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Symposium – What Real-World Criminal Cases Tell Us About Genetics Evidence

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What Real-World Criminal Cases Tell Us About Genetics Evidence

DEBORAH W. DENNO*

Rapid advances in genetic and neuroscience research over the past few decades have fueled a focus on how such information is viewed and used by the criminal justice system. Researchers at the University of Utah recently conducted an unprecedented experimental study indicating that psychopathic criminal offenders are more likely to receive lighter sentences if a judge was aware of genetic and neurobiological explanations for the offender's psychopathy. This Article contends that the study's conclusions derive from substantial flaws in the study's design and methodology. The hypothetical case upon which the study is based captures just one narrow and unrepresentative component of how genetic and neurobiological information operates, and the study suffers from serious omissions that affect the validity and reliability of its results. It is important to call attention to these problems given that the study's widely publicized findings are likely to bolster inaccurate perceptions regarding the dangers of allowing behavioral genetics evidence in criminal cases. This Article concludes with a detailed discussion of a number of recent criminal cases involving behavioral genetics evidence. Familiarity with such cases may improve the real-world applicability of future experimental studies exploring the influence of genetics evidence on criminal cases.

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INTRODUCTION

A recent study by researchers at the University of Utah found that psychopathic criminal offenders are more likely to receive a lighter sentence if a judge was aware of genetic and neurobiological explanations for the offender's psychopathy.¹ This striking conclusion was widely publicized;² indeed, the results of the study were reported in *Science*, one

1. Lisa G. Aspinwall, Teneille R. Brown, & James Tabery, *The Double-Edged Sword: Does Biomechanism Increase or Decrease Judges' Sentencing of Psychopaths?*, 337 *SCIENCE* 846, 848-49 (2012) [hereinafter *The Double-Edged Sword*].

2. For a range of news articles discussing the study, see Benedict Carey, *Study of Judges Finds Evidence from Brain Scans Led to Lighter Sentences*, N.Y. TIMES, LATE ED., Aug. 16, 2012, at A12; Greg Miller, *In Mock Case, Biological Evidence Reduces Sentences*, 337 *SCIENCE* 778 (2012); Bruce Bower, *Psychopaths Get Time Off for Bad Brains: Biological Evidence May Prompt Sentencing Break for Violent Offenders*, SCI. NEWS (Aug. 16, 2012), http://www.sciencenews.org/view/generic/id/343095/title/Psychopaths_get_time_off_for_bad_brains; *Expert Reaction to Knowledge About the Biological Basis of Psychopathy and Judges Sentencing*, SCI. MEDIA CTR. (Aug. 16, 2012), <http://www.sciencemediacentre.org/expert-reaction-to-knowledge-about-the-biological-basis-of-psychopathy-and-judges-sentencing-2>; Jessica Hamzelou, *Scientific Explanation of Psychopathy Cuts Jail Time*, NEWSIDENTIST (Aug. 16, 2012, 7:00 PM), <http://www.newscientist.com/article/dn22189-scientific-explanation-of-psychopathy-cuts-jail-time.html>; Mike Jaccarino, *'I Couldn't Help Myself': Psychos Get Off with Shorter Prison Terms When Judge Hears Expert Testimony on the Biology of the Illness*, MAILONLINE (Aug. 18, 2012, 11:39 PM), <http://www.dailymail.co.uk/news/article-2190268/University-Utah-researchers-Psychos-shorter-prison-terms-judge-hears-expert-testimony.html>; Christian Jarrett, *Judges Are More Forgiving of a Psychopath When They're Given a Neurobiological Explanation for His Condition*, BEFORE IT'S NEWS (Aug. 16, 2012, 12:10 PM), <http://beforeitsnews.com/science-and-technology/2012/08/judges-are-more-forgiving-of-a-psychopath-when-theyre-given-a-neurobiological-explanation-for-his-condition-2454346.html>; Douglas Keene, *Judges Are Biased in Favor of Psychopaths Whose "Brains Made Them Do It"*, KEENE TRIAL CONSULTING (Aug. 24, 2012), http://keenetrials.com/blog/2012/08/24/judges-are-biased-in-favor-of-psychopaths-whose-brains-made-them-do-it/?utm_source=rss&utm_medium=rss&utm_campaign=judges-are-biased-in-favor-of-psychopaths-whose-brains-made-them-do-it; Kate Kelland, *Biology Gives American Psychopaths a Legal Break*, REUTERS (Aug. 16, 2012, 3:30 PM), <http://averaorg.adam.com/content.aspx?>

of the world's most reputable scientific journals.³ The study is also noteworthy as being the first of its kind. Although rapid advances in genetic and neuroscience research over the past few decades have focused attention on how such information is viewed and used by the criminal justice system,⁴ this study is the first to experimentally test the influence of genetics evidence on judges' sentencing decisions.⁵ The study's authors—professors in psychology, law, and philosophy⁶—have diverse backgrounds that seem ideally suited for such a bold and ambitious project.

Unfortunately, the study is also significantly flawed. Problems with both the design and the methodology call into question the study's findings and its potential impact. The study's conclusions, for example, can feed fears that defendants who are genetically predisposed to anti-social behavior may be “let off the hook” due to the very genetic predispositions that purportedly hardwire them for lives of crime.⁷ This perception of the influence of genetics on crime and punishment has long been perpetuated by the media,⁸ and it may gain further traction now that

productId=16&gid=55485; Brian Maffly, *Researchers: Judges Who Consider Genetic Data Go Easier on Psychopaths*, SALT LAKE TRIB. (Aug. 18, 2012, 9:50 PM), <http://www.sltrib.com/sltrib/news/54687899-78/judges-utah-criminal-diagnosis.html.csp>; Hamilton Nolan, *Brain Scans Explain and Excuse All Behavior So Just Do What You Want*, GAWKER (Aug. 17, 2012, 11:15 AM), <http://gawker.com/5935656/brain-scans-explain-and-excuse-all-behavior-so-just-do-what-you-want>; Stephanie Pappas, *Why Psychopathy May Not Be the Best Defense*, LIVESCIENCE (Aug. 16, 2012, 2:00 PM), <http://www.livescience.com/22430-psychopathy-courtroom-defense.html>; Natasha Pinoi, *Biology Influences Judges' Sentencing*, AM. ASS'N FOR THE ADVANCEMENT OF SCI. (Aug. 17, 2012), http://chinese.eurekalert.org/en/pub_releases/2012-08/aaft-bijo81312.php; *Psychopaths Get a Break from Biology: Judges Reduce Sentences If Genetics, Neurobiology Are Blamed*, SCI. DAILY (Aug. 16, 2012), <http://www.sciencedaily.com/releases/2012/08/120816121825.htm>; Alix Spiegel, *Would Judge Give Psychopath with Genetic Defect Lighter Sentence?*, NAT'L PUB. RADIO (Aug. 17, 2012), <http://m.npr.org/news/front/158944525>; Maia Szalavitz, *My Brain Made Me Do It: Psychopaths and Free Will*, TIME (Aug. 17, 2012), <http://healthland.time.com/2012/08/17/my-brain-made-me-do-it-psychopaths-and-free-will>; Benjamin Wood, *Study: Judges Reduce Sentences When Mental Disorder Explanations Are Heard*, DESERET NEWS (Aug. 16, 2012, 12:52 PM), <http://www.deseretnews.com/article/865560793/Study-Judges-reduce-sentences-when-mental-disorder-explanations-are-heard.html>; Ainsley Young, *Study: Psychopaths Might Get Shorter Sentences*, DAILY UTAH CHRON. (Aug. 21, 2012), <http://www.dailyutahchronicle.com/?p=2573931>.

3. Johan Bollen et al., *Journal Status*, 69 SCIENTOMETRICS 669, 675 (2006) (concluding after an empirical assessment that *Science* is one of the most “top-ranked” and “highly prestigious” scientific journals).

4. See generally Deborah W. Denno, *Courts' Increasing Consideration of Behavioral Genetics Evidence in Criminal Cases: Results of a Longitudinal Study*, 2011 MICH. ST. L. REV. 967 [hereinafter *Longitudinal Study*] (reviewing the literature on genetics and crime in the context of a unique study of the use of behavioral genetics evidence in criminal cases decided between 1994 and 2011); James S. Walker & William Bernet, *Neuroscience and Legal Proceedings*, in THE ORIGINS OF ANTISOCIAL BEHAVIOR: A DEVELOPMENTAL PERSPECTIVE 237, 237–59 (Christopher R. Thomas & Kayla Pope eds., 2012) (providing a thorough discussion of the admissibility and use of modern genetic and neuroscientific techniques and information in legal proceedings).

5. *The Double-Edged Sword*, *supra* note 1, at 846 (“[T]he effect of biomechanical evidence on judges' reasoning in sentencing has yet to be experimentally tested.”).

6. *Id.* at 846 n.1.

7. *Longitudinal Study*, *supra* note 4, at 970.

8. *Id.* at 969.

scientific research offers supposed confirmation. An alternative and equally disturbing interpretation of the genetics-crime-sentencing link is that biological explanations for crime may be used to mask racism and eugenics, and as possible grounds for prosecutorial misuse.⁹ There is extensive evidence that such beliefs are inaccurate, but those who hold these views nonetheless seem to feel that genetics evidence should never be allowed inside a courtroom; it is argued to be too damning and powerful.¹⁰ The findings of this study could be interpreted, however remotely, to support such a viewpoint. This rendition may not be advocated by the study's authors, but many researchers have faced the daunting reality of having little control over how the results of their work are disseminated or applied.

Part I of this Article provides a more detailed description of the study (hereinafter referred to as the "sentencing study"). Part II discusses the sentencing study's faulty experimental design and methodology, beginning by addressing one of the study's most puzzling aspects—its narrow focus on the yet unrecognized diagnosis of psychopathy. Part II then analyzes the ways in which the hypothetical case that serves as the basis for the experiment is substantially different from the typical criminal case involving genetics evidence. Part III explains the gene-environment interaction that is a facet of virtually every criminal case involving behavioral genetics evidence and explores the ramifications of the sentencing study's failure to account for this interaction. Finally, Part IV further probes the complexity of the gene-environment interaction by describing a number of real cases that involve behavioral genetics evidence.

I. THE SENTENCING STUDY

The sentencing study was presented to 181 state trial judges as a set of facts about a hypothetical defendant, Jonathan Donahue, who attacked a restaurant manager with blows to the head because the manager initially refused to give Donahue money.¹¹ The manager suffered brain damage as

9. *Id.* at 972–73.

10. *Id.* at 967–75.

