortex—the ventral anterior frontal gyrus (IFG)—to be implicated in impaired emotional insight in methamphetamine addicts. *See id.* The ventral IFG plays an important role in influencing behavioral outcomes and modulating the fight-or-flight responses of the hypothalamus. *See id.*

140. Rebecca McKetin et al., *The Profile of Psychiatric Symptoms Exacerbated by Methamphetamine Use*, 161 DRUG & ALCOHOL DEPENDENCE 104, 104 (2016). This study sought to differentiate psychiatric symptoms induced by methamphetamine use from those caused by preexisting psychiatric disorders. *See id.* at 105. Methamphetamine use did not induce the negative symptoms associated with schizophrenia—diminished emotional expression or avolition—but did increase the severity of many psychiatric symptoms, including positive psychotic symptoms (hallucinations and persecutory delusions), affective symptoms (depression, suicidality, hostility, and self-neglect), and psychomotor agitation. *See id.* at 107–08.

addiction may result in an enduring psychosis that persists even after the drug has been eliminated from the bloodstream.<sup>141</sup> Even individuals who recover from the prolonged psychosis may suffer “flashbacks” of psychotic symptoms when confronted with stressful situations.<sup>142</sup> Methamphetamine-induced psychosis is often cited by experts testifying on behalf of violent methamphetamine-addicted criminal defendants.<sup>143</sup>

Methamphetamine addiction results in catastrophic brain damage to critical neural circuits and structures. Associated with this damage are corresponding cognitive and behavioral deficits linked to long-term methamphetamine addiction, which are distinct from effects due to acute intoxication. This may suggest that addiction, particularly to methamphetamine, should be handled in a different manner than intoxication in the mens rea analysis.

### III. THE MENS REA PROBLEM FOR DRUG-ADDICTED CRIMINAL DEFENDANTS: DIFFERENTIATING ADDICTION FROM CRIMINAL LAW’S INTOXICATION DOCTRINES

American criminal law has various approaches to the effect of intoxication on mens rea, including a Supreme Court ruling from over twenty years ago that allows states to prohibit consideration of intoxication in the mens rea analysis.<sup>144</sup> But if methamphetamine addiction results in dramatic brain changes, as supported by the neuroscience findings discussed above, should its effect on mental culpability be considered in the mens rea analysis in a different way than acute intoxication?

This part discusses the arguments for and against differentiating between acute intoxication and addiction. Part III.A looks at whether addiction should be considered “voluntary” and thus subject to the same doctrines that govern voluntary intoxication. Part III.B discusses whether addiction affects mental state and, if so, whether disallowing consideration of addiction in the mens rea analysis improperly elevates actus reus and violates due process. Then, Part III.C addresses whether pragmatic concerns about juries’ ability to make fine culpability distinctions support rejection of neuroscience in the courtroom.

#### A. *The Nuances of Voluntary Addiction*

The legal doctrines of intoxication represent an exception to the general tenet of criminal law that liability requires a match between behavior and

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141. See Barr et al., *supra* note 78, at 306.

142. See *id.*

143. See, e.g., *Bonifield v. Lewis*, No. C 12-3857 PJH (PR), 2014 WL 1101658, at \*4-5 (N.D. Cal. Mar. 18, 2014) (describing expert testimony that the defendant had “damaged himself irretrievably due to decades of methamphetamine abuse” and was experiencing a “drug-induced psychosis,” which lasted even when the drug had exited his system); *Malone v. Oklahoma*, 168 P.3d 185, 195 (Okla. Crim. App. 2007) (recounting the testimony of Dr. David Smith, who stated that the effect on a person of “amphetamine psychosis” is comparable to paranoid schizophrenia).

144. See generally *Montana v. Egelhoff*, 518 U.S. 37 (1996); *supra* Part I.B.

offense mental state requirements.<sup>145</sup> Under *Egelhoff*, the state does not have to prove mens rea in “a purely subjective sense,” but it may instead prove circumstances that would otherwise establish the required mens rea “but for” the intoxication.<sup>146</sup> The question is whether this exception should extend to addiction, thus encompassing addiction within the doctrines of intoxication. Is addiction as voluntary as intoxication?

Limiting the legal relevance of intoxication to the mens rea analysis is generally justified by voluntariness: an individual should not be found less blameworthy for conduct committed while in a voluntarily induced intoxicated state.<sup>147</sup> “The law accepts free will and blame-worthiness as a general premise,” and will rarely depart from that presumption.<sup>148</sup> The legal exception to this tenet, regarding issues of capacity, arises where the defendant’s incapacitated state is seemingly out of his control and cannot be deterred.<sup>149</sup> By contrast, imbibing intoxicating substances is considered a choice and gross intoxication a moral failing.<sup>150</sup>

Deterrence is a clear goal of doctrines that limit or eliminate the relevance of voluntary intoxication to the mens rea analysis. The MPC Comments acknowledge that, even if intoxication does affect an individual’s awareness of risk, “[b]ecoming so drunk as to destroy temporarily the actor’s powers of perception and judgment is conduct that plainly has no affirmative social value . . . . The actor’s moral culpability lies in engaging in such conduct.”<sup>151</sup> In the *Egelhoff* plurality opinion, Justice Scalia emphasized that a rule disallowing consideration of voluntary intoxication acts as a general deterrent, a specific deterrent (in the form of incarceration), and “comports with and implements society’s moral perception that one who has voluntarily impaired his own faculties should be responsible for the consequences.”<sup>152</sup>

The issues of deterrence and voluntariness, however, may require a distinction between acute intoxication and addiction. The deterrent effects of intoxication doctrines may not apply to addiction due to the disconnect between the act of drug use and the resultant condition of addiction.<sup>153</sup>

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145. See *supra* note 44 and accompanying text.

