Behavioural genetics in criminal court

Introduction of genetic evidence of a predisposition to violent or impulsive behaviour is on the rise in criminal trials. However, a panoply of data suggests that such evidence is ineffective at reducing judgements of culpability and punishment, and therefore its use in the legal process is likely to diminish.

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Behavioural genetics, once largely the preserve of scientists exploring the relative influences of heredity and environment on behavioural traits, is now an increasingly frequent visitor in the courts[1]. The interest of attorneys — particularly the criminal defence bar — in the genetic roots of behaviour lies in the presumed effect of genetic explanations on perceptions of individual responsibility. If a defendant's criminal behaviour, rather than being determined by conscious choices, were driven by unconscious genetic predispositions to commit antisocial acts, the person may seem less responsible for the outcome and therefore less deserving of punishment[2]. Behavioural genetics, at least in principle, thus has become a tool for legal claims of reduced culpability and mitigated punishment. The future of its use in criminal trials, however, is less clear.

The science behind the legal argument is based on studies that have found an association between certain genetic variants, often interacting with childhood maltreatment, and impulsive or antisocial behaviour[3]. One of the most influential such reports analysed data from a longitudinal epidemiologic study of a birth cohort in Dunedin, New Zealand, examining high- and low-activity polymorphisms in the promoter region of the monoamine oxidase A (MAOA) gene on the X chromosome in male subjects. The investigators found a gene-by-environment interaction between a history of childhood maltreatment and MAOA status: subjects with an allele associated with reduced MAOA production who had a history of childhood maltreatment made up only 12% of the sample but accounted for 44% of convictions for violent crime[4].

Although the exact relationship between specific genes and antisocial behaviour is far from settled, the admission of behavioural genetic evidence into court proceedings is on the rise, especially in death penalty cases, in which criminal defendants have sought to introduce behavioural genetic evidence in sentencing hearings to argue for mitigation[1]. Behavioural genetics appears to be part of a growing trend in criminal cases of introducing evidence based on neuroscientific methods — including functional magnetic resonance imaging (fMRI) studies and neuropsychological testing — to address responsibility and punishment[5]. While still controversial, some legal theorists have suggested that behavioural genetic and other neuroscientific evidence has the potential to undermine legal notions of free will, and therefore drive a reorientation of the criminal justice system from punishment to rehabilitation.

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How effective is behavioural genetic evidence?

Several highly publicized cases have illustrated the potential impact of behavioural genetic evidence. Two convicted murderers in Italy successfully proffered such evidence to reduce their terms of imprisonment[6]. In one case, the trial judge reduced the defendant's sentence by three years after learning that he suffered from mental illness; an appellate court reduced his sentence by an additional year on being told that the defendant possessed a low-activity MAOA allele. Less than two years after this holding, another defendant — who was convicted of killing her sister, burning the corpse, and attempting to kill her parents — had her sentence reduced from life in prison without parole to a term of twenty years, in part because it was discovered that she had a low-activity MAOA gene.

However, more systematic data call into question the impact of behavioural genetic evidence. Notably, the largest systematic review of American court cases found no discernible overall effect of behavioural genetic evidence on criminal sentencing, notwithstanding one instance in which it seemed to contribute to a jury's decision not to sentence a murder defendant to death[1]. (Given that this analysis focused exclusively on appellate decisions — representing a small percentage of criminal cases — limits inherent in the data could account for the failure to ascertain an effect of behavioural genetic evidence in court.)

Researchers have also started to examine experimentally the effect that such evidence might have on culpability and sentencing decisions. One study found that a sample of US state court judges reduced a hypothetical defendant's average prison sentence by less than one year (from approximately 14 years in the control condition to about 13 years) when behavioural genetic evidence was proffered to support the diagnosis of psychopathy[5]. However, a similar study using the same methods with German judges failed to replicate even this modest reduction[7].

Another program of research, using large, representative samples of the US population, systematically varied the heinousness of the crimes/behaviours, the presence or absence of behavioural genetic evidence, and other factors related to characteristics of the defendant, and asked participants to render a variety of decisions (including whether a criminal defendant was guilty or not guilty by reason of insanity; whether the defendant should be sentenced to death; and what the length of incarceration should be)[8]. Across eight separate experiments, behavioural genetic evidence had no effect one way or another on perceptions of responsibility, nor on the degree to which individuals should be punished for misbehaviour. However, the studies did consistently find that both the egregiousness of the behaviour and the strength of participants' beliefs in free will increased the magnitude of the punishments they levied. This lack of effect is consistent with research failing to find consistent impact on culpability judgements of neuroscientific explanations of misbehaviour — typically based on interpretations of fMRI data.