11. See *The Double-Edged Sword*, *supra* note 1, at 846; Lisa G. Aspinwall et al., *Supplementary Materials for The Double-Edged Sword: Does Biomechanism Increase or Decrease Judges' Sentencing of Psychopaths?*, *SCIENCE* (Aug. 17, 2012), at 6–12, <http://www.sciencemag.org/content/337/6096/846/suppl/DC1> [hereinafter *Supplementary Materials*]. The sentencing study explains that state court administrators were contacted by email in all fifty states to distribute an anonymous online survey to their judges. However, only nineteen of the administrators sent the email to their respective judges. *Id.* at 2–3 ("Participants and the Recruitment Procedure"). The authors never report the potential bias of examining responses from judges in only nineteen of the fifty states. More importantly, they never report how many judges in those nineteen states refused to participate compared to the number that did participate. While the authors wished to protect the anonymity of the responding judges, this information would have been available regardless because it entailed merely comparing the number of

a result of the attack, as well as disabilities related to his memory and fine motor skills. Donahue was found guilty of aggravated battery but was acquitted of robbery because he left the money at the scene of the crime.¹² The study asked the judges what type of sentence Donahue deserved.¹³

In the hypothetical instructions provided to them, all of the judges received an “expert evaluation” in which a psychiatrist stated that Donahue had been diagnosed as a psychopath.¹⁴ The judges were then randomly assigned to one of four groups, each with a different combination of two criteria: (1) whether the expert evaluation was presented by the prosecution as an aggravating factor or by the defense as a mitigating factor, and (2) whether the judges heard additional testimony by a neurobiologist who offered genetic and neurobiological explanations for the development of psychopathy.¹⁵

The sentencing study determined that in real life, the judges typically sentenced offenders who were convicted of aggravated battery to an average sentence of nine years.¹⁶ This nine-year number was used as a basis for comparison with the average length of Donahue’s hypothetical sentence. The authors found that judges who were *not* presented with additional neurobiological evidence regarding psychopathy sentenced Donahue to an average of 13.93 years.¹⁷ The authors interpreted the length of this sentence—which was substantially longer than the nine-year baseline—as an indication that the judges generally regarded Donahue’s psychopathy as an aggravating factor because it increased his likelihood of engaging in future violence.¹⁸ However, judges who *were* presented with additional neurobiological evidence regarding psychopathy gave Donahue an average sentence of 12.83 years.¹⁹ From these results, the sentencing study’s authors concluded that a psychopathic diagnosis is a double-edged sword: For some judges it aggravates an offender’s sentence, whereas for others, explanatory biomechanisms²⁰ mitigate the sentence.²¹

state trial judges in a particular state with the number of judges who actually responded in that state.

12. *The Double-Edged Sword*, *supra* note 1, at 846; *Supplementary Materials*, *supra* note 11, at 6–12. An added complicating component to this scenario is that the facts do not depict an average aggravated assault case because Donahue still engaged in an attempted armed robbery even though he did not leave with any money. Therefore the hypothetical characterizes an aggravated assault with an underlying unpunished armed robbery, factors that may well have weighed heavily with the judges and also introduced some noise to the measures.

13. *The Double-Edged Sword*, *supra* note 1, at 846–47.

14. *The Double-Edged Sword*, *supra* note 1, at 846; *Supplementary Materials*, *supra* note 11, at 9–10.

15. *See The Double-Edged Sword*, *supra* note 1, at 846–47.

16. *Id.* at 847.

17. *Id.* at 846–47.

18. *Id.* at 847–48.

19. *Id.* at 847.

20. It is unclear what the authors of the study mean by the word “biomechanism.” There are three definitions of biomechanism in the Oxford English Dictionary Online—two of which are described as “rare.” Definition 1-b comes closest to approximating how the term is used in *The*

This Article questions this conclusion, however, because of the troublesome aspects of the study's design and methodology. In some instances these problems are so pervasive that it is difficult to understand what the authors are attempting to measure. Part II of this Article discusses the most significant of these problems.

II. THE SENTENCING STUDY'S PROBLEMS

A. THE "DIAGNOSIS" OF PSYCHOPATHY

One of the more inexplicable and questionable aspects of the sentencing study is the authors' decision to feature a hypothetical defendant with psychopathy. The authors do not acknowledge or explain their choice to focus exclusively on a condition that is, at present, not fully recognized or diagnostically accepted in the medical community. Psychopathy is not listed in the *Diagnostic and Statistical Manual of Mental Disorders: Fifth Edition* ("DSM-V"),²² nor has psychopathy been included in any prior edition of the DSM.²³ While there have been pointed criticisms of the DSM-V and its proposed diagnostic models for personality disorders,²⁴ the DSM is still considered a mainstay of the classification of

Double-Edged Sword, that being "[t]he ordered sequence or pattern of interdependent events involved in a biological or biochemical process." See *Biomechanism*, OXFORD ENG. DICTIONARY <http://www.oed.com/view/Entry/275620?redirectedFrom=biomechanism#eid> (last visited July 30, 2013). As William Bernet, M.D., notes: "The word 'biomechanism' is not a commonly used word in scientific writing. . . . There are very few articles in the medical literature that have used that word previously." E-mail from William Bernet, Professor Emeritus, Dep't of Psychiatry, Vanderbilt Univ. Sch. of Med., to Deborah W. Denno, Arthur A. McGivney Professor of Law, Fordham Univ. Sch. of Law (Mar. 25, 2013, 2:15 PM) (on file with author).

21. See *The Double-Edged Sword*, *supra* note 1, at 846–49.

22. See generally AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS (5th ed. 2013) [hereinafter DSM-V].

23. Much has been written about the past exclusion of psychopathy from the DSM, especially with respect to the DSM's section on Antisocial Personality Disorder, the classification most closely associated with psychopathy. See Stephen J. Morse, *Psychopathy and the Law: The United States Experience*, in RESPONSIBILITY AND PSYCHOPATHY: INTERFACING LAW, PSYCHIATRY, AND PHILOSOPHY 41 (Luca Malatesti & John McMillan eds., 2010) (contrasting psychopathy with antisocial personality disorder, a condition that is recognized by the DSM); see also Robert D. Hare, *Psychopathy: A Clinical Construct Whose Time Has Come*, 23 CRIM. JUST. & BEHAV. 25 (1996) (discussing the history of psychopathy as a construct and the development of psychometric tools for its assessment).

24. For a detailed account of the history of the DSM, as well as a critique of the creation process for the DSM-V and overly broad nature of the DSM in general, see generally GARY GREENBERG, *THE BOOK OF WOE: THE DSM AND THE UNMAKING OF PSYCHIATRY* (2013). For a deeper analysis of the proposed diagnostic models for personality disorders for the DSM-V, as well as a critique of these models and their impact, see generally Andrew E. Skodol, *Personality Disorders in DSM-5*, 8 ANN. REV. CLINICAL PSYCHOL. 317 (2012); Leslie C. Morey & Andrew E. Skodol, *Convergence Between DSM-IV-TR and DSM-5 Diagnostic Models for Personality Disorder: Evaluation of Strategies for Establishing Diagnostic Thresholds*, 19 J. PSYCHIATRIC PRAC. 179 (2013). In addition to such critiques, others discuss how the APA changed course in proposing and then omitting the term psychopathy in the DSM-V. See Donald R. Lynam & David D. Vachon, *Antisocial Personality Disorder in DSM-5: Missteps and Missed Opportunities*, 3 PERSONALITY DISORDERS: THEORY, RES., & TREATMENT 483, 489

psychiatric disorders, “the Bible of psychiatry, providing a scriptural basis for the profession.”²⁵ There are reasons why psychopathy has been consistently excluded from the DSM, no matter how controversial some may view them.²⁶ In brief, the medical community’s understanding of psychopathy is far less established than that of many other conditions.²⁷ Yet there are also strong negative connotations associated with the term psychopathy²⁸ that make it a quizzical and emotionally laden choice as the sole diagnosis in a study’s hypothetical. The sentencing study’s authors themselves describe psychopathy as “a diagnosis with much stigma.”²⁹

In the sentencing study, a substantial number of judges claimed to possess varying degrees of knowledge about psychopathy before their participation,³⁰ but there is no way of knowing whether their familiarity is more nuanced than that of the general public. Thus, the stigma associated with psychopathy cannot be discounted when interpreting the judges’ sentencing decisions. For that matter, the study’s authors arguably added to that stigma by instructing the judges that “rehabilitation was not an alternative” for Donahue, “as large-scale treatment has to date been ineffective for adult psychopaths.”³¹ This perplexing directive on the part of the authors substantially loaded the dice in favor of the judges’ sentencing decisions being influenced by considerations of future dangerousness or retribution. The statement reinforces the stereotype that both psychopaths and individuals with a genetic link to their behavior are immutable and hardwired for crime. It also implies that psychopaths and those with a genetic condition differ from other offenders in their resistance to treatment and rehabilitation, when in fact, rehabilitation has generally been ineffective for all sorts of offenders.³² Nonetheless, by

(2012) (“Our third major criticism of the DSM-V proposal for ASPD [Antisocial Personality Disorder] is that it represents a missed opportunity to reunite two constructs that have grown slightly apart over time—ASPD and psychopathy.”).

25. GREENBERG, *supra* note 24, at 15.

26. See *supra* note 23; Lynam & Vachon, *supra* note 24, at 489.

27. See generally Joanna M. Berg et al., *Misconceptions Regarding Psychopathic Personality: Implications for Clinical Practice and Research*, 3 NEUROPSYCHIATRY 63 (2013).

28. *Id.* at 64 (noting that “[p]sychopathic personality (psychopathy) is a widely misunderstood psychological disorder” plagued by mischaracterizations that “may be fueled by media depictions of extraordinary violence or audacity” or by stereotyped personas depicted “as deranged and out of touch with reality”—inaccuracies that have been adopted by standard reference sources and have become synonymous with such labels as “insane person, lunatic, mad person, maniac, mental case, nutcase, psycho and psychotic, among others”) (internal quotation marks omitted).

29. *The Double-Edged Sword*, *supra* note 1, at 849.

30. *Supplementary Materials*, *supra* note 11, at 5.

31. See *The Double-Edged Sword*, *supra* note 1, at 849.

32. Joan Petersilia & Kevin R. Reitz, *Sentencing and Corrections: Overlapping and Inseparable Subjects*, in THE OXFORD HANDBOOK OF SENTENCING AND CORRECTIONS 3, 15–16 (Joan Petersilia & Kevin R. Reitz eds., 2012) (describing the issue of whether rehabilitation works as “the most challenging question in corrections” and noting that only 5–15% reductions in recidivism result from even the most innovative “evidence-based treatment practices and principles”).

removing even the prospect of rehabilitation, the authors essentially eliminated one of the judges' key grounds for mitigation.³³ It therefore comes as no surprise that judges sentenced psychopaths more harshly or listed more aggravating factors than mitigating factors in their reasoning.³⁴

The authors purported to test the influence of the defendant's diagnosis of psychopathy on the judges' decisions, but the study did not include a control group.³⁵ It is unclear why, at least for some of the judges, the facts of the hypothetical *Donahue* case were not modified to portray the defendant as having no psychopathy diagnosis. In addition, the authors could have substituted a more established diagnosis, such as antisocial personality disorder, which was included in the DSM-V as well as all prior DSM editions (apart from the first, at least terminologically).³⁶ Notably, the defendant in *Mobley v. State*,³⁷ the real-life case upon which the hypothetical *Donahue* case is supposedly based,³⁸ claimed that he suffered from antisocial personality disorder.³⁹ Yet the sentencing study's authors deviated from *Mobley* in a number of incomprehensible ways, which are explained further in Part II.C.