146. See *Egelhoff*, 518 U.S. at 58 (Ginsburg, J., concurring).

147. See *id.* at 49–50 (plurality opinion).

148. *United States v. Brawner*, 471 F.2d 969, 1002 (D.C. Cir. 1972) (stating that the court has “not embarked on enquiry that must yield to tenets of the philosophy of determinism” in addressing voluntary act and mens rea requirements); see Stephen J. Morse, *A Good Enough Reason: Addiction, Agency and Criminal Responsibility*, 56 INQUIRY 490, 497 (2013) (stating that “the law ultimately views the criminal wrongdoer as an agent and not simply as a passive victim” of “biological or environmental variables”).

149. See Carissa Byrne Hessick & Douglas A. Berman, *Towards a Theory of Mitigation*, 96 B.U. L. REV. 161, 175–80, 183–85 (2016) (discussing justifications for doctrines of diminished capacity).

150. See MODEL PENAL CODE § 2.08 cmt. 1, at 359 (AM. LAW INST., Official Draft and Revised Comments 1985); see also *Egelhoff*, 518 U.S. at 49–50.

151. MODEL PENAL CODE § 2.08 cmt. 1, at 359.

152. *Egelhoff*, 518 U.S. at 49–50.

153. See Ruben D. Baler & Nora D. Volkow, *Drug Addiction: The Neurobiology of Disrupted Self-Control*, 12 TRENDS MOLECULAR MED. 559, 559 (2007).

Only some individuals who experiment with drugs become addicted.<sup>154</sup> Contrast this with intoxication, where the ingestion of intoxicating substances is directly and temporally related to the inducement of an intoxicated state.<sup>155</sup> Because of this causal connection, doctrines seeking to deter offenses committed while intoxicated can effectively deter the act of becoming intoxicated.<sup>156</sup> But the same is not true for addiction.<sup>157</sup> This difference in causality suggests that deterrence is not a likely outcome of addressing addiction under current doctrines of intoxication.

Furthermore, neuroscience findings posit that neither the initiation nor maintenance of addiction is voluntary in the same way as is the act of ingesting a substance to become acutely intoxicated.<sup>158</sup> Drug-addicted individuals and nonaddicted individuals may seek drugs for vastly different reasons: while a nonaddicted individual may seek the “high” or stress-relieving effects of the drug, an addict is fulfilling a need.<sup>159</sup> As one former addict recounted, “While actively using, I don’t care about you, I don’t care about myself, and I sure as hell don’t care about no police. . . . I was using against my will because once you’re in that lifestyle, it totally consumes you. We don’t even think about the consequences.”<sup>160</sup> While doctrines of intoxication might fairly impute a mental state for voluntarily choosing to become intoxicated, the justification for doing so does not apply to addiction.

The emergence of drug addiction in an individual “is ultimately a function of interactions between drug effects, biological and environmental factors, which are crucially influenced by the developmental stage of the individual.”<sup>161</sup> The development of addiction is in part mediated by the dopaminergic system which, as discussed above, is catastrophically altered by methamphetamine use.<sup>162</sup> “Repeated use of the drug changes the brain of the user so that behaviors become more reflexive and, consequently, much less amenable to cognitive interference.”<sup>163</sup> The entire system of processing risk and reward becomes compromised.<sup>164</sup> Acute drug intake increases dopamine release, which is followed by marked decreases in

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154. *See id.*

155. *See* Jordan B. Peterson et al., *Acute Alcohol Intoxication and Cognitive Functioning*, 51 J. STUD. ON ALCOHOL 114, 115–16 (1990) (describing methods of measuring alcohol intoxication, performed fifteen minutes after drinking).

156. *See Egelhoff*, 518 U.S. at 49–50 (stating that the effect of increased punishment for unlawful acts committed while drunk has the direct result of deterring drunkenness).

157. *See* Baler & Volkow, *supra* note 153, at 559.

158. *See id.*

159. *See id.* at 560 (noting that addicted individuals continue to take drugs compulsively “even when it is no longer perceived as pleasurable”).

160. Juleyka Lantigua-Williams, ‘Using Against My Will,’ ATLANTIC (June 19, 2016), <http://www.theatlantic.com/politics/archive/2016/06/using-against-my-will/486203/> (providing an edited portion of a conversation between the author and Adrian Silva, a former methamphetamine addict with an extensive criminal past, who reformed his ways after participating in a court’s drug program) [<https://perma.cc/23QH-4GYJ>].

161. Baler & Volkow, *supra* note 153, at 559.

162. *See supra* Part II.C.

163. Baler & Volkow, *supra* note 153, at 559.

164. *See id.* at 560.

drug-addicted individuals.<sup>165</sup> This pattern of dopamine flux becomes conditionally associated with other stimuli or cues, until the stimuli themselves are able to stimulate dopamine release and a strong desire for the drug.<sup>166</sup> Even with knowledge of the negative effects of the drug, this positive feedback loop makes an addict in remission extremely vulnerable and at high risk of relapse when exposed to any number of previously neutral stimuli.<sup>167</sup>

Furthermore, increased severity of addiction is associated with increased severity of deficits in coping with stress.<sup>168</sup> Deficits in coping with stress are strongly related to drug craving, and the involvement of several neurotransmitter systems in that relationship has been shown not only for users of methamphetamine but also for those who use cocaine, heroin, alcohol, and tobacco.<sup>169</sup> The emotion dysregulation associated with drug abuse contributes to the maintenance of addiction, which in turn contributes to increased severity of dysregulation.<sup>170</sup> This positive feedback loop makes recovery from addiction incredibly difficult—and relapse likely<sup>171</sup>—and highlights the differences between acute intoxication and the significant neurological effects of long-term addiction. These effects suggest that neither the initiation nor maintenance of addiction is voluntary and that addiction is not a moral failing, but a biological one.

