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Peer Commentary

Actions speak louder than images: the use of neuroscientific evidence in criminal cases

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The editors of this journal have kindly requested me to comment on four very interesting empirical studies from the USA,[1] England and Wales,[2] Canada,[3] and the Netherlands[4] that have attempted to discover the extent to which and in what way neuroscientific evidence is used in criminal cases. Recent excitement about the potential legal implications of non-invasive brain imaging by fMRI motivates this work, excitement that has been generated since about 2000, when the explosion in studies of cognitive, affective, and social neuroscience began. Although some are cautious and even hostile to the possibility of such legal implications at present, others think neuroscience has immense potential to guide the law and, alas, some suffer from Brain Overclaim Syndrome.[5]

These studies begin to examine the reality of neuroscientific influence in criminal cases. All focus on appellate cases reported in various data bases for somewhat different periods in the range of years from 2000 to 2012 and all are admirably cautious about

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1 Nita Farahany, *Neuroscience and Behavioral Genetics in US Criminal Law: an Empirical Analysis*, 2 J. L. & BIOSCI. 485 (2015).

2 Paul Catley & Lisa Claydon, *The Use of Neuroscientific Evidence in The Courtroom By Those Accused Of Criminal Offenses in England and Wales*, 2 J. L. & BIOSCI. 510 (2015).

3 Jennifer Chandler, *The Use of Neuroscientific Evidence in Canadian Criminal Proceedings*, 2 J. L. & BIOSCI. 550 (2015).

4 C.H. de Kogel & E.J.M.C. Westgeest, *Neuroscientific and Behavioral Genetic Information in Criminal Cases in the Netherlands*, 2 J. L. & BIOSCI. 580 (2015).

5 Stephen J. Morse, *Brain Overclaim Syndrome and Criminal Responsibility: a Diagnostic Note*, 3 OHIO ST. J. CRIM. L. 397 (2006); Stephen J. Morse, *Brain Overclaim Redux*, 31 LAW & INEQ. 309 (2013).

the methodological limitations of the study sample. None purports to be an accurate representation of the use of neuroscientific evidence throughout the criminal justice system and other methodological quibbles may be raised, such as the failure to use independent inter-rater reliability for characterizing the cases. All use a very expansive definition of neuroscience that includes techniques and data that long antedate the new neuroscience. At most, the data are suggestive. Nonetheless, the studies are interesting and innovative, and the authors are to be congratulated.

The late, great baseball scientist, Yogi Berra, was apocryphally quoted as saying, 'It's déjà vu all over again.' That is precisely the reaction provoked by reading these studies. That is, the courts and, to a much lesser extent, the authors of these studies make the classic mistakes about the relevance of neuroscience and behavioral genetics to criminal cases that have bedeviled the reception of behavioral science in general and of psychiatry and psychology in particular. The overarching classic mistake is misunderstanding or uncritically accepting the validity of apparently relevant science and misunderstanding the relevance of the science to the specific criminal law criteria at issue, which are primarily acts and mental states. There are no brain or nervous system criteria in criminal law for any doctrine. In particular, courts too often do not understand the following. Metaphysical free will is not a criterion for any criminal law doctrine and it is not even foundational for criminal responsibility in general.[6] Causation in general and brain causation in particular, even causation by abnormal variables, are not *per se* a mitigating or excusing condition and causation *per se* is not the equivalent of compulsion, which is an excusing condition. And, finally, people with the same diagnosis or condition are behaviorally heterogeneous and ultimately it is the behavior that is legally relevant, not the diagnosis. In one form or another, most of these cases exhibit these mistakes and confusions. It is no surprise that one of the authors, Professor Nita Farahany, characterizes the cases as follows: 'That use [of neurobiological research in criminal law] continues to be haphazard, *ad hoc*, and often ill conceived.'[7] After briefly canvasing the general findings of the studies, this comment will focus on why Professor Farahany's conclusion is correct and what can be done to rectify the problem.