With respect to whether psychopaths are sentenced more harshly than other defendants, the authors used a sentencing baseline of nine years as a point of comparison. In theory, nine years represents the average sentence returned by the judges for aggravated battery crimes in their daily practice.⁴⁰ However, the authors themselves admit that the nine-year baseline was not a controlled statistic because they encountered numerous difficulties in reaching that number.⁴¹ This Article does not

33. See *infra* notes 88–92 (discussing the flexible standards for mitigating evidence).

34. See *The Double-Edged Sword*, *supra* note 1, at 847–48; *Supplementary Materials*, *supra* note 11, at 23–24.

35. See *The Double-Edged Sword*, *supra* note 1, at 846.

36. See DSM-V, *supra* note 22, at 659–63; see also *supra* note 23 and accompanying text. Apart from the first DSM, all DSM editions (II, III, III-R, IV, IV-R, and V) contain a section on Antisocial Personality Disorder. See AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS 7 (1st ed. 1952) [hereinafter DSM-I]; AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS 43 (2d ed. 1968); AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS 317–21 (3d ed. 1980); AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS 342–46 (3d Revised ed. 1987); AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS 645–49 (4th ed. 1994); AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS 701–06 (4th Revised ed. 2000); DSM-V, *supra* note 22, at 659–63. The initial DSM contained terms similar to Antisocial Personality Disorder but the exact label did not appear until DSM-II. See DSM-I, *supra*.

37. 455 S.E.2d 61 (Ga. 1995).

38. See *The Double-Edged Sword*, *supra* note 1, at 846.

39. See Deborah W. Denno, *Behavioral Genetics Evidence in Criminal Cases: 1994–2007*, in *THE IMPACT OF BEHAVIORAL SCIENCES ON CRIMINAL LAW* 317–54, 465–98 (Nita A. Farahany ed., 2009), [hereinafter *Genetics Evidence*]; Deborah W. Denno, *Legal Implications of Genetics and Crime Research*, in *GENETICS OF CRIMINAL AND ANTISOCIAL BEHAVIOUR: SYMPOSIUM NO. 194* 248 (Gregory R. Bock & Jamie A. Goode eds., 1996).

40. See *The Double-Edged Sword*, *supra* note 1, at 846.

41. For example, the hypothetical aggravated battery presented in the sentencing study may have

discuss many of these drawbacks because it would be redundant to rehash them, despite their seriousness. What is clear from the study's description is that the judges' estimates were unreliable.⁴²

B. DONAHUE IS ATYPICAL

The hypothetical case of Jonathan Donahue serves as the basis for the sentencing study's experiment,⁴³ yet the case differs significantly from a typical behavioral genetics criminal case. This Author's own research consisted of a survey of all criminal cases addressing behavioral genetics evidence over a seventeen year period (1994–2011)⁴⁴ and revealed several common characteristics. This Article focuses on my findings from the last four years of the survey (June 1, 2007 to July 1, 2011), because the use of behavioral genetics evidence was particularly prevalent during this period and the timing corresponds well to the date of the sentencing study.

In total, the survey found thirty-three criminal cases that considered behavioral genetics evidence from 2007 to 2011.⁴⁵ To compile these cases,

been more severe or included more aggravating factors than the judges' typical real-life aggravated battery cases. Moreover, estimates of judges' personal averages "were collected after exposure to the complete case and thus were potentially influenced by its aggravated nature." See *supra* note 12 and accompanying text (referring to evidence that Donahue had engaged in an attempted robbery); *Supplementary Materials, supra* note 11, at 19. While the study's authors explain that the "analyses may have overcontrolled for some of the aggravating aspects of the case," there is no definite support for that conclusion. *Id.* at 19. Indeed, the authors concede that the judges' personal average sentences for aggravated battery covered a very wide spectrum, ranging from 0.5 to 30 years, with "significant variability by State of Adjudication." *Id.* at 18. With only nineteen states represented in the study and an "unequal distribution of judges" across the represented states, the authors were confined to only five states with respect to the kinds of effects that they could control. *Id.* at 15, 22. Notably, six judges did not even have a criminal docket and were instructed to adopt an average sentence of ten years. *Id.* at 21 n.1.

42. The nine-year baseline was based on the judges' responses to the following question: "In your state of [State of Adjudication], approximate what you believe or know to be the *minimum* (*maximum*) sentence for cases of aggravated battery (in years)." *Supplementary Materials, supra* note 11, at 13 (emphasis omitted). There are several problems with reliance on this information. First, the "judges' estimates of the average or standard sentence for aggravated battery in their state of adjudication" were so variable within the state that the authors could not use them to create a sufficiently reliable state average in order to control for sentencing differences across states. *Id.* at 22. Second, nearly 25% of the participating judges stated that they were unaware of their state's average sentence for aggravated battery, thereby winnowing the sample of respondents for this question down to only 125 judges. *Id.* Because of the variability resulting from so many judges not knowing the average sentence within their state, the authors could not compare the sentences provided for the hypothetical case against "each judge's respective state average." *Id.* Third, there was substantial variability in sentencing across states, with some states indicating "a stronger trend toward mitigation than others." *Id.* Because of these problems, the authors recommended that any additional research in this area survey judges only from states with comparable sentencing guidelines, and that judges' estimates of personal and state averages be gathered before the judges are provided with a hypothetical case. *Id.*

43. See *The Double-Edged Sword, supra* note 1, at 846; *Supplementary Materials, supra* note 11, at 6–12.

44. See *Longitudinal Study, supra* note 4, at 971; see also Denno, *Genetics Evidence, supra* note 39, at 465–98.

45. *Longitudinal Study, supra* note 4, at 991.

I relied solely on legal research databases, a strategy that excludes less accessible cases but ensures a systematic and replicable process across different states and years.⁴⁶ All but one of the thirty-three cases ended up as a capital case in which the defendant was initially sentenced to death by a judge or jury.⁴⁷ The single exception was a life imprisonment case in which the defendant claimed that he was tried and adjudicated while incompetent to stand trial.⁴⁸ It is therefore clear that behavioral genetics evidence appears to arise with the greatest frequency in capital cases.⁴⁹

Although the courts in the survey were usually open to admitting behavioral genetics evidence either at trial or in post-trial proceedings,⁵⁰ the evidence was most frequently offered for mitigation purposes in the penalty phase of a capital trial.⁵¹ During sentencing, genetics evidence can have life-or-death significance for a defendant. In ten of the thirty-three cases in the survey, defendants originally sentenced to death had their death sentences vacated on appeal.⁵² In seven of those ten cases, counsels' failures to adequately investigate or present behavioral genetics evidence (typically in addition to other factors) were grounds for vacating the death sentence and remanding the case for imposition of a sentence of life in prison.⁵³

46. *Id.* at 991–92.

47. *Id.* at 993, 1029 chart 1.

48. *Id.*; *Morris v. Malfi*, No. C 06-7409 SI, 2010 WL 2629738, at *11, *16 (N.D. Cal. June 29, 2010), *aff'd*, 449 F. App'x 686 (9th Cir. 2011) (denying writ of habeas corpus on the basis that the new evidence did not raise real questions of Morris' incompetence at the time of the crime, but issuing a certificate of appealability).

49. See *Longitudinal Study*, *supra* note 4, at 993; Denno, *Genetics Evidence*, *supra* note 39, at 465–98.

50. See *Longitudinal Study*, *supra* note 4, at 1033 chart 5.

51. For a discussion of the role and meaning of mitigation evidence, see *infra* notes 80–92 and accompanying text.

52. See *Detrich v. Ryan*, 619 F.3d 1038, 1069 (9th Cir. 2010), *vacated*, 131 S. Ct. 2449 (2011) (vacating *Detrich's* death sentence and remanding the case to the district court); *Hamilton v. Ayers*, 583 F.3d 1100, 1136 (9th Cir. 2009) (remanding the case to Tulane County Superior Court with instructions to reduce defendant's sentence to life imprisonment without parole); *Jones v. Ryan*, 583 F.3d 626, 647 (9th Cir. 2009), *vacated*, 131 S. Ct. 2091 (2011) (reversing and remanding the case with instructions to issue a writ of habeas corpus); *Morales v. Mitchell*, 507 F.3d 916, 942 (6th Cir. 2007) (finding that the defendant was entitled to a writ of habeas corpus and a vacating of his death sentence); *Allison v. Cullen*, 725 F. Supp. 2d 924, 925 (C.D. Cal. 2010) (vacating the death sentence and granting relief on the defendant's ineffective assistance of counsel claim); *Ex parte Smith*, No. 1080973, 2010 WL 4148528, at *13 (Ala. Oct. 22, 2010) (remanding the case for another penalty-phase hearing); *Hall v. McPherson*, 663 S.E.2d 659, 670 (Ga. 2008) (upholding the habeas court's vacation of the defendant's death sentence); *Woodall v. Simpson*, No. 5:06 CV-P216-R, 2009 WL 464939, at *55 (W.D. Ky. Feb. 24, 2009) (vacating the death sentence and remanding the case to state trial court); *Malone v. State*, 168 P.3d 185, 215, 230 (Okla. Crim. App. 2007) (reversing the defendant's death sentence); *Commonwealth v. Williams*, Nos. 200001876, 200002869, 2010 Pa. D. & C. 4th LEXIS 193, at *15 (Pa. D. & C. May 13, 2010) (vacating the death sentence and sentencing the defendant to life in prison).

53. See *Detrich*, 619 F.3d at 1065, 1068–69 (vacating the death sentence on finding that failure to introduce mitigating evidence of *Detrich's* neuropsychological damage, along with his traumatic and abusive childhood, constituted ineffective assistance of counsel); *Hamilton*, 583 F.3d at 1135–36 (reducing defendant's sentence to life imprisonment without parole on finding that failure to

For the remainder of this Article, I will draw upon the characteristics of the typical behavioral genetics case, as revealed by my survey, to consider how closely the sentencing study's hypothetical *Donahue* case reflects legal reality. The remainder of this Part focuses particularly on the facts of the *Donahue* case and the legal constructs applied to its resolution.