#### B. Does Addiction Affect Mens Rea?

Even if addiction is not voluntary, it has been argued that there is no effect of addiction on mens rea. As it was described by one scholar:

[A]ddicts . . . will not lack mens rea for their substance-related criminal activity . . . . In most cases of serious criminal wrongdoing . . . there still will be no mens rea problem. An addict who burgles, robs, or kills surely forms the intent to do so.<sup>172</sup>

The MPC agrees, stating that there is a “relative rarity of cases where intoxication really does engender unawareness as distinguished from imprudence.”<sup>173</sup> Courts have employed similar reasoning when faced with acts committed by methamphetamine-addicted individuals. In denying a writ of habeas corpus for a man sentenced to death, a Texas court determined that no reasonable juror would have found the man’s mental impairments—including a chronic methamphetamine addiction and thirteen-day methamphetamine binge—negated the intent or knowledge

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165. *See id.*

166. *See id.*

167. *See id.*

168. *See* Okita et al., *supra* note 122, at 168.

169. *See id.*

170. *See id.*; *see also* Kohno et al., *supra* note 127, at 1554 (noting that methamphetamine addiction’s effect on temporal discounting of rewards “may promote the initiation as well as the maintenance of addiction”).

171. *See* Okita et al., *supra* note 122, at 168.

172. Morse, *supra* note 148, at 27.

173. MODEL PENAL CODE § 2.08 cmt. 1, at 359 (AM. LAW INST., Official Draft and Revised Comments 1985).

required for a capital murder conviction.<sup>174</sup> In granting a certificate of appealability for ineffective assistance of counsel,<sup>175</sup> a California court found the prisoner had not made a substantial showing that trial counsel was ineffective for failing to present the defense of mental defect due to long-term drug abuse but had made a showing that counsel was ineffective for failing to do the same for a mental defect due to causes other than long-term drug use.<sup>176</sup> The court was not convinced that a reasonable juror would have ruled differently had counsel argued at the guilt phase of trial that the defendant's long-term methamphetamine addiction had caused brain damage that prevented him from forming an intent to kill.<sup>177</sup> This distinction illuminates the court's opinion that a reasonable juror would not believe long-term methamphetamine addiction might cause a mental defect that negates mens rea, even if said juror might believe that a mental defect due to a different, non-drug-related cause can negate mens rea.<sup>178</sup>

The severe effects of methamphetamine addiction on the brain and associated cognitive and behavioral deficits, however, suggest that addiction does affect mens rea.<sup>179</sup> The distinctions among the culpability terms of the MPC and terms used in state and federal jurisdictions lie along the axes of attitude and probability.<sup>180</sup> For purposely and knowingly, the distinction is one of attitude: conscious object versus awareness.<sup>181</sup> The Comments make this explicit, stating that "action is not purposive . . . unless it was [the actor's] conscious object to perform an action of that nature or to cause such a result. It is meaningful to think of the actor's *attitude* as different."<sup>182</sup> In contrast, the distinction between knowingly and recklessly is one of probability: practically certain versus substantial risk.<sup>183</sup> While both involve awareness of risk, recklessness involves risk "of a probability less than substantial certainty" that is "unjustifiable."<sup>184</sup> Finally, the distinction between recklessly and

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174. See *Stroman v. Thaler*, No. 3:05-CV-1616-D, 2009 WL 3075168, at \*6–7 (N.D. Tex. Sept. 28, 2009).

175. A claim of ineffective assistance of counsel is a constitutional claim of a denial of a defendant's Sixth Amendment right to counsel, as the Supreme Court has long recognized that "the right to counsel is the right to the effective assistance of counsel." *Strickland v. Washington*, 466 U.S. 668, 686 (1984) (quoting *McMann v. Richardson*, 397 U.S. 759, 771 n.14 (1970)).

176. See *Bonnifield v. Lewis*, No. C 12–3857 PJH (PR), 2014 WL 1101658, at \*12, \*16 (N.D. Cal. Mar. 18, 2014) (denying the petition for a writ of habeas corpus, but granting a certificate of appealability).

177. See *id.* (denying a prisoner's constitutional claim that trial counsel was ineffective for failing to present testimony regarding the prisoner's brain damage due to long-term methamphetamine addiction during the guilt phase of trial, and declining to include this claim among those satisfying the certificate of appealability standard).

178. See *id.*

179. See *supra* Part II.C.

180. See DUBBER, *supra* note 22, at 59–61.

181. See *id.* at 55.

182. MODEL PENAL CODE § 2.02 cmt. 2, at 233 (AM. LAW INST., Official Draft and Revised Comments 1985) (emphasis added).

183. See DUBBER, *supra* note 22, at 59–60.

184. MODEL PENAL CODE § 2.02 cmt. 3, at 236–37. The MPC Comments emphasize that the level of certainty of the risk is a subjective analysis. See *id.* As the Comments note, both

negligently is one of awareness.<sup>185</sup> While acting recklessly involves “conscious risk creation,”<sup>186</sup> a person acts negligently “when he inadvertently creates a substantial and unjustifiable risk of which he ought to be aware.”<sup>187</sup> The question is whether methamphetamine addiction influences the ability to form any of these mental states.

Methamphetamine addiction results in organic brain damage to key pathways and structures that influence cognition and behavior, contributing to emotion dysregulation, impulsivity, deficits in risk and reward processing, and characteristics of psychosis.<sup>188</sup> Each of these deficits may influence an individual’s ability to form an offense’s requisite mens rea. For intent, an impulsive individual, who struggles to inhibit his response to provocation and misapprehends the world as a dangerous place,<sup>189</sup> may not have the “conscious object” to cause, for example, the death of another human or may not be practically certain that such result will occur, as required for knowledge.<sup>190</sup> If the deficits are severe enough, such an individual may not even satisfy the requirements of recklessness, because he may not be capable of comprehending the existence of a risk.<sup>191</sup> It is only negligence, the objective culpability term, for which addiction can categorically be stated to have no effect.<sup>192</sup> Therefore, particularly depending on the severity of the addiction, neuroscience research suggests that methamphetamine addiction may have a significant effect on the ability of a criminal defendant to form an offense’s requisite mental state.