Not surprisingly, sentencing decisions were the most common context for the introduction of neuroscience evidence, but it was also used to resolve questions about the act doctrine, *mens rea*, affirmative defenses, such as legal insanity and, surprisingly, duress, and, also surprisingly, competence. Perhaps, the most striking finding is how infrequently the new neuroscience of functional imaging and related techniques is used. This varies across jurisdictions, but the large majority of cases involve the 'old' neurology or the old neuropsychology that uses classical structural imaging or behavioral methods to assess brain functioning associated with well-characterized neurological conditions, such as epilepsy and frontal lobe injuries or lesions. Such diagnostic methods are far more common than fMRI, and in the Dutch and Canadian samples, there is virtually no functional imaging evidence. It would be interesting to compare the current samples with similar samples from, say, 1980–2000. There should be little difference in the use of neuroscience as the current studies expansively defines it

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6 Stephen J. Morse, *The Non-problem of Free Will in Forensic Psychiatry and Psychology*, 25 Behav. Sci. Law 203 (2007).

7 Farahany, *supra* note 1 at 488–89.

unless the new neuroscience has emboldened advocates to make claims based on the old neurology or neuropsychology that they would not otherwise have made.

In sum, these studies suggest that the influence of the new neuroinvestigative techniques applied to individual cases for forensic assessment is quite modest. Even when inferences are drawn in individual cases using group data about the consequences of various neurological conditions, the studies used are often classic behavioral studies rather than neuroimaging investigations. Indeed, careful examination of the expanded case studies the papers present indicates that in most instances the neuroscientific evidence was far less important than the behavioral evidence and the former was used largely to buttress the latter. The neuroevidence was rarely dispositive and in the other cases it is impossible to know from these papers' summaries of the case reports how influential the additive neuroevidence was.

In a case well-known to US lawyers, *Powell v Texas*,[8] the Supreme Court was asked to hold that, 'a person may not be punished if the condition essential to constitute the defined crime is part of the pattern of his disease and is occasioned by a compulsion symptomatic of the disease.'[9] In short, the Court was asked to adopt a constitutionally required defense of compulsion or 'involuntariness' based on the disease of chronic alcoholism. In response, writing for the plurality, Justice Marshall said, 'The difficulty with this position…is that it goes much too far on the basis of too little knowledge.'[10] This was a correct reflection of the state of knowledge.[11] It is also true of the potential contributions of the new (and old) neuroscience to criminal law decision-making as I shall try to explain in what follows.

The first question when considering the admissibility of scientific evidence, as always, is the degree to which the basis of the testimony has been established. It is no critique of contemporary neuroscience to note that it is working on one of the hardest problems in science, the relation of the brain to mind and action. We do not know how the brain enables the mind and action[12] and the new neuroscience is a very young science using still relatively crude methods despite the astonishing advances. Most of what we know is correlational and coarse rather than causal and fine-grained.[13] Perhaps, most important for legal purposes, replications are very rare, making it difficult to know what data are firmly established. Recent work has demonstrated that about a third of a sample of important findings in psychology failed to replicate.[14] The behavioral neurosciences are less mature than psychology and healthy caution is warranted. For example, the apparently wide but not universal Dutch acceptance of a brain disease model of addiction that guides legal decision-making fails to confront the hard questions about the status of the science. Judges are not yet in a good position to evaluate neuroscience and may be either too critical or too uncritical.[15] In what follows,

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[8] 392 U.S. 514 (1968).

[9] *Id.* at 521.

[10] *Id.* at 521.

[11] Despite strong contemporary claims that addiction is a chronic and relapsing brain disease, the understanding of addiction is still controversial. See Gene Heyman, Addiction: A Disorder of Choice (2009).

[12] Ralph Adolphs, *The Unsolved Problems of Neuroscience*, 19 Trends Cogn. Sci. 173 (2015).

[13] Gregory A. Miller, *Mistreating Psychology in the Decades of the Brain*, 5 Persp. Psychol. Sci. 716 (2010).

[14] Open Science Collaboration, *Estimating the Reproducibility of Psychological Science*, 349 Science 943 (2015).

[15] Jed S. Rakoff, *Neuroscience and the Law: Don't Rush In*, New York Review of Books, May 12, 2016, at 30.

however, I shall assume that the science is reasonably valid and that images in individual cases were properly acquired and evaluated.