C. DONAHUE IS NOT A CAPITAL CASE

The hypothetical *Donahue* case is not based on a capital crime. Indeed, the facts of most criminal cases involving behavioral genetics evidence are far more egregious than those presented in *Donahue*. The authors of the sentencing study claim that the hypothetical *Donahue* case is “loosely based” upon the real case of *Mobley v. State*,⁵⁴ but the reality is that “Jonathan Donahue” and Stephen Mobley have little of substance in common, making a comparison between the two cases an empty stretch. In 1991, Mobley robbed a Domino's Pizza store in Georgia.⁵⁵ During the robbery, Mobley shot the store's manager in the head while the young man begged for his life.⁵⁶ Mobley was soon caught and immediately confessed to the robbery and murder.⁵⁷ Mobley was young (aged twenty-five), white, came from an affluent family, and there was no evidence that he had ever been neglected or physically abused.⁵⁸ Yet Mobley had a long, steady history of personal and behavioral disorders that became worse with age, led to a prison sentence for forgery, and ultimately culminated in numerous armed robberies while he was in his mid-twenties.⁵⁹ It was after this crime spree that Mobley robbed and murdered the Domino's Pizza manager.⁶⁰ While awaiting trial for the manager's death, Mobley fought with other inmates, sodomized his cellmate, verbally taunted and threatened prison guards, and defiantly

investigate and present evidence of defendant's childhood and mental health history was prejudicial to the defendant); *Jones*, 583 F.3d at 643, 647 (issuing a writ of habeas on finding that defense counsel had failed to conduct a reasonable mitigation investigation and present sufficient witnesses and evidence at sentencing); *Morales*, 507 F.3d at 942 (vacating the death sentence on finding that failure of the defense counsel to conduct an investigation into mitigating evidence of alcoholism in the family, Morales' own alcoholism and its effects on him, and his upbringing constituted ineffective assistance of counsel); *Allison*, 725 F. Supp. 2d at 925 (granting relief on Allison's ineffective assistance of counsel for failure to present mitigating evidence claim, as well as several other claims); *Hall*, 663 S.E.2d at 664 (upholding vacation of death sentence on finding that the defendant's trial counsel should have investigated further into his background and that failure to do so was the result of inattention rather than a strategic decision); *Williams*, 2010 Pa. D. & C. 4th LEXIS 193, at *15 (vacating the death sentence on finding that Williams was developmentally disabled and therefore ineligible for the death penalty).

54. See *The Double-Edged Sword*, *supra* note 1, at 846.

55. *Mobley v. State*, 426 S.E.2d 150, 151 (Ga. 1993).

56. Denno, *Genetics Evidence*, *supra* note 39, at 325.

57. See *Mobley*, 426 S.E.2d at 115.

58. Denno, *Genetics Evidence*, *supra* note 39, at 325; *Turpin*, 502 S.E.2d at 463–64.

59. Denno, *Genetics Evidence*, *supra* note 39, at 325.

60. *Id.*

tattooed the word “Domino” on his own back.⁶¹ Counseling and punishment seemed to have no effect on his behavior.⁶²

In contrast, the hypothetical defendant Jonathan Donahue did not murder the store manager but rather engaged in assault and attempted robbery (although the sentencing study does not mention the charge of attempted robbery).⁶³ Additionally, he left the money at the scene of the crime. Donahue’s conviction for aggravated assault resulted from inflicting injuries that were not life-threatening and posed relatively minor long-term consequences. Furthermore, Donahue seemingly had no criminal record and no history of violence or behavioral disorders. The only apparent similarities to the case of Stephen Mobley are minor: the defendant’s age, his victim’s occupation, and a lack of remorse for his crime. Like Mobley, Donahue’s lack of remorse stands out; Donahue boasts about his actions and gets a tattoo symbolic of the scene of his crime but the far less serious nature of Donahue’s crime greatly diminishes the impact of such behavior.⁶⁴

It is unclear why the sentencing study’s authors limited Donahue’s crime to aggravated battery given that murder is the crime most commonly

61. *Id.*

62. See Daniel A. Summer, *The Use of Human Genome Research in Criminal Defense and Mitigation of Punishment*, in GENETICS AND CRIMINALITY: THE POTENTIAL MISUSE OF SCIENTIFIC INFORMATION IN COURT 182, 189 (Jeffrey R. Botkin et al. eds., 1999) (“Mobley’s parents made numerous efforts to correct their son’s deviant behavior by traditional forms of punishment, reform school and intensive psychological counseling. All efforts to modify Mobley’s behavior were unsuccessful . . .”).

63. See *supra* note 12 (discussing the sentencing study’s omission of an attempted robbery charge).

64. *Supplementary Materials*, *supra* note 11, at 6–7. The Jonathan Donahue vignette is as follows:

Jonathan Donahue (age 24 at the time) entered a Burger King restaurant at midnight on February 17, 2008, brandishing a loaded, semi-automatic pistol. He demanded money from the store manager, William Porter, who was standing behind the till. Porter was 25 years old at the time and had no previous relation to Donahue. When Porter did not initially respond to the demand for money, Donahue forced him to his knees and then struck him forcefully and repeatedly in the back of the head with the pistol. Donahue later said he struck Porter because “that fat son-of-a-bitch wouldn’t stop crying.” Donahue ran off without taking any money.

Donahue was eventually arrested and confessed to battering Porter at the Burger King. Porter’s blood was also found on the pistol that was obtained from Donahue’s car.

Porter sustained moderate, permanent brain damage from the forceful blows to his head. He was in the hospital, in a coma for 20 days, but has since come out of the coma and returned to his home. However, Porter continues to have difficulty remembering many words and controlling his fine motor movement (such as holding pencils or typing).

Donahue bragged about his actions at Burger King to fellow pre-trial detainees, and he boasted about his assault on Porter to jail staff. He also had a king’s crown tattooed on his back.

The Trial

Donahue was charged with aggravated battery (an unlawful touching of the person of another with a deadly weapon) and armed robbery (illegal taking of property in the presence of a person by violence or intimidation).

In February 2010, a jury found Donahue guilty beyond a reasonable doubt of aggravated battery, but he was acquitted of armed robbery as the evidence pointed to his not leaving the Burger King with any money.

associated with the use of expert genetic testimony.⁶⁵ The authors submitted that if Donahue had been “found guilty of murder and had thus faced either the death sentence or life in prison without the possibility of parole, then future dangerousness would have lost its appeal as the defendant might have been incarcerated for life with no potential to reoffend.”⁶⁶ This rationale is dubious for several reasons. First, even among those defendants sentenced to death, nearly one-fifth are never actually executed.⁶⁷ Therefore, a judge does not know a defendant’s fate with certainty at the time of sentencing. Moreover, even in prison, convicted murderers are considered by the legal and prison system to be more dangerous than other convicts.⁶⁸ Prison violence is a serious matter,⁶⁹ and it is difficult to imagine that a judge would not take that knowledge into account.

Finally, even if the authors are correct in speculating that judges would not consider the future dangerousness of a convicted murderer, that perception does not change the reality that most criminal cases addressing behavioral genetics involve capital crimes.⁷⁰ My survey did not find any cases from 2007 to 2011 in which the State introduced behavioral genetics factors as aggravating evidence or as an indication that a defendant posed a future danger to others. The sentencing study’s authors may believe that these findings indicate a general consensus that future dangerousness is a superfluous consideration for defendants convicted of serious crimes. However, that presumption seems to be a proposed explanation for an outcome rather than a rationale for selecting a less serious crime solely to decrease the likelihood of that outcome.

D. THE SENTENCING STUDY USES MISLEADING LEGAL CONSTRUCTS

The sentencing study refers to “aggravating” and “mitigating” factors.⁷¹ These terms are grounded in legal reality and can be found in statutes and guidelines applicable to both noncapital and capital cases.⁷² The sentencing study, however, defines aggravating and mitigating

65. See *supra* notes 45–51 and accompanying text.

66. *The Double-Edged Sword*, *supra* note 1, at 849.

67. DEATH PENALTY INFO. CTR., THE DEATH PENALTY IN 2010 YEAR END REPORT (2010). The first chart shows the number of people who have been executed. *Id.* at 1. There is also a table showing the number of death sentences. *Id.* at 3. The ratio of death sentences handed down between 1976 and 2010 to those actually carried out during that period was about 16%, or one in six. *Id.*

68. See Mark D. Cunningham, *Dangerousness and Death: A Nexus in Search of Science and Reason*, 61 AM. PSYCHOLOGIST 828, 831 (2006).

69. See generally Kristine Levan, PRISON VIOLENCE: CAUSES, CONSEQUENCES AND SOLUTIONS (2012).

70. See *supra* notes 47–49 and accompanying text.

71. *The Double-Edged Sword*, *supra* note 1, at 846.

72. See OFFICE OF GEN. COUNSEL, U.S. SENTENCING COMM’N, AGGRAVATING AND MITIGATING ROLE ADJUSTMENTS PRIMER, §§ 3B1.1–3B1.2 (Apr. 2012); see, e.g., N.J. STAT. ANN. § 2C:44-1 (2010) (establishing criteria for withholding or imposing sentence of imprisonment).

factors in a manner that bears little resemblance to their legal definitions. As part of the study, the judges who heard additional testimony regarding genetic and neurobiological explanations for the development of psychopathy responded to questions regarding “their reasoning about the effects of expert testimony concerning psychopathy on judgment.”⁷³ Two independent evaluators then reviewed these responses and categorized them as being “aggravating” or “mitigating.”⁷⁴ The resulting information is illuminating. For example, a number of responses categorized as “aggravating” reveal retribution to be a driving force in the judges’ sentencing decisions.⁷⁵ But there is no basis to assume that the study’s categorizations correspond with the legal rules that judges are expected to follow when they make sentencing determinations in real life.⁷⁶

These legal rules guide fact finders in determining the outcome of criminal cases, in sharp contrast to an after-the-fact construction of “aggravating” and “mitigating” factors employed by the sentencing study. The role of aggravating and mitigating factors is one of the most consequential aspects of capital cases, which, as previously mentioned, constitute the vast majority of criminal cases involving behavioral genetics evidence. Any real-world application of the sentencing study’s findings regarding genetics evidence is likely to take place in the context of capital cases, leaving the authors’ study-specific use of these terms particularly vulnerable to misinterpretation.

In a capital case, behavioral genetics evidence can be used in two ways: first, during the guilt-or-innocence phase, which involves a factual determination about whether a defendant committed the crime, and second, during the penalty phase, after the jury has found the defendant to be guilty of a capital crime and then hears both aggravating evidence from the State and mitigating evidence from the defense to aid in the determination of a capital sentence.⁷⁷ Evidence is applied differently during these two phases. While the guilt-or-innocence phase concerns a factual inquiry, the penalty phase probes “the moral and normative choice” of whether a defendant “deserve[s] to die.”⁷⁸

The penalty phase is more thorough and well-documented and also most critical in assessing the impact of behavioral genetics evidence.⁷⁹ The

73. *The Double-Edged Sword*, *supra* note 1, at 848 tbl.1.

74. *Id.* at 847; see *Supplementary Materials*, *supra* note 11, at 23–26.

75. See *The Double-Edged Sword*, *supra* note 1, at 848 tbl.1 (setting forth aggravating factors); *Supplementary Materials*, *supra* note 11, at 23–24 (providing sample aggravating reasons offered by participating judges).

76. See *The Double-Edged Sword*, *supra* note 1, at 848 tbl.1 (listing aggravating and mitigating factors).

77. John H. Blume & Emily C. Paavola, *Life, Death, and Neuroimaging: The Advantages and Disadvantages of the Defense’s Use of Neuroimages in Capital Cases—Lessons from the Front*, 62 *MERCER L. REV.* 909, 914 (2011).