Some have maligned the argument that addiction should be considered in the mens rea analysis, even if it does influence mens rea,<sup>193</sup> because drug users are aware of the risk of addiction and can “fairly be held responsible to a substantial degree for becoming addicted.”<sup>194</sup> While the close temporal relationship between ingesting an intoxicant and committing acts while intoxicated might justify such liability under the legal doctrines of intoxication,<sup>195</sup> addiction is distinguished by the more tenuous connection

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“substantial” and “unjustifiable” are terms of degree, so the MPC provides a standard for determining “*how* substantial and *how* unjustifiable the risk must be in order to warrant a finding of culpability.” *Id.* § 2.02 cmt. 3, at 237. The defendant’s disregard of the risk must “involve[] a gross deviation from the standard of conduct that a law-abiding person would observe in the actor’s situation.” *Id.* § 2.02 cmt. 3, at 226.

185. See Robinson, *supra* note 27, at 841.

186. MODEL PENAL CODE § 2.02 cmt. 3, at 236.

187. *Id.* § 2.02 cmt. 4, at 240.

188. See *supra* Part II.C.

189. See *supra* note 139 and accompanying text.

190. See *supra* notes 181–82 and accompanying text.

191. See *supra* note 132 and accompanying text.

192. See Susan F. Mandiberg, *Protecting Society and Defendants Too: The Constitutional Dilemma of Mental Abnormality and Intoxication Defenses*, 53 FORDHAM L. REV. 221, 228 (1984) (noting that “mental abnormality and intoxication can be negating defenses only to subjective mental state requirements: intent, purpose, knowledge, and in some cases recklessness” (footnote omitted)).

193. See, e.g., Herbert Fingarette, *Addiction and Criminal Responsibility*, 84 YALE L.J. 413 (1975) (criticizing arguments that addiction-related conduct is involuntary); Morse, *supra* note 148.

194. Morse, *supra* note 148, at 22.

195. See *supra* note 155 and accompanying text.



between the initial acts contributing to one's status as an addict and acts committed months, or even years, later.<sup>196</sup> "Very few [individuals becoming addicts] would in fact foresee committing specific crimes . . . . [E]ven if addicts are mostly responsible for becoming addicted and may be aware of the general risks addiction poses, this responsibility is different from the responsibility necessary to be culpable for specific crimes."<sup>197</sup> Therefore, imputing the mental state involved in becoming an addict to the offense's requisite mens rea is inappropriate. Neither the "conduct" nor "moral culpability" of becoming addicted to drugs—as is used to justify intoxication doctrines by the MPC and *Egelhoff*, respectively<sup>198</sup>—justifies assigning liability regardless of mens rea to drug-addicted criminal defendants.

In *Egelhoff*, the Court determined that excising voluntary intoxication from the mens rea analysis—regardless of the actual effect of intoxication on mental state—did not violate due process because the right to have intoxication considered on issues of intent is not fundamental.<sup>199</sup> However, the requirement that criminal defendants satisfy offenses' mens rea requirements to be found guilty—and the intended subjectivity of that analysis—may be so rooted in the conscience of the American people as to be fundamental.<sup>200</sup> The mens rea analysis examines the subjective mental state of the criminal defendant.<sup>201</sup> Excluding the negating evidence of addiction on mental state selectively redefines an offense to allow the defendant at issue to be found guilty on objective standards, while subjective standards apply to everyone else.<sup>202</sup> This creates a mere legal fiction, as "[s]uch concealed redefinition [of the offense] permits the illusion that the defendant was convicted on the basis of a subjective mental state, and so permits the enhanced punishment attendant upon such increased culpability."<sup>203</sup>

Furthermore, imputing the mens rea for becoming an addict to crimes committed once addicted is a form of strict liability,<sup>204</sup> as it assigns liability for actus reus with no regard for mens rea.<sup>205</sup> For at least 800 years, criminal law has focused on both the criminal act and the criminal mind.<sup>206</sup> In the American criminal justice system, mental state is as important an element as the act itself in justifying criminal liability.<sup>207</sup> Ignoring a defendant's addiction in the mens rea analysis, where it has been established that such a condition results in lasting brain damage that may

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196. See *supra* notes 153–71 and accompanying text.

197. Morse, *supra* note 148, at 22–23.

198. See *supra* Part I.B.

199. See generally *Montana v. Egelhoff*, 518 U.S. 37 (1996).

200. See Bennett, *supra* note 14, at 438.

201. See *supra* note 32 and accompanying text.

202. See Mandiberg, *supra* note 192, at 233.

203. *Id.*

204. See Morse, *supra* note 148, at 22.

205. See *supra* note 35 and accompanying text.

206. See Bennett, *supra* note 14, at 438.

207. See *id.*

affect mental state, likely violates a defendant's fundamental right to due process. While intoxication is a voluntary, transient condition—potentially justifying imputing the mens rea of becoming intoxicated to an act committed minutes or hours later—addiction endures.<sup>208</sup> If the effects of addiction cannot be considered in evaluating mental state, the act alone is sufficient to establish liability.<sup>209</sup> Such a result is not consistent with traditions in criminal responsibility, suggesting that the due process analysis for drug-addicted individuals should be differentiated from that of voluntary intoxication in *Egelhoff*.<sup>210</sup>

Outlawing consideration of the effects of addiction in the mens rea analysis likely violates a fundamental right, regardless of the status of the doctrines of voluntary intoxication, in light of both the neuroscience research suggesting that methamphetamine addiction does affect mens rea as well as criminal law's concern with subjective mental state. However, even where the law acknowledges a right as fundamental, it may be restricted where the state can demonstrate a compelling interest.<sup>211</sup> One such interest may be in reliable and efficient fact-finding.