Thus, for all the potential that some legal commentators and others have seen in the use of behavioural genetic evidence in support of arguments for diminished responsibility and thus mitigation of punishment, such effects have been difficult to detect in actual cases — with rare exceptions — and are modest or entirely absent in the experimental data.

Explaining the null effect

Several possibilities might explain why behavioural genetics fails consistently to affect culpability judgements and punishment decisions in experimental settings. One is that biogenetic explanations for behaviour appear to induce countervailing beliefs, leading both to the perception that persons are less blameworthy for their behaviour but also that they are more likely to commit such acts again. Thus, the net effect of behavioural genetic evidence may be null.

An additional possibility is that the lay public simply does not comprehend the intricacies of behavioural genetic evidence and therefore ignores it when rendering decisions about culpability. Yet another option is that the lay public does not view genes as the primary or even the major determinant of behaviour, and therefore finds evidence of a genetic predisposition to be of little relevance in determining culpability or imposing punishment. Or judges and the lay public alike may recognize that genes have some influence on behaviour, along with a host of other factors, but not see that as incompatible with an expectation that people will exercise sufficient control to conform their behaviour to the law, even if for some people that may require more effort than for others. Whatever the reason, and a combination of factors may be at play, most people are unpersuaded that evidence regarding the role of biological factors such as genes should alter their decisions about criminal punishment.

In rejecting behavioural genetic evidence as a basis to reduce culpability and punishment, judges and lay people appear to be in agreement with a group of scholars who have argued that genetic explanations of behaviour should have only a limited effect on legal determinations of responsibility and punishment[9]. Demonstrating an increased risk for antisocial behaviour associated with a particular genetic variant, they argue, is an insufficient basis on which to predicate a claim of reduced responsibility. The law traditionally has required the presence of either decreased rationality or impaired ability to control behaviour as an indicator of diminished responsibility. Only if a genetic variant acts through one of these mechanisms, these scholars argue, and produces a substantial decrement in rationality or behavioural control, should the law take it into account in assigning blame and apportioning punishment. So far, behavioural genetic evidence generally has failed this test, and hence the impact of behavioural genetic evidence on claims for mitigation has, understandably, been weak.

How likely is genetic and neurobiological research to overcome these limitations? As Buckholtz and Meyer-Lindenberg[10] note, studies have identified a number of changes in brain structure and function in men with the MAOA-L allele that can plausibly be linked to increased impulsive aggression. These include reduced grey matter volume in the amygdala and cingulate gyrus, increased activation of the amygdala and other brain regions associated with emotional responses, and diminished activity in areas that modulate such reactions, including the anterior cingulate. Yet, most studies of the relationship of MAOA-L alleles to violence have shown no effect of the low-producing allele per se, in the absence of indicators of childhood maltreatment — suggesting that these alterations in themselves are insufficient to account for increased violence risk. To our knowledge, comparable studies of brain structure and function in subjects having both the MAOA-L allele and a history of maltreatment in childhood have not been performed. Nor have these changes been directly linked to violent and other antisocial behaviour. At best, then, we are a long way from having the kind of evidence that the law might find probative on issues of responsibility and punishment.

What the future holds

Given the doctrinal and empirical challenges to the effective use of behavioural genetic evidence for mitigation, we question the consensus of most commentators that the presence of such evidence in court proceedings will continue to grow, at least for the foreseeable future. To be sure, defendants facing the death penalty or long prison terms have little to lose by mustering every argument that could possibly have a mitigating effect. In addition, genetic and other neuroscientific evidence is already being used to support claims of incapacity or the presence of mental disorders.

It should also be noted that potential use of behavioural genetic evidence is not limited solely to criminal trials. Employers contesting claims that mental disorders are work related, civil litigants rebutting arguments that their behaviour caused a plaintiff's emotional distress, or parties involved with child custody disputes, all might believe that behavioural genetic evidence is potentially helpful to their case. Indeed, civil defendants may attempt to compel complainants to undergo genetic testing to corroborate their claims.

However, unless the introduction of behavioural genetic evidence can be shown materially to affect the outcome of cases, its role in the legal process is likely to diminish.

If legal decision-makers — whether juries or judges — are unlikely to be swayed by genetic evidence, there would seem to be little reason for courts to fund genetic testing for indigent defendants, or for them to overturn the convictions or sentences of defendants who contend that their legal counsel was ineffective by failing to introduce evidence regarding the genetic influences on their behaviour.

Greater legal impact of genetic explanations of behaviour, in turn, may await elucidation of the mechanisms associated with increased risk of antisocial outcomes and demonstration of their relationship to the traditional legal standards of rationality and behavioural control. Until that happens — and a sufficient body of evidence is not likely to appear soon — the wisdom of the general public may be worth attending to: resisting the allure of science may result in fairer outcomes all around. ❐

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Competing interests

The authors declare no competing financial interests.