78. *Id.* at 915.

79. See *Longitudinal Study*, *supra* note 4, 1012–15.

vast majority of death penalty states require that a fact finder (usually the jury) consider and weigh both aggravating and mitigating circumstances during the penalty phase.⁸⁰ In most jurisdictions, aggravating circumstances must outweigh mitigating circumstances for a defendant to be sentenced to death,⁸¹ although the Supreme Court has recognized exceptions.⁸² If a defendant challenges a death sentence, a reviewing court must reweigh the ratio of aggravating and mitigating circumstances.⁸³

A defense attorney's presentation of mitigating evidence usually includes information about a capital defendant's pre-crime background and life,⁸⁴ while the prosecution's presentation of aggravating evidence typically incorporates a defendant's prior criminal record, if applicable, and the circumstances surrounding the crime.⁸⁵ Types of aggravating and mitigating circumstances vary by state, but there are common statutory aggravating factors that many jurisdictions share. These include the following: commission of an offense in an "[e]specially heinous, cruel or depraved manner;" "[u]se, threatened use or possession of a deadly weapon;" or commission of an offense expecting to receive something of "pecuniary value."⁸⁶ Statutory mitigating factors can include the "age of the defendant," the "defendant's capacity to appreciate the wrongfulness of the defendant's conduct," and other factors.⁸⁷

In 2006, the Supreme Court set forth a substantially open-ended standard for mitigating evidence, which allows defendants to present evidence relevant to "any aspect of [the] defendant's character or record and any of the circumstances of the offense that the defendant proffers as a basis for a sentence less than death."⁸⁸ As a result of this legal framework, mitigating evidence can be all-encompassing and subjective, moving fact finders to empathize with a defendant who has committed even very

80. See James R. Acker & Charles S. Lanier, *Matters of Life or Death: The Sentencing Provisions in Capital Punishment Statutes*, 31 CRIM. L. BULL. 19, 35 (1995) ("Most statutes direct the judge or jury to consider enumerated aggravating and mitigating circumstances prior to arriving at a sentencing decision . . .").

81. For discussions of these factors and how they interplay, see *id.* at 33–52; see also O. Carter Snead, *Memory and Punishment*, 64 VAND. L. REV. 1195, 1248–52 (2011).

82. See *Kansas v. Marsh*, 548 U.S. 163, 173, 181 (2006) (upholding a Kansas death penalty statute that allowed jurors to impose the death penalty when aggravating circumstances were not required to outweigh mitigating circumstances, including when aggravating and mitigating circumstances were equally distributed).

83. *Wiggins v. Smith*, 539 U.S. 510, 534 (2003).

84. See, e.g., *Malone v. State*, 168 P.3d 185, 223 (Okla. Crim. App. 2007).

85. See, e.g., *id.* at 229.

86. See, e.g., ARIZ. REV. STAT. § 13–701(D) (2011) (listing Arizona's aggravating factors).

87. See, e.g., *id.* § 13–701(E) (listing Arizona's mitigating factors).

88. *Kansas v. Marsh*, 548 U.S. 163, 174 (2006) (citing *Lockett v. Ohio*, 438 U.S. 586, 604 (1978)). "[A] state capital sentencing system must: (1) rationally narrow the class of death-eligible defendants; and (2) permit a jury to render a reasoned, individualized sentencing determination based on a death-eligible defendant's record, personal characteristics, and the circumstances of his crime." *Id.* at 172–73.

serious crimes.⁸⁹ In one notorious capital case, for example, the sentencing judge noted that a mitigating circumstance working in the defendant's favor was the fact "that [the defendant's] family loved him."⁹⁰ This evidence would be irrelevant as a defense against a murder conviction. My research indicates that behavioral genetics evidence is most frequently used to validate the existence of conditions (such as mental illness or addiction) that could have been introduced during either the guilt or penalty phases of trial, regardless of any genetic link;⁹¹ yet, the remarkably flexible standards for mitigating evidence also enable defendants to raise behavioral genetics evidence that goes back generations.⁹²

The case of *Rhoades v. Henry*⁹³ demonstrates how such factors might interrelate. The defendant presented "a family tree depicting drug and alcohol abuse, suicide, intelligence, mental health, and criminal convictions,"⁹⁴ as well as testimony from a neuropsychologist who linked together the problems across generations. As the neuropsychologist explained, "[t]he alcoholism and suicides seen in past generations of [the defendant's] family very likely play a genetic role in the emotional and mental health of [the defendant] and his siblings."⁹⁵ Yet it was the more immediate family circumstances of physical and sexual abuse, in addition to medical problems and the defendant's chronic use of methamphetamine, that "may well have damaged [the defendant's] brain in areas critical to impulse control and the ability to think clearly in high pressured situations."⁹⁶ Nonetheless, the court determined that the aggravating factors outweighed the mitigating factors and affirmed the defendant's sentence and convictions.⁹⁷

My survey results suggest that behavioral genetics evidence either has no decipherable impact on a defendant's case or it becomes at most an effective factor alongside other variables in rendering a defendant ineligible for the death penalty. At the same time, it can be challenging to isolate the effect of any one piece of mitigating evidence when it comes to interpreting the influences on death penalty sentences.⁹⁸ The

89. See Blume & Paavola, *supra* note 77, at 915 ("[T]his decision is not, at its core, a determination of fact, for example, did the defendant 'do it,' but a moral and normative choice—does he deserve to die?").

90. *Schiro v. Landrigan*, 550 U.S. 465, 470 (2007).

91. See *Longitudinal Study*, *supra* note 4, at 1033 chart 5. Note that the total number of cases exceeds the number of examined cases (thirty-three) because in some cases the evidence was applied to validate more than one condition.

92. See *id.* at 967.

93. 638 F.3d 1027 (9th Cir. 2011).

94. *Id.* at 1048.

95. *Id.* (quoting declaration by Craig Beavers, Ph.D.).

96. *Id.*

97. *Id.* at 1052, 1055.

98. See *Longitudinal Study*, *supra* note 4, at 1028 ("[I]n most cases, the evidence is so tightly intertwined with other factors in a defendant's life that the particular impact of behavioral genetics can be difficult to isolate.").

defense generally introduces a lengthy list of mitigating factors to the court.⁹⁹ My analysis of the thirty-three cases gathered from 2007 to 2011 yielded a wide range of behavioral genetic factors that could have varying degrees of impact on fact finders' sentencing determinations, depending on the type and quality of evidence at issue.¹⁰⁰ For example, judges and juries may view the results of specific scientific tests differently than information related to a defendant's family history of mental illness and subsequent schizophrenia diagnosis. These distinctions could be further affected by other kinds of family and environmental influences that may be introduced as mitigating evidence, as well as the many types of aggravating evidence pertaining to the specifics of the crime or the defendant's criminal history.

This intertwining of multiple influences packs a punch, both in terms of the purported correlates of a defendant's behavior and how his story unfolds in the courtroom.¹⁰¹ In cases involving behavioral genetics evidence, the interaction between genetic and environmental factors is particularly important. Yet the sentencing study does not account for this interaction, thereby calling into question the validity and reliability of its findings. Part III addresses these points in more detail.

III. THE SENTENCING STUDY FAILS TO CONSIDER THE INTERACTION BETWEEN GENES AND ENVIRONMENT

Genes influence behavior but they do not determine behavior.¹⁰² A person's genetic makeup impacts her body's physiology, which in turn responds to the immediate environment, and only then manifests in a particular course of conduct.¹⁰³ Researchers who assess an individual's genetic predisposition to certain characteristics (such as mental illness) examine the interaction between that individual's genetic makeup and her environmental influences.¹⁰⁴

99. *See id.*

100. *See id.* at 1012–15.

101. *See infra* notes 103–119 and accompanying text. For an excellent example of a study that measures multiple variables and interactive effects, see N.J. Schweitzer et al., *Neuroimages as Evidence in a Mens Rea Defense*, 17 *PSYCHOL. PUB. POL'Y & L.* 357 (2011).

102. Matt McGue, *The End of Behavioral Genetics?*, 40 *BEHAV. GENETICS* 284, 288 (2010).

103. *See generally* CATHERINE BAKER, *BEHAVIORAL GENETICS: AN INTRODUCTION TO HOW GENES AND ENVIRONMENTS INTERACT THROUGH DEVELOPMENT TO SHAPE DIFFERENCES IN MOOD, PERSONALITY, AND INTELLIGENCE* (2004).

104. *See, e.g.*, ROBERT PLOMIN ET AL., *BEHAVIORAL GENETICS* 305–33 (5th ed. 2008); Michael Rutter, *Gene-Environmental Interplay: Scientific Issues and Challenges*, in *GENE-ENVIRONMENT INTERACTIONS IN DEVELOPMENTAL PSYCHOPATHOLOGY* 3, 3–17 (Kenneth A. Dodge & Michael Rutter eds., 2011); Serena Bezdjian et al., *Psychopathic Personality in Children: Genetic and Environmental Contributions*, 41 *PSYCHOL. MED.* 589 (2011); Avshalom Caspi et al., *Role of Genotype in the Cycle of Violence in Maltreated Children*, 297 *SCIENCE* 851 (2002); Terrie E. Moffitt, *The New Look of Behavioral Genetics in Developmental Psychopathology: Gene-Environment Interplay in Antisocial Behaviors*, 131 *PSYCHOL. BULL.* 533 (2005).

As my survey of thirty-three cases from 2007 to 2011 showed, in the context of a criminal case, there is substantial variety in the nature of the behavioral genetics evidence sought to be admitted.¹⁰⁵ The evidence falls across four overlapping categories: (1) expert testimony,¹⁰⁶ (2) family history,¹⁰⁷ (3) behavioral history (such as school records),¹⁰⁸ and (4) medical history (such as medical records).¹⁰⁹ Family history evidence, which is especially comprehensive,¹¹⁰ is often introduced through the testimony of