### C. Pragmatic Problems of Presenting Neuroscience to the Jury

Jurors are the court's fact-finders and the foundation of evidentiary law is in circumscribing what can and cannot be set before the jury. Scientific evidence—particularly neuroscience—is often treated as presenting a distinct risk.<sup>212</sup> In the courtroom, presenting brain scans to validate expert testimony is often met with resistance, “as if [defendants'] experts' interpretations of brain scans are somehow less reliable than their experts' unsubstantiated testimony.”<sup>213</sup> Lawyers and nonlawyers alike are concerned that neuroscience is “too complex and too technical” for ordinary, untrained people to understand and apply.<sup>214</sup> Or they worry that the evidence will be used to draw overbroad inferences about individual actors from data collected in group studies.<sup>215</sup> The suggestion is that the pragmatic problems posed by such evidence justify its limitation.

There is a belief among some courts and scholars that allowing evidence of intoxication—and by extension, addiction—to disprove mental state is particularly dangerous because juries cannot make subtle culpability distinctions and are unduly influenced by scientific evidence.<sup>216</sup>

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208. See *supra* notes 161–71 and accompanying text.

209. See *supra* note 35 and accompanying text.

210. See *supra* Part I.C.

211. See Bennett, *supra* note 14, at 438.

212. See Deborah Denno, *The Place for Neuroscience in Criminal Law*, in *PHILOSOPHICAL FOUNDATIONS OF LAW AND NEUROSCIENCE* 69, 77–80 (Dennis Patterson & Michael Pardo eds., 2016).

213. *Id.* at 79.

214. Jones et al., *supra* note 17, at 730.

215. See *id.* at 731.

216. See Mandiberg, *supra* note 192, at 242–43 (“It is the use of the evidence to disprove mental state, not the evidence itself, that some courts find inherently confusing; these courts think such usage requires the jury to make unduly subtle distinctions.”).

“[N]euroscientific evidence should not be used to make fine-grained culpability assessments at trial. It is beyond the qualifications of the jury in our adversarial system of justice to make nuanced distinctions about where a qualifying agent falls on the capacity spectrum.”<sup>217</sup> However, the juror does just that—make nuanced distinctions—in evaluating mental state in every criminal trial. This fact-finding is precisely within the responsibility and capability of the jury.

However, courts have expressed unease about juries’ capabilities as well.<sup>218</sup> Of particular concern to the Supreme Court is the possibility that juries are unduly influenced by scientific evidence. In *Egelhoff*, Justice Scalia noted that laws prohibiting consideration of intoxication in the mens rea analysis are even more justified in modern times because juries presented with evidence of intoxication “will be too quick to accept the claim that the defendant was biologically incapable of forming the requisite mens rea.”<sup>219</sup> Neurological images from magnetic resonance imaging (MRI) and positron emission tomography (PET) scans—with their bright colors and perceived legitimacy—are often considered particularly dangerous in their ability to confuse the jury.<sup>220</sup>

Interestingly, the opposite reasoning has been used to justify withholding from the jury evidence of the effects of intoxication on mental states. For example, a Minnesota court remarked that “we treat expert testimony on intoxication and mental illness cases much the same. . . . [E]xpert opinion testimony about the general effects of mental illness or intoxication is ordinarily inadmissible because most jurors have some experience with these conditions.”<sup>221</sup> While in some cases neuroscience evidence is inadmissible for its potential to confuse an unknowing jury, it is inadmissible in others because the jury naturally has such knowledge. This seasonal treatment suggests that it is the category of evidence itself, not its potential value to the fact-finder, that influences its admissibility.

Other scholars strongly disagree with limiting neuroscience evidence in the courtroom. Professor Deborah W. Denno, Founding Director of the Neuroscience and Law Center at Fordham University School of Law,

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217. Peggy Sasso, *Criminal Responsibility in the Age of “Mind-Reading,”* 46 AM. CRIM. L. REV. 1191, 1223 (2009).

218. Courts throughout the United States have expressed concern about a juror’s ability to make culpability distinctions. *See, e.g.,* *Bethea v. United States*, 365 A.2d 64, 89–90 (D.C. 1976) (“The potential impact of psychiatric evidence in an area so critically close to the ultimate issue of responsibility cannot be minimized. . . . There is no reason to suppose that the problem [of admitting expert testimony] will be any less acute where the issue is the subtle distinction between mental states . . . .”); *State v. McKenzie*, 581 P.2d 1205, 1233 (Mont. 1978) (stating that “psychiatric evaluation as to subtle gradations of mental impairment is highly subjective and not within the common experience of the layman juror”), *vacated*, 443 U.S. 903 (1979); *Steele v. State*, 294 N.W.2d 2, 9 (Wis. 1980) (“Judge and jury ought not be required to identify, classify and evaluate all categories and classifications of human behavior . . . .” (quoting *Curl v. State*, 162 N.W.2d 77, 93 (Wis. 1968))).

219. *Montana v. Egelhoff*, 518 U.S. 37, 50–51 (1996).

220. *See* Ruben C. Gur et al., *A Perspective on the Potential Role of Neuroscience in the Court*, 85 FORDHAM L. REV. 547, 571 (2016); Jones et al., *supra* note 17, at 731.