The ultimate guide to wisdom about the proper use of neuroscientific evidence is a keen understanding of legal relevance, which in turn requires an equally keen understanding of the legal question at issue. The question in any case, then, is how, precisely, does neuroscience evidence help decide whether an act or mental state criterion was present at the relevant time. Past mental state questions include the act doctrine, *mens rea*, legal insanity, and sentencing based on culpability. Present mental state questions include various criminal competencies and sentencing based on prediction of future dangerousness. No hand-waving about relevance is allowed. For example, a broken brain or a gene-environment interaction that raises the risk of antisocial behavior is not *per se* a mitigating or excusing condition. Such evidence is relevant only if it supports the presence of a genuine excusing or mitigating condition. Whatever rhetorical use an advocate may be able to make of neuroevidence is distinguishable from whether the evidence is really, as opposed to rhetorically, relevant. The chain of inference from the purely mechanical neurodata to the law's act and mental state criteria must be clear. Unless the neuroevidence can help answer these questions, it is not legally relevant, even if it is scientifically valid. Thus, if there is a disjunction between the subject's behavior and the neuroevidence, actions always speak louder than images, except perhaps in cases of malingering (although the science cannot at present reliably and validly identify malingerers). If the defendant's brain appears broken, but he is a rational agent, he is rational for legal purposes. If the brain appears normal, but the agent is clearly psychotic, the agent is not rational for legal purposes.

For example, fetal alcohol syndrome (FAS) plays a large role in the Canadian cases (although not in the other samples), but the potentially legally relevant aspects of the disorder are the cognitive and rationality defects, which are behavioral signs, that sufferers demonstrate from an early age. Are the brains of FAS sufferers different from the brains of those without the disorder? Of course. This is just a necessary truth of biological materialism. If the behavior is markedly different, so will be the brain. Brain difference is not *per se* a mitigating or excusing condition, however. If a particular FAS sufferer is somehow sufficiently able rationally to regulate his behavior, then FAS is irrelevant to mitigation or excuse. Moreover, if a FAS sufferer exhibited lifelong cognitive defects, as many do, that sufferer is potentially excusable even if sophisticated neurotechniques cannot identify the brain pathology or brain difference. Adolescent responsibility furnishes another, similar example. We knew and the law recognized for centuries that adolescents are on average less rational than adults and we were certain about this long before diffusion tensor imaging demonstrated that adolescent and adult brains also differ biologically on average. If the neurotechniques were not able to demonstrate brain difference, would we conclude that adolescents are as rational as adults?

Many of the cases in these studies fail to understand the relevance of the neuroevidence. Even if there is clear evidence of brain damage or a neurological disorder, it does not mean that the defendant did not act, lacked *mens rea*, was less culpable, is incompetent, or will be dangerous in the future. All the criteria depend on direct assessment of the offender's behavior. In a review published in 2013 that looked at every culpability, competence and prediction question in criminal law, Morse and Newsome concluded that with the exception of a few well-characterized medical disorders, present

neuroscience was insufficiently advanced to help decide any legal question.[16] Nothing has changed since. Neural markers are too insensitive to aid the diagnosis even of major mental disorder,[17] and the notion that neuroscience can help determine whether a defendant knew right from wrong or the nature and quality of his act, for example, is ludicrous. There are few studies to date of the neural prediction of future offending or antisocial conduct and none is more than proof of concept or ready for practical use at present.

The alleged relevance of neuroevidence to competence determinations, which occurs in many of the samples, is instructive but bewildering. Criminal competencies are behaviorally functional and again defined entirely in terms of mental states. Does the defendant understand the nature of the charges, can he rationally assist counsel, does he understand the consequence of a guilty plea, does he understand the nature of the penalty about to be imposed on him and why it is being imposed? These normative, mental criteria must all be evaluated behaviorally. Either the defendant can perform these tasks to the requisite degree or he cannot.

These are continuum capacities, however, and it may be asked whether neuroscience can help with the gray area, indeterminate cases. The answer is, no, for various reasons. Any brain condition will have heterogeneous consequences. Some people with very broken brains have essentially normal mental functioning. But, cannot group data about people with this condition help us draw inferences at the margin. Once again, the answer is, no, in the present state of neuroscience as a result of the 'clear cut' problem. Behavioral neuroscientists are interested in the neural correlates and causes of various behavioral phenomena, such as schizophrenia, impulsivity, or memory defects. Valid studies begin with well-characterized behavioral phenomena to be investigated, but in these cases the behavior is clear and no neuroscience is necessary to distinguish them. Nonetheless, even in clear cases, there will be substantial overlap in the data between the comparison/experimental and control subjects, which is why neural markers are insufficiently sensitive to be used for diagnosing even severe mental disorders. Gray area phenomena are not studied because it is not clear that researchers can properly assign subjects to the comparison and control groups because the phenomenon is not well-characterized. If gray area cases were studied, the date overlap would be massive and thus unhelpful in distinguishing the cases. In behaviorally unclear cases in which the law needs help the most, neuroscience is least able to furnish it.