105. See *Longitudinal Study*, *supra* note 4, at 1012–15.

106. See *Rhoades v. Henry*, 638 F.3d 1027, 1048 (9th Cir. 2010); *Jones v. Ryan*, 583 F.3d 626, 634 (9th Cir. 2009); *Hamilton v. Ayers*, 583 F.3d 1100, 1128 (9th Cir. 2009); *Morales v. Mitchell*, 507 F.3d 916, 944 (6th Cir. 2007); *Allison v. Cullen*, No. CV 92-06404 CAS, 2010 U.S. Dist. LEXIS 82957, at *168–72 (C.D. Cal. July 22, 2010); *Morris v. Malfi*, No. C 06-7409 SI, 2010 WL 2629738, at *9 (N.D. Cal. June 29, 2010); *Darling v. Sec’y*, No. 6:07-CV-1701-Orl-31GJK, 2010 WL 2471441, at *22–23 (M.D. Fla. June 17, 2010); *Creech v. Hardison*, No. CV 99-0224-S-BLW, 2010 WL 1338126, at *10 (D. Idaho Mar. 31, 2010); *Henry v. Ryan*, No. CV 02-656-PHX-SRB, 2009 WL 692356, at *69 (D. Ariz. Mar. 17, 2009); *Hall v. Quarterman*, No. 4:06-CV-436-A, 2009 WL 612559, at *17–18 (N.D. Tex. Mar. 9, 2009); *Woodall v. Simpson*, No. 5:06CV-P216-R, 2009 WL 464939, at *48 (W.D. Ky. Feb. 24, 2009); *Williams v. Norris*, No. 5:07cv00234 SWW, 2008 WL 4820559, at *14 (E.D. Ark. Nov. 4, 2008); *Wood v. Schriro*, No. CV-98-053-TUC-JMR, 2007 WL 3124451, at *30 (D. Ariz. Oct. 24, 2007); *Schurz v. Schriro*, No. CV-97-580-PHX-EHC, 2007 WL 2808220, at *40–41 (D. Ariz. Sept. 25, 2007); *Berryman v. Ayers*, No. 1:95-CV-05309-AWI, 2007 WL 1991049, at *14–15 (E.D. Cal. July 10, 2007); *Loving v. United States*, 68 M.J. 1, 14–15 (C.A.A.F. 2009); *Brant v. State*, 21 So. 3d 1276, 1283 (Fla. 2009); *Simpson v. State*, 3 So. 3d 1135, 1139 (Fla. 2009); *Hall v. McPherson*, 663 S.E.2d 659, 667 (Ga. 2008); *Malone v. State*, 168 P.3d 185, 195 (Okla. Crim. App. 2007); *Commonwealth v. Gibson*, 19 A.3d 512, 519 (Pa. 2011); *Commonwealth v. Williams*, No. 200001876, 200002869, 2010 Pa. D. & C. 4th. LEXIS 193, at *6–9 (Pa. D. & C. May 13, 2010); *Keough v. State*, No. W2008-01916-CCA-R3-PD, 2010 WL 2612937, at *13 (Tenn. Crim. App. June 30, 2010).

107. See *Mickey v. Ayers*, 606 F.3d 1223, 1242–43 (9th Cir. 2010); *Jones*, 583 F.3d at 634; *Hamilton*, 583 F.3d at 1127–28; *Purkey v. United States*, No. 06-8001-CV-W-FJG, 2010 WL 4386532, at *2–3 (W.D. Mo. Oct. 28, 2010); *Hawkins v. Wong*, No. CV. S-96-1155, 2010 WL 3516399, at *89 (E.D. Cal. Sept. 2, 2010); *Allison*, 2010 U.S. Dist. LEXIS 82957 at *134–36, *145; *Morris*, 2010 WL 2629738 at *7; *Turner v. Epps*, No. 4:07CV77-WAP, 2010 WL 653880, at *13 (N.D. Miss. Feb. 19, 2010); *Henry*, 2009 WL 692356 at *74; *Williams*, 2008 WL 4820559 at *14; *Wood*, 2007 WL 3124451 at *30–31; *Schurz*, 2007 WL 2808220 at *40–41; *Loving*, 68 M.J. at 14; *Ex parte Smith*, No. 1080973, 2010 WL 4148528, at *4 (Ala. Oct. 22, 2010); *Brant*, 21 So. 3d at 1280; *Hall*, 663 S.E.2d at 667; *Malone*, 168 P.3d at 195; *Keough*, 2010 WL 261293, at *13.

108. See *Allison*, 2010 U.S. Dist. LEXIS 82957 at *169–71; *Henry*, 2009 WL 692356 at *65; *Rienhardt v. Ryan*, 669 F. Supp. 2d 1038, 1052 (D. Ariz. 2009); *Berryman*, 2007 WL 1991049 at *78.

109. See *Detrich*, 619 F.3d at 1063; *Jones*, 583 F.3d at 631; *Worthington v. Roper*, 619 F. Supp. 2d 661, 682–83 (E.D. Miss. 2009).

110. See *Cullen v. Pinholster*, 131 S. Ct. 1388, 1404, 1425 (2011) (using family history of alcohol abuse to support the theory that defendant might have a genetic predisposition to substance abuse and a family history of mental illness); *Hawkins v. Wong*, No. CIV S-96-1155 MCE EFB DP, 2010 WL 3516399, at *91 (E.D. Cal. Sept. 2, 2010) (showing how a defendant sought a social historian who could have testified to his family tree, which “included many alcoholics, indicating a family genetic predisposition to alcoholism . . . [and which also] included many violent, abusive, and mentally ill or handicapped persons”); *Allison*, 2010 U.S. Dist. LEXIS 82957 at *169 (concerning a family history of alcoholism and depression); *Worthington*, 619 F. Supp. 2d at 672, 682–83 (exhibiting a defendant with a family history of depression, bipolar disorder, schizophrenia, and inherited brain dysfunction); *Ex parte Smith*, No. 1080973, 2010 WL 4148528, at *4 (Ala. Oct. 22, 2010) (showing use of mental disability as evidence); *Brant*, 21 So.3d at 1280 (showing defendant with depression); *Hall*, 663 S.E.2d at 667 (concerning a defendant with a substance dependence disorder); *Malone*, 168 P.3d at 195

the defendant's relatives as well as through experts.¹¹¹ Behavioral genetics evidence for a number of the cases in my survey was comprised almost entirely of the defendant's family history,¹¹² whereas other cases used experts with a broad range of backgrounds and expertise.¹¹³ This multifaceted approach can help to explain a defendant's criminally violent behavior.

The defendant in *Hawkins v. Wong*,¹¹⁴ for example, successfully argued that his counsel was ineffective in part for neglecting to hire a social historian who could have testified about how Hawkins' background impacted his behavior.¹¹⁵ Hawkins' counsel failed to uncover a host of disorders including the defendant's genetic predisposition to alcoholism and mental illness, a childhood comprised of "physical abuse, neglect, abandonment, and poverty," and a number of never-treated mental illnesses such as "depression, post-traumatic stress disorder, attention deficit-hyperactivity disorder, and polysubstance abuse."¹¹⁶ The Ninth Circuit Court of Appeals agreed that such mitigating evidence would have been instrumental in showing Hawkins' genetic predisposition to alcoholism and mental illness, as well as a number of violent, abusive, alcoholic, mentally ill, or disabled persons in his generational history.¹¹⁷ The mitigating evidence that counsel overlooked "would have shown that

(concerning a defendant with both addiction and depression); *Gibson*, 19 A.3d at 519 (exhibiting use of alcohol abuse as evidence).

111. For expert testimony on behavioral genetics, see, e.g., *Henry*, 638 F.3d at 1048–49; *Detrich*, 619 F.3d at 1063; *Jones*, 583 F.3d at 633–34; *Mitchell*, 507 F.3d at 944; *Morris*, 2010 WL 2629738 at *9; *Rienhardt v. Ryan*, 669 F. Supp. 2d 1038, 1052 (D. Ariz. 2009); *Brant*, 21 So. 3d at 1283; *Simpson v. State*, 3 So. 3d 1135, 1139 (Fla. 2009); *Hall*, 663 S.E.2d at 667; *Malone*, 168 P.3d at 195; *Gibson*, 19 A.3d at 519; *Williams*, 2010 Pa. D. & C. 4th LEXIS 193 at *6.

112. See *Hawkins*, 2010 WL 3516399 at *91 (involving a defendant who sought a social historian who could have testified to his family tree, which "included many alcoholics, indicating a family genetic predisposition to alcoholism . . . [and which also] included many violent, abusive, and mentally ill or handicapped persons"); *Allison*, 2010 U.S. Dist. LEXIS 82957 at *169 (suggesting that a defendant's family history showed that he might have a genetic predisposition to alcoholism, substance abuse, and mental illness by means of expert witness testimony); *Epps*, 2010 WL 653880 at *13 (evidencing a family history of mental illness, including a grandmother who had been diagnosed with schizophrenia); *Worthington*, 619 F. Supp. 2d at 682 (showing use of genetic predisposition to and family history of depression, bipolar disorder, schizophrenia, and inherited brain dysfunction as evidence); *Henry*, 2009 WL 692356 at *74 (using defendant's family history of schizophrenia and defendant's symptoms as a child as evidence); *Williams*, 2008 WL 4820559 at *12 ("[Defendant] experienced family dysfunction which extended from generation to generation."); *Wood*, 2007 WL 3124451 at *31 (including evidence of a family history of alcoholism); *Gibson*, 19 A.3d at 519 (including evidence of a family history of alcohol abuse to support the concept that defendant might have a genetic predisposition to substance abuse); *Keough*, 2010 WL 2612937 at *13 (including testimony by an addiction medicine specialist that alcoholism is genetic and that defendant had a family history of alcoholism).

113. See *supra* notes 103–104 and accompanying text.

114. No. CIV S-96-1155 MCE EFB DP, 2010 WL 3516399 (E.D. Cal. Sept. 2, 2010).

115. *Id.* at *91.

116. *Id.* at *89.

117. *Id.*

petitioner was born into a family marked by extreme pathology and dysfunction over multiple generations.”¹¹⁸ The court permitted an evidentiary hearing on Hawkins’ ineffective assistance of counsel claim.¹¹⁹ This case exemplifies a close interaction between both genetics and environment in a defendant’s development.

In contrast to the real-life scenario described above, the design of the sentencing study focuses only on a combination of “psychiatric, genetic, and neurobiological science.”¹²⁰ This relatively narrow perspective may skew the study’s results to show a stronger link among those three factors than may actually exist, assuming that any link exists at all. Indeed, the sentencing study fails to control for environmental factors on two levels: first, the humanizing effect of receiving *any* additional information about a defendant, and second, the gene-environment interaction that exists in basically any real-world criminal case involving behavioral genetics evidence. I will discuss these levels in turn.

Judges who are aware of additional information regarding a defendant’s background and behavior may feel more empathy towards that defendant, and thus hand down a lighter sentence. It would have been enlightening if the sentencing study’s authors had added a control group for whom the defendant’s diagnosis of “psychopathy” was replaced with one that was indicative of an environmentally based condition such as “neglect.” The authors could have taken a similar approach with the additional evidence component of the experiment. Environmental factors, like biological ones, can “contribute to improper brain development,”¹²¹ to borrow a phrase from the sentencing study’s hypothetical judges’ instructions. The study’s authors thus could have added a control group for whom the evidence of an additional biomechanism was replaced with evidence of an additional enviromechanism. If the sentencing study had been designed in this way, it would be easier to discern whether the outcome revealed that the judges’ sentencing decisions were influenced by additional biological information about psychopathy, or simply by additional information which, in and of itself, may have accompanying humanizing tendencies. A second approach would be to include environmental factors in the hypothetical fact pattern and test how they relate to the diagnosis of psychopathy and the additional biomechanism.¹²² In sum, any effort to discern the impact of one type of evidence in a behavioral genetics case must examine the gene-environment interaction. To create a hypothetical case that separates those

118. *Id.* (internal quotation marks omitted).

119. *Id.* at *92.

120. *The Double-Edged Sword*, *supra* note 1, at 849.

121. *Supplementary Materials*, *supra* note 11, at 10.