221. *State v. Provost*, 490 N.W.2d 93, 103 (Minn. 1992).

wrote, “[A]lthough neuroscience brings unique insight to the law, there is nothing about neuroscience that merits unique treatment by the law.”<sup>222</sup> Others maintain that the best way to rectify concerns about jurors’ ability to distinguish between mens rea culpabilities is by improving jury instructions.<sup>223</sup> One study found that small differences in wording of the language used to communicate mens rea to jurors can significantly improve accuracy in distinguishing between culpable mental states.<sup>224</sup> This suggests that careful construction of jury instructions on mens rea, the effects of addiction, and the application of neuroscience evidence would likely alleviate most of the concerns about juror’s distinguishing capabilities.<sup>225</sup> As Minnesota Supreme Court Judge Sandra Gardebring articulated, “Though a subjective state of mind may at times be difficult to determine, there is no mystery to mens rea, the latinism notwithstanding. Jurors in their everyday lives constantly make judgments on whether the conduct of others was intentional or accidental, premeditated or not.”<sup>226</sup> Judge David L. Bazelon of the D.C. Circuit advocated a similar position.<sup>227</sup> In determining culpability, he acknowledged that there is “no simple, scientific formula that will provide a clear-cut answer to every case” and stated that we should just tell jurors the truth: the jury is to judge the defendant’s blameworthiness, there is no “calibrated, easily-applied standard” to guide their decision, and the question must be resolved with reference to the jury’s “own understanding of community concepts of blameworthiness.”<sup>228</sup>

While allowing the consideration of addiction in the mens rea analysis may complicate the jury’s assignation of liability, this is an insufficiently compelling reason to eliminate such consideration altogether. Renowned criminal law scholar Paul H. Robinson stated eloquently: “I agree that complexity is to be avoided as much as possible. . . . But in the end, the proper distribution of liability sometimes depends upon a concept that is complex. . . . The law must be as complicated as are our notions of justice.”<sup>229</sup> Justice requires that criminal law incorporate scientific findings into culpability analyses rather than ignore such discoveries for the sake of simplicity.

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222. Denno, *supra* note 212, at 81.

223. See Matthew R. Ginther et al., *The Language of Mens Rea*, 67 VAND. L. REV. 1327, 1358 (2014).

224. See *id.* at 1363. Interestingly, even once the participants were able to distinguish between knowledge and recklessness, they did not impose greater punishment on knowing acts. See *id.* The authors opined that it is “troubling that citizens apparently do not see the clear moral distinction that the MPC presupposes between unjustifiably causing a criminal harm knowingly or instead recklessly.” *Id.* at 1363–64.

225. See *id.*

226. *Provost*, 490 N.W.2d at 101 (explaining why the court believes expert opinion testimony is not helpful in determining whether a defendant formed intent).

227. See *United States v. Brawner*, 471 F.2d 969, 1012 (D.C. Cir. 1972) (Bazelon, J., concurring).

228. *Id.*

229. Paul H. Robinson, *In Defense of the Model Penal Code: A Reply to Professor Fletcher*, 2 BUFF. CRIM. L. REV. 25, 35 (1998).

## IV. THE CASE FOR A DOCTRINE OF ADDICTION

This part advocates for a doctrine of addiction that adopts neuroscience findings of the impact of addiction on cognition and behavior and acknowledges addiction's potential to affect mens rea. Specifically, this Note argues that addiction should not be incorporated under the law's doctrines of intoxication. Instead, it should be acknowledged that addiction does affect mens rea and its effect should be considered in the mens rea analysis. Finally, this Note encourages the update of the MPC and prescribes a section on addiction.

*A. Addiction Is Distinct from Intoxication  
and Should Not Be Incorporated Under the Law's  
Doctrines of Intoxication*

Application of the doctrine of voluntary intoxication to drug-addicted criminal defendants is inappropriate due to the significant differences between acute intoxication and long-term addiction.<sup>230</sup> Even if criminal law's doctrines of intoxication, limiting the relevance of intoxication to the mens rea analysis,<sup>231</sup> remain unchanged, these doctrines should not be expanded so as to include such limitations on addiction. Addiction is neither voluntary in the sense that we understand the term in reference to voluntary intoxication nor is it transient or as temporally connected to the act of drug ingestion as is intoxication.<sup>232</sup> Therefore, the justifications for doctrines of intoxication that limit or eliminate the relevance of intoxication to the mens rea analysis do not apply to long-term drug addiction.

Voluntariness justifies doctrines that limit intoxication's relevance to the mens rea analysis.<sup>233</sup> It is instinctively undesirable that a criminal defendant might not satisfy the elements of an offense simply because his voluntary intoxication rendered him unaware of the degree of risk involved in his actions. Intoxicated actors can wreak havoc if they get behind the wheel of a car, play around with a dangerous object, or attempt physical contact with another person. Criminal law seeks to deter the act of becoming so intoxicated that one cannot control himself or comprehend situational risks.<sup>234</sup> The temporal relationship between imbibing intoxicating substances and the resultant intoxication, combined with the truly voluntary nature of such an act, may provide a reasonable justification for disallowing consideration of intoxication in the mens rea analysis, even if such intoxication does affect mental state.<sup>235</sup>

The same reasoning cannot be extended to addiction. The fear of addiction may deter some individuals from using drugs, but in the population of drug users, the emergence of addiction is too variable to

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230. *See supra* Part III.A–B.

231. *See supra* Part I.

232. *See supra* notes 153–71 and accompanying text.

233. *See supra* Part III.A.

234. *See supra* Part III.A.

235. *See supra* notes 147–52 and accompanying text.

expect such a policy to significantly deter the state of addiction.<sup>236</sup> The line between drug use and drug addiction is not well understood and is influenced by a variety of social, environmental, and biological factors.<sup>237</sup> While there may be a “safe” level of intoxication—thus, individuals may be deterred from becoming too intoxicated—there is no safe level of addiction. Furthermore, unlike the close temporal relationship between ingesting an intoxicant, being intoxicated, and committing acts while intoxicated, addiction is distinguished by its more tenuous connection between the initial acts contributing to one’s status as an addict, developing addiction, and offensive acts committed months or even years later.<sup>238</sup> Therefore, the state of addiction cannot be deterred in the same way that *Egelhoff* suggests intoxication can be deterred.