Actions speak louder than images, EEG findings, or neuropsychological tests, behavioral genetics, or any of the other types of neuroevidence courts are confronted with. A critical reader will be repeatedly struck by how many of the expanded cases either used irrelevant or weak (or non-existent) neuroscience—eg to assess competence or whether a defendant suffered from a mental illness—or could have been fully resolved with more careful behavioral evaluation. Of course there can be conflict about the behavioral evidence, but because act and mental state questions must be resolved, it is the behavioral evidence that is doing the real work. And for the reasons given,

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[16] Stephen J. Morse & William T. Newsome, *Criminal Responsibility, Criminal Competence, and Prediction of Criminal Behavior*, in A Primer on Criminal Law and Neuroscience 150 (S. J. Morse & A. L. Roskies eds., 2013).

[17] Mark D. Rego, *Counterpoint: Clinical Neuroscience is Not Ready for Clinical Use*, 208 Brit. J. Psychiat. 312 (2016). The author claims that dementias are an exception, but this, too, is not clear.

neuroevidence will seldom be helpful in resolving the gray area cases in which most help is needed. Much is at stake in criminal cases and of course judges would like scientific help to resolve the vexing normative issues they must resolve, but, at present, turning to the neuroscience will do nothing more in most cases than to provide a rationalization for a result the judge wishes to reach on other grounds or to avoid responsibility for having to make the hard decision directly by relying on the expert.

Is there a more optimistic story? Before Professor Farahany becomes methodologically cautious, she claims that neuroscience is already 'entrenched' in the US legal system. This is not an empirical statement. It is a normative characterization and the evidence seems to show quite the opposite, with the possible exception of capital punishment decisions. She also ends on the optimistic note of claiming that neuroscience 'improved' competency evaluations and reconsiderations of the role of punishment in society. But it is unclear how the former could possibly be true. Either the behavioral signs are reasonably obvious or neuroscience cannot help as a result of the clear-cut problem. It is also unclear what the evidence is for the latter because the proper role of punishment in society has been debated for centuries and how would one assess how neuroscience has 'improved' this debate. Professor Farahany also claims that the evidence is more 'nuanced than previously believed', but, with respect, her own case studies indicate a lack of nuanced understanding of relevance. She concludes that, '[n]eurobiological evidence has profound implications for some of the most significant decisions we make in law and policy', but without a conceptual framework about legal relevance—and none of these empirical studies purports to or is required to provide one—it is difficult to know what those 'profound implications' are. Moreover, the current state of the science relevant to criminal law[18] does not support the statement. Indeed, the optimism of the conclusion seems quite at odds with the earlier characterization of the reception of the evidence and her excellently sober account of the actual data, which in her sample and all the other samples exhibit the problems identified.

Nonetheless, I share Professor Farahany's optimism, but more reservedly. If a proper framework for the relevance of neuroscience to law is established and if a cautious approach to the science is adopted, I think neuroscience can potentially help refine legal mental state categories, such as *mens rea* and mental disorder through a conceptual-empirical equilibrium in which legal categories guide neuroscientific investigation that in turn then help clarify the legal categories. Neuroscience might also help the fairness and efficiency of criminal law decision-making by increasing predictive accuracy. The criminal law already uses predictions for purposes of diversion, sentencing, parole, and the quasi-criminal commitment of some sexual offenders. We have already decided as a normative matter that predictions are acceptable. If neural variables make this practice more accurate at reasonably acceptable cost, that is an advance. Finally, in tandem with behavioral science, neuroscience might help us more accurately understand legally relevant human capacities, such as the capacity for rationality and for self-control, which would again improve legal policy, doctrine, and adjudication. But all such

[18] I am more optimistic about the contribution of neuroscience in some non-criminal contexts, such as the objective measurement of pain or establishing the veridicality of memory.

optimistic outcomes will depend on precise understanding of legal relevance and valid science.

In conclusion, these four studies are, in my opinion, more interesting for what they teach us about how neuroscience evidence is used than about how much it is used. They are a guide to a better future if we draw the right conclusions from them. The emerging study of law and neuroscience owes a debt to the authors.