122. *See supra* notes 102–104 (emphasizing the research significance of the gene-environment interaction).

two components—in particular when one component is then ignored—is to separate a study’s findings from real-world applicability.

This phenomenon is especially apparent when behavioral genetics evidence is raised in ineffective assistance of counsel claims based, at least in part, on counsel’s failure to pursue or present mitigating genetics evidence.¹²³ The results of my survey indicate that behavioral genetics evidence alone is generally insufficient to support such claims.¹²⁴ Yet when that evidence is combined with other evidence, such as environmental factors, courts appeared far more willing to grant evidentiary hearings or even to vacate death sentences altogether based on claims of ineffective assistance.¹²⁵

In *Morales v. Mitchell*,¹²⁶ for example, the court held that defense counsel rendered ineffective assistance for failing to conduct an investigation into mitigating evidence which primarily concerned information about Morales’ family, Morales’ own alcoholism and its effects on him, and his family upbringing.¹²⁷ The district court in *Allison v. Cullen*¹²⁸ also vacated a defendant’s death sentence and granted relief on his claim of ineffective assistance of counsel based on counsel’s failure to present mitigating evidence,¹²⁹ including expert testimony that the defendant might have a genetic predisposition to alcoholism, substance abuse, and mental illness.¹³⁰ Likewise, in *Hall v. McPherson*,¹³¹ the Supreme Court of Georgia upheld the habeas court’s vacation of McPherson’s death sentence, claiming that the defendant’s trial counsel should have investigated further into McPherson’s background, which included a family tree showing a genetic predisposition to substance abuse.¹³²

In *Hamilton v. Ayers*,¹³³ the Ninth Circuit held that Hamilton’s counsel should have investigated and presented evidence of Hamilton’s health history, thereby suggesting that counsel’s failure to include behavioral genetics evidence was a factor for claiming ineffective assistance.¹³⁴ But the following year, in *Mickey v. Ayers*,¹³⁵ the same court of appeals that vacated Hamilton’s death sentence affirmed a denial of habeas for another defendant’s guilt phase and reversed the district

123. See *Longitudinal Study*, *supra* note 4, at 994–96, 1015–16.

124. *Id.* at 1017.

125. *Id.*

126. 507 F.3d 916 (6th Cir. 2007).

127. *Id.* at 931, 936.

128. No. CV 92-06404 CAS, 2010 U.S. Dist. LEXIS 82957 (C.D. Cal. July 22, 2010).

129. *Id.* at *120–21, *177.

130. *Id.* at *133, *169.

131. 663 S.E.2d 659 (Ga. 2008).

132. *Id.* at 662, 667, 670.

133. 583 F.3d 1100 (9th Cir. 2009).

134. *Id.* at 1135–36.

135. 606 F.3d 1223 (9th Cir. 2010).

court's grant of habeas relief with respect to the penalty phase.¹³⁶ The district court held that Mickey's counsel could have made a successful case with mitigation evidence that Mickey's genetic propensities, combined with his family upbringing and mental illness, predisposed him to alcohol and drug dependency.¹³⁷ On appeal, however, the Ninth Circuit found that the second penalty phase expert's research into genetic links of certain diseases was in a nascent stage at the time of trial; Mickey's counsel was therefore not deficient in failing to provide the expert with Mickey's family history of substance abuse.¹³⁸

The significance of the gene-environment interaction is by no means limited to ineffective assistance of counsel claims, as is vividly illustrated by the case of Bradley Waldroup.¹³⁹ In 2006, Waldroup killed his wife's friend and attempted to kill his wife, actions that the State characterized as intentional and premeditated.¹⁴⁰ Waldroup's crimes were gruesome. He shot his wife's friend eight times, slit open her head, and attacked his wife repeatedly with a machete.¹⁴¹ Yet a jury declined to sentence him to death.¹⁴² A forensic psychiatrist who evaluated Waldroup on behalf of the defense testified that Waldroup possessed a particular variant of a deficiency of monoamine oxidase A ("MAOA").¹⁴³ Coincidentally, this is one of the disorders discovered in the sentencing study's hypothetical defendant as well.¹⁴⁴ Jurors in the *Waldroup* case, however, also learned that Waldroup was severely abused as a child and encountered "stressful life experiences" near the time of his crimes.¹⁴⁵ Expert testimony revealed that Waldroup's MAOA deficiency, combined with the abuse he suffered as a child, made him more vulnerable to violent behavior as an adult.¹⁴⁶

136. *Id.* at 1248–49.

137. *Id.* at 1240.

138. *Id.* at 1247.

139. See Walker & Bernet, *supra* note 4, at 247 (noting that the *Waldroup* case "illustrates how testimony regarding this GxE interaction might help explain the defendant's behavior and also his limited capacity to form the intent to commit first-degree murder").

140. State v. Waldroup, No. E2010-01906-CCA-R3-CD, 2011 WL 5051677, at *1–3 (Tenn. Crim. App. Oct. 20, 2011); see Barbara Bradley Hagerty, *Can Your Genes Make You Murder?*, NAT'L PUB. RADIO (July 1, 2010, 12:00 AM), <http://www.npr.org/templates/story/story.php?storyId=128043329>.

141. *Waldroup*, 2011 WL 5051677 at *1–3; see Hagerty, *supra* note 140.

142. See Walker & Bernet, *supra* note 4, at 248; Hagerty, *supra* note 140. After deliberating for only eleven hours, the jury convicted Waldroup of aggravated kidnapping, voluntary manslaughter, and attempted second-degree murder. *Waldroup*, 2011 WL 5051677 at *1. The trial court sentenced Waldroup "to an effective sentence of thirty-two years" and the Court of Criminal Appeals of Tennessee affirmed. *Id.* at *1.

143. Hagerty, *supra* note 140. For a discussion of MAOA and other genes of interest to researchers studying psychopathy, see Tracy D. Gunter et al., *Behavioral Genetics in Antisocial Spectrum Disorders and Psychopathy: A Review of the Recent Literature*, 28 BEHAV. SCI. & L. 148 (2010).

144. See *The Double-Edged Sword*, *supra* note 1, at 846.

145. Walker & Bernet, *supra* note 4, at 248.

146. Hagerty, *supra* note 140; Walker & Bernet, *supra* note 4, at 248. Bernet describes the technical aspects of this interaction as follows: "The genotype revealed that Mr. Waldroup had the low-activity allele of the MAOA gene (which, together with a history of child maltreatment, put him at

Testimony regarding this gene-environmental interaction appeared to have a substantial impact on the jurors, one of whom noted that “[t]here was more to [Waldroup’s] whole life that led to that moment [of killing].”¹⁴⁷ When asked if the decision was swayed by Waldroup’s genetics, the juror responded, “Oh I’m sure And his background—nature vs. nurture.”¹⁴⁸

In determining the cause of Waldroup’s violent behavior, it would not be possible to separate the influence of Waldroup’s MAOA deficiency from the influence of the abuse he suffered as a child. It would also be difficult to determine the individual influence of these two separate components on the *Waldroup* jury’s deliberations. Both components clearly played a role. But my survey of criminal cases from 2007 to 2011 showed that there have been other cases in which the severity of the defendant’s crime appeared to have overshadowed such considerations.¹⁴⁹ In one such case involving a defendant who poured gasoline on the victim and then set him on fire,¹⁵⁰ the court acknowledged a range of mitigating genetic and environmental factors.¹⁵¹ However, the court was not convinced that those factors would have hindered the defendant’s ability to control and comprehend his violent actions.¹⁵² One could imagine an experimental study designed to tease out such distinctions, but that study would have to account for the inevitable gene-environment interaction. Part IV attempts to facilitate any such effort by describing several additional criminal cases that are particularly well-suited to demonstrate the complexity of the interaction between genetic and environmental factors.

IV. THE GENE-ENVIRONMENT INTERACTION IN REAL CASES

This Part begins by discussing two cases from my 2007–2011 survey in which behavioral genetics evidence was offered to validate the existence of substance and alcohol dependency.¹⁵³ I start with these cases in part because my survey of behavioral genetics cases revealed that genetics evidence was used to confirm defendants’ substance and alcohol addictions in a striking 61% of all the cases.¹⁵⁴ While most of these cases

increased risk of violent behavior) and had both short and long alleles of the SLC6A4 gene (which, together with a history of stressful life experiences, put him at an increased risk of depression and suicidality).” *Id.* at 248.

147. Hagerty, *supra* note 140 (internal quotation marks omitted).

148. *Id.* (internal quotation marks omitted).

149. See *Longitudinal Study*, *supra* note 4, at 1012–14.

150. Schurz v. Schriro, No. CV-97-580-PHX-EHC, 2007 WL 2808220, at *1–2 (D. Ariz. Sept. 25, 2007).

151. *Id.* at *48–49.

152. *Id.*

153. See *Longitudinal Study*, *supra* note 4, at 1005–08.

154. See *Cullen v. Pinholster*, 131 S. Ct. 1388, 1404 (2011); *Worthington v. Roper*, 631 F.3d 487, 493, 501, 510 (8th Cir. 2011); *Rhoades v. Henry*, 638 F.3d 1027, 1048–49 (9th Cir. 2010); *Mickey v.*

also involved a genetic predisposition to other conditions, the alcohol and substance abuse claims remain predominant and have increased over time.¹⁵⁵ These alcohol and substance dependency challenges are also wonderful illustrations of the interaction between genes and environment because both arenas involve many factors.

In *Schurz v. Schriro*,¹⁵⁶ the defendant claimed that his counsel should have presented evidence concerning the following disorders and deficiencies: a genetic predisposition toward addiction and mental illness, possible fetal alcohol syndrome, patterns of alcoholism among family members including his mother, father, grandfather, grandmother, and aunts and uncles, devastating parental and physical neglect, and chronic alcohol and substance abuse.¹⁵⁷ The court agreed that the defendant's "home environment was dysfunctional" and emphasized the defendant's exposure to "his family's alcoholism, verbal and physical abuse, which was at times severe, lack of nurturing from his parents, and family fights and violence."¹⁵⁸ Regardless, the district court denied habeas relief, suggesting that the sentencing court would have given little weight to the defendant's dysfunctional family history.¹⁵⁹

In *Morales v. Mitchell*,¹⁶⁰ however, the Sixth Circuit affirmed the district court's finding that the defendant's counsel was ineffective because the counsel had failed to conduct an adequate investigation of a broad range of genetic and environmental factors.¹⁶¹ These factors included the defendant's family history of alcoholism, the defendant's personal experiences with alcoholism and its repercussions (such as being prone to blackouts), his upbringing (alcoholic and absent parents, and a mentally disabled brother), and the "role of alcohol in the Native American Indian culture in which he was raised."¹⁶² This evidence showed

Ayers, 606 F.3d 1223, 1236, 1247 (9th Cir. 2010); Jones v. Ryan, 583 F.3d 626, 632–34 (9th Cir. 2009); Morales v. Mitchell, 507 F.3d 916, 931 (6th Cir. 2007); Rienhardt v. Ryan, 669 F. Supp. 2d 1038, 1052 (D. Ariz. 2009); Hodges v. Bell, 548 F. Supp. 2d 485, 491 (M.D. Tenn. 2008); Purkey v. United States, No. 06-8001-CV-W-FJG, 2009 WL 3160774, at *6 (W.D. Mo. Oct. 28, 2010); Allison v. Cullen, No. CV 92-06404 CAS, 2010 U.S. Dist. LEXIS 82957, at *169 (C.D. Cal. July 22, 2010); Darling v. Sec'y, No. 6:07-CV-1701-Orl-31GJK, 2010 WL 2471441, at *22 (M.D. Fla. June 17, 2010); Wood v. Schriro, No. CV-98-053-TUC-JMR, 2007 WL 3124451, at *45 (D. Ariz. Oct. 24, 2007); *Schurz*, 2007 WL 2808220 at *40–41; Berryman v. Ayers, No. 1:95-CV-05309-AWI, 2007 WL 1991049, at *17 (E.D. Cal. July 10, 2007); Loving v. United States, 68 M.J. 1, 14–15 (2009); Simpson v. State, 3 So. 3d 1135, 1139 (Fla. 2009); Hall v. McPherson, 663 S.E.2d 659, 667 (Ga. 2008); Malone v. State, 168 P.3d 185, 195 (Okla. Crim. App. 2007); Commonwealth v. Gibson, 19 A.3d 512, 519 (Pa. 2011); Keough v. State, No. W2008-01916-CCA-R3-PD, 2010 WL 2612937, at *36 (Tenn. Crim. App. June 30, 2010).