A counterpoint may be that including addiction within doctrines of intoxication is justified because it is sufficient to seek to deter all drug use in order to deter addiction. However, plenty of addictive drugs are legal for adults to purchase and consume.<sup>239</sup> Whether the addictive substance is alcohol, heroin, or methamphetamine, it is unrealistic for the success of a doctrine to rest on the deterrence of all drug use. Therefore, deterrence does not justify including addiction within the doctrines of intoxication, as there is limited ability to deter addiction.

Furthermore, the state of being an addict is not voluntary in the same sense as is the state of intoxication. Neuroscience evidence suggests that the issues of voluntariness and choice are particularly nuanced for drug-addicted individuals.<sup>240</sup> Both the initiation and maintenance of addiction are influenced by a host of environmental and biological factors that are distinct from the direct effects of an intoxicating substance.<sup>241</sup> Even when the effects of the drug are not pleasurable, addicts may continue to feel a compulsion to seek out the drug.<sup>242</sup> Research on the dopaminergic system involved in addiction suggests that repeated use of drugs leads to reflexive behaviors, a relationship that is buoyed by the forming of complex associations between cues and the drug.<sup>243</sup> The result is that previously neutral stimuli may themselves stimulate dopamine release and intense cravings for the drug.<sup>244</sup> This cycle may be heightened by the various effects of the specific drug abused.<sup>245</sup> Methamphetamine, for example, contributes to severe emotion dysregulation, inhibitory dysfunction, and

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236. *See supra* notes 153–71 and accompanying text.

237. *See* Baler & Volkow, *supra* note 153, at 559–60 (noting the complexity of the physiological interactions in addiction).

238. *See supra* notes 153–71 and accompanying text.

239. For example, caffeine, nicotine, alcohol, and a variety of prescription opioids are all addictive, yet legal. *See generally Commonly Abused Drugs Chart*, NAT’L INST. ON DRUG ABUSE, <https://www.drugabuse.gov/drugs-abuse/commonly-abused-drugs-charts> (last visited Mar. 25, 2017) [<https://perma.cc/5NUN-K36V>].

240. *See supra* notes 153–71 and accompanying text.

241. *See* Baler & Volkow, *supra* note 153, at 559.

242. *See id.* at 560.

243. *See id.*

244. *See id.*

245. *See id.*

difficulty coping with stress.<sup>246</sup> Each of these has been shown to increase drug craving, and it is worth noting that the neurotransmitter systems affected by methamphetamine are also disturbed by cocaine, heroin, and alcohol.<sup>247</sup> Although initial drug use is a choice, neither the emergence nor maintenance of addiction is voluntary. Therefore, the justification for criminal law's doctrines of intoxication, which focuses on deterrence of the voluntary act of becoming intoxicated, does not provide a similar justification for applying those doctrines to addiction.

*B. Addiction Does Affect Mental State  
and Should Be Considered in the Mens Rea Analysis*

As discussed above, addiction results in significant damage to neural structures and pathways that have a critical role in cognition and behavior.<sup>248</sup> The culpability terms of the MPC and the mens rea terms used throughout American jurisdictions may require analysis of intent, awareness, and probability.<sup>249</sup> Neuroscience research reveals that each of these is influenced by particular neural circuits and structures, many of which may be damaged by drug addiction as has been specifically demonstrated for methamphetamine addiction.<sup>250</sup> It is at best naive to suggest that drug addiction has no effect on mental state or the formation of an offense's requisite mens rea.

The extent of the effect of addiction on mental state may vary according to many factors, including severity of addiction, type of drug, and comorbidities.<sup>251</sup> Any such analysis, therefore, could not be a simple "check yes for addict" but would require the jury to carefully weigh the persuasiveness of all evidence regarding the nature of the individual defendant's drug addiction and its potential effect on mental state. Although there are valid concerns about jurors' ability to comprehend such complexities,<sup>252</sup> that is precisely the role of the jury as fact-finder.<sup>253</sup> Concerns about juror aptitude are not unique to neuroscience evidence, and carefully constructed jury instructions may mitigate these issues.<sup>254</sup> The pragmatic concerns of such an analysis should not prevent its implementation where it is necessary for a fair and just trial for all defendants.

The mens rea analysis has traditionally been a subjective inquiry in American criminal law, designed to address the mental state of the defendant at the time of commission of the offensive act.<sup>255</sup> A doctrine that would define the mental element of offenses to make addiction irrelevant,

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246. *See supra* Part II.C.

247. *See* Okita et al., *supra* note 122, at 168.

248. *See supra* Parts II.C, III.B.

249. *See supra* Part I.A.

250. *See supra* notes 153–71 and accompanying text.

251. *See* Homer et al., *supra* note 77, at 302–03.

252. *See supra* notes 212–20 and accompanying text.

253. *See supra* notes 223–28 and accompanying text.

254. *See supra* notes 223–28 and accompanying text.

255. *See supra* note 32 and accompanying text.

as is allowed for intoxication under the *Egelhoff* doctrine,<sup>256</sup> improperly elevates the importance of actus reus over mens rea. This amounts to strict liability for the act, with no consideration of the mental state of the actor.<sup>257</sup> Such a doctrine is anathema to traditional offense definitions in American criminal law. What is traditionally a subjective analysis for all defendants is redefined to become an objective analysis for drug-addicted defendants only.<sup>258</sup> Moreover, this departs from fundamental principles of American criminal law and potentially violates due process.