155. See *Longitudinal Study*, *supra* note 4, at 1005–06.

156. No. CV-97-580-PHX-EHC, 2007 WL 2808220 (D. Ariz. Sept. 25, 2007).

157. *Id.* at *41.

158. *Id.* at *48.

159. *Id.* at *49.

160. 507 F.3d 916 (6th Cir. 2007).

161. *Id.* at 931–34.

162. *Id.* at 931.

that the defendant's parents, grandparents, uncle, and aunts were alcoholics, and that several relatives had died from cirrhosis of the liver.¹⁶³ Such mitigation evidence contributed to the court's determination that the defendant was entitled to a writ of habeas corpus and his death sentence was vacated.¹⁶⁴

When the gene-environment interaction arises in cases in which genetics evidence is used for reasons other than alcoholism and substance dependency, the cases can become far more complex. In *Creech v. Hardison*,¹⁶⁵ for example, the defendant claimed ineffective assistance of counsel at his resentencing hearing because his counsel did not adequately research mitigation evidence.¹⁶⁶ At the rehearing, a psychologist testified "that Creech probably had a genetic or biological predisposition for violence."¹⁶⁷ The testimony was based on the defendant's mental health reports, various records and psychological tests, and an interview.¹⁶⁸ Creech also suffered from "an antisocial personality and scored in the 96th percentile of the prison population for psychopathy."¹⁶⁹

As damning as this latter evidence may appear, it was offered for mitigation purposes during the sentencing hearing for Creech's murder of a fellow prison inmate while Creech was already serving a life sentence for murder.¹⁷⁰ On appeal, Creech also introduced new evidence from a 2005 neurological examination showing that he had "bilateral brain damage that affected [his] insight, judgment and capacity to exercise social inhibitions."¹⁷¹ The court nonetheless concluded that such mitigating circumstances had already been considered,¹⁷² adding that although a "neurologist's opinion that Creech has brain damage may be more specific than [the psychologist's] testimony," it offered "only a modest counterweight" to the aggravating factors involved in Creech's case.¹⁷³ These factors included Creech's long criminal record and the "brutal manner" in which he killed his more vulnerable victim "over a petty dispute."¹⁷⁴ Creech had murdered the other prisoner by hitting him with a battery-filled sock and then stomping on his head and neck.¹⁷⁵

163. *Id.* at 932–33.

164. *Id.* at 942.

165. No. CV 99-0224-S-BLW, 2010 WL 1338126 (D. Idaho Mar. 31, 2010).

166. *Id.* at *10.

167. *Id.*

168. *Id.*

169. *Id.*

170. *Id.* at *1, *10.

171. *Id.* at *14 (alteration in original) (internal quotation marks omitted).

172. *Id.*

173. *Id.* at *15.

174. *Id.*

175. *Id.* at *1.

*Brant v. State*¹⁷⁶ is another complicated case involving the interaction of genetic and environmental evidence. A forensic psychiatrist for the defense testified that Brant suffered from a condition known as sexual sadism, which “in most cases . . . arises out of a genetic predisposition and unhealthy childhood environment.”¹⁷⁷ With respect to Brant’s conviction for sexual battery, the psychiatrist explained that Brant possessed “a substantial impairment in his ability to conform his conduct to the requirements of the law” because Brant’s sexual sadism and the effects of methamphetamine¹⁷⁸ fueled his sexual impulses.¹⁷⁹ A PET scan of Brant’s brain also showed “underactivity” in areas associated with impulse control and good judgment.¹⁸⁰ The Florida Supreme Court concluded that mitigating factors did not outweigh aggravating factors and affirmed Brant’s death sentence, but did not turn the behavioral genetics evidence into a tool for aggravation.

The complexity of these cases relative to the *Donahue* hypothetical bears emphasizing, given that the sentencing study’s authors attempted to present a difficult scenario. In *Creech* and *Brant*, the evidence related to behavioral genetics (such as psychopathy) may appear aggravating at first but could potentially serve as mitigating factors when examined through a different lens.¹⁸¹ These cases illustrate that the interaction between genetic and environmental factors—and the kinds of balances in which courts are engaged—are far more intricate than the sentencing study recognized. Moreover, analysis of these and other real criminal cases involving behavioral genetics evidence suggests that it would be extremely difficult to isolate a single piece of information as being likely to lead either to a particular outcome or to categorically affect a fact finder’s deliberations.

CONCLUSION

The sentencing study’s authors may interpret the effects of genetics evidence in their single-hypothetical study as a double-edged sword,¹⁸² but it is not at all clear that there is any support for such a simplistic perspective in actual case law. Nor are the evidentiary hurdles the same for each side of that sword. It is much more difficult for the State to prove that genetic factors will predict a defendant’s future dangerousness than it is for the defense to introduce such information to suggest why a defendant should not be executed. When asked about her opinion of the

176. 21 So. 3d 1276 (Fla. 2009).

177. *Id.* at 1282.

178. *Id.* at 1283 (internal quotation marks omitted).

179. *Id.*

180. *Id.* at 1281.

181. See *Longitudinal Study*, *supra* note 4, at 1033 chart 5.

182. See generally *The Double-Edged Sword*, *supra* note 1.

sentencing study, psychologist Jennifer Skeem explained that “any tendency toward reduced sentences for psychopathic convicts in a survey would be weaker in actual courtrooms where judges hear evidence contested by prosecutors and defense attorneys.”¹⁸³

I emphasize again that my survey of criminal cases involving behavioral genetics evidence did not reveal a single case in which such evidence was used to support the likelihood of a defendant’s future dangerousness.¹⁸⁴ This outcome puts into perspective the sentencing study’s findings regarding genetics and future dangerousness, as well as related concerns expressed by some courts.¹⁸⁵ Furthermore, I am aware of no case in which the State introduced behavioral genetics evidence in any capacity, much less as an aggravating factor.¹⁸⁶ To the contrary, my survey indicates that only defense attorneys introduced behavioral genetics evidence into court. This finding alone speaks volumes regarding each side’s perspective on the utility and relevance of genetic factors to their respective cases.

Yet misconceptions abound regarding the role of genetics evidence in the criminal courts. Media reports of the Bradley Waldroup case, for example, tended to focus exclusively on testimony related to the defendant’s genetic makeup rather than his childhood suffering, or even the impact of the latter on the former. One headline posed the question: “Can Your Genes Make You Murder?”¹⁸⁷ Another provided a mocking response: “Pity the Poor Murderer, His Genes Made Him Do it.”¹⁸⁸ Such depictions propagate the myth that genetics evidence renders a defendant no longer responsible for his actions. They also reinforce a lopsided emphasis on the singular power of genetics testimony, regardless of whatever other evidence may have been offered during the guilt or penalty phases of a criminal trial. Unfortunately, the sentencing

183. See Bower, *supra* note 2.

184. See *Longitudinal Study*, *supra* note 4, at 996.

185. See *Landrigan v. Stewart*, 272 F.3d 1221, 1229 (9th Cir. 2001) (“[A]lthough Landrigan’s new evidence can be called mitigating in some slight sense, it would also have shown the court that it could anticipate that he would continue to be violent. He had already done that to a fare-thee-well. The prospect was chilling; before he was 30 years of age, Landrigan had murdered one man, repeatedly stabbed another one, escaped from prison, and within two months murdered still another man. . . . On this record, assuring the court that genetics made him the way he is could not have been very helpful.”). The Supreme Court quoted the Ninth Circuit’s latter phrases, stating that it could not explain the reasoning any better. See *Schiro v. Landrigan*, 550 U.S. 465, 481 (2007) (“The prospect was chilling; before he was 30 years of age, Landrigan had murdered one man, repeatedly stabbed another one, escaped from prison, and within two months murdered still another man. . . . On this record, assuring the court that genetics made him the way he is could not have been very helpful.” (quoting *Landrigan*, 272 F.3d at 1229)).

186. See *Longitudinal Study*, *supra* note 4, at 993–96.

187. See Hagerty, *supra* note 140.

188. Nigel Barber, *Pity the Poor Murderer, His Genes Made Him Do It*, PSYCHOL. TODAY (July 13, 2010), <http://www.psychologytoday.com/blog/the-human-beast/201007/pity-the-poor-murderer-his-genes-made-him-do-it>.

study plays into these erroneous beliefs by examining only genetics factors relating to its hypothetical defendant. The potential for misleading results and inaccurate interpretations increases when this narrow focus is pursued in the context of a research design that methodologically loads the dice in favor of finding a genetics impact on judges. In addition, in some instances the sentencing study's methodological flaws are so pervasive that it is difficult to decipher the authors' goals and findings, thereby heightening the prospect that the study's results could be simplified and misinterpreted.

Admittedly, it is no small task to design a study that experimentally tests aspects of the relationships between genetics, crime, and sentencing. Behavioral genetics is multifaceted and incorporates a broad range of themes such as genetics, biology, psychology, sociology, and statistics.¹⁸⁹ A highly interdisciplinary field emerges when the intricacies of the criminal justice system are added to the mix. The relationships among the topic areas that comprise this field are complex, and there is a vital need for more insight. The sentencing study is a pioneering attempt to impart new information. In providing a springboard for future similar efforts, the authors of this study have contributed a great deal to both behavioral genetics and the criminal law.

189. For a broad overview of these kinds of interdisciplinary relationships, see generally GREGORY CARY, *HUMAN GENETICS FOR THE SOCIAL SCIENCES* (2003); PLOMIN ET AL., *supra* note 104.