This Note does not suggest the elimination of criminal responsibility for drug-addicted criminal defendants. Instead, it seeks to remind legal institutions that mens rea remains a critical justification for criminal liability, one that should not be manipulated for specific categories of defendants. Nor should modern science be ignored for the sake of simplicity.<sup>259</sup> It may be that future scientific findings continue to complicate the assignment of criminal culpability.<sup>260</sup> However, the practice of limiting the relevance of addiction to mental state renders the mens rea analysis an unacceptable legal fiction now. Therefore, the potential effects of addiction on mental state should be considered in the mens rea analysis. Doctrines that would eliminate addiction's relevance may violate the constitutional rights of criminal defendants.

*C. The MPC Should Be Updated to Reflect Current Science  
and Acknowledge the Effect of Addiction on Mental State*

The drafters of the MPC relied on the science of their time when developing the mens rea culpability categories and doctrine of intoxication, which focuses almost exclusively on alcohol.<sup>261</sup> While an immense achievement in American criminal law at the time, both of these sections are now outdated. "In promulgating a Model Penal Code, the American Law Institute sought and obtained the trust and reliance of many states who adopted their model code. Knowing the model to be seriously flawed, the Institute has an obligation to address those flaws."<sup>262</sup>

Immense advances in science in the time since its completion have led to calls for an update in the MPC's approach to mental state. Professor Denno writes, "The failure to update the MPC further has resulted in a mens rea provision that no longer mirrors current science if it is interpreted in the way it was originally intended."<sup>263</sup> Although section 2.02's reliance on Freudian psychotherapy renders the MPC's focus on "voluntary act" and "conscious object" outdated, and the assignation of greater liability for knowingly than recklessly is potentially at odds with the values of the

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256. *See supra* Part I.B.2.

257. *See supra* note 204 and accompanying text.

258. *See supra* note 202 and accompanying text.

259. *See supra* note 229 and accompanying text.

260. *See supra* note 229 and accompanying text.

261. *See supra* Part I.B.1.

262. Robinson, *supra* note 229, at 43.

263. Denno, *supra* note 30, at 614.



everyday citizen,<sup>264</sup> the MPC's culpability terms are at least a workable attempt to categorize mental states. What is no longer workable, however, is the MPC's ignorance of addiction. The ALI has updated portions of the MPC from time to time.<sup>265</sup> It is time for the ALI to reexamine the MPC's intoxication section and, crucially, include an additional section on addiction that reflects modern neuroscience. This Note proposes adoption of the following:

§ 2.X. Addiction.

- (1) Addiction is not a defense unless it negates an element of the offense.
- (2) Addiction does not, in itself, negative an element of the offense but requires additional proof that the effect of the addiction is such that it negates an offense's requisite mens rea. The burden of proof for such a showing lies with the defendant.
- (3) A criminal defendant's addiction to intoxicating substances is relevant to the analysis of the mental culpability or mens rea elements of an offense. Factors that may be considered in analyzing the potential effect of addiction on mens rea include but are not limited to:
  - (a) Severity of addiction. Indicia of severity may include length of addiction, frequency of drug use, and history of overdose or hospitalization.
  - (b) Drug(s) of choice. Expert testimony and scientific research regarding the neural, cognitive, and behavioral effects of the specific drug(s) abused are encouraged.
  - (c) Neurological damage observed in defendant. Brain scans and expert testimony are not dispositive but may assist the fact-finder.
  - (d) Comorbidities. These may include a history of depression, bipolar disorder, schizophrenia, psychosis, or any other relevant disease or disorder.
  - (e) Any other factor(s) deemed relevant and significant by the scientific and legal communities.
- (4) In considering these factors, the goal is to elucidate the subjective mental state of the defendant during the commission of the offense for which he has been charged.

The ALI's adoption of such a provision on addiction will hopefully be a call to action for the state and federal systems. In the process, the ALI might consider whether its culpability terms and intoxication sections also require an update to reflect modern values and scientific understanding. At the very least, it is imperative that the ALI acknowledge the vast amount of

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264. See *supra* note 224 and accompanying text.

265. The ALI is currently "re-examining Article 213 of the Model Penal Code, which was ahead of its time when approved by ALI in 1962, but is now outdated and no longer a reliable guide for legislatures and courts." *Model Penal Code: Sexual Assault & Related Offenses*, ALI, <https://www.ali.org/projects/show/sexual-assault-and-related-offenses/> (last visited Mar. 25, 2017) [<https://perma.cc/H8Z5-GFEX>].

research on the effects of addiction on cognition and behavior. As the self-proclaimed “leading independent organization in the United States producing scholarly work to clarify, modernize, and improve the law,”<sup>266</sup> the ALI has a professional and moral obligation to address a fundamental flaw existing within one of their most important contributions, the Model Penal Code.

#### CONCLUSION

American criminal law is outdated in its approach to the effect of drugs on the mens rea analysis. Modern neuroscience findings reveal extensive differences between acute intoxication and drug addiction, particularly with regard to voluntariness and effects on neurophysiology, cognition, and behavior. However, the Modern Penal Code, U.S. Supreme Court, common law, and legislatures all fail to recognize these distinctions in their criminal law doctrines. It is time for legal acknowledgment and adoption of neuroscience findings, particularly with regard to the relevance of addiction to the mens rea analysis. Addiction should be distinguished from intoxication and a new doctrine of addiction should be adopted. Any doctrine of addiction must recognize the relevance of drug addiction to the mens rea analysis and incorporate a subjective analysis of the potential influence of addiction on the mental state of the criminal defendant in question. Anything less renders delusory the mens rea analysis for drug-addicted criminal defendants and may result in fundamental injustice.

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266. *About ALI*, ALI, <https://www.ali.org/about-ali> (last visited Mar. 25, 2017) [<https://perma.cc/ZCW9-X4CW>].