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The use of behavioural genetics in the criminal justice system: A disability & human rights perspective

Charles O'Mahony [a,*], Aisling de Paor [b]

[a] School of Law, National University of Ireland Galway, Ireland
[b] School of Law & Government, Dublin City University, Ireland

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1. Introduction

Scientific and technological advances are presenting a new era of genetic exploration and uncovering valuable information about human beings. Genetic science and technology is advancing at a significant pace, with scientists making genetic discoveries as to the make up of the human body and the cause of disease and disability. Scientists are also beginning to make discoveries as to the genetic basis of anti-social behaviour and violence. These discoveries facilitate technological innovation and the development of genetic testing is becoming available for medical and non-medical purposes including use in the criminal justice context, thus presenting ethical and legal challenges. Behavioural genetics has been hailed as the future of criminal justice (Andrews, 2002; Beecher-Monas & Garcia-Rill, 2006) and the expanded use of behavioural genetics has been forecasted (Wasserman, 2004; Wilson, 2015). There is already a growing use of neuroscience and neurobiological material in criminal justice system (McSwiggan, Elger, & Appelbaum, 2017).

While much attention has been dedicated to the regulation of genetic information in commercial contexts such as employment and insurance, less has been focused on regulating the use of genetic testing in the criminal justice context. There has been a proliferation in the use of genetic science within the criminal justice system over the last number of decades. The development of DNA evidence, the development of and regulation of DNA databases, the rules of evidence on the use of DNA evidence indicates the growing acceptance and utility of genetic science in the criminal justice system.

This article examines the available scientific knowledge on behavioural genetics and its application in the criminal justice system. The question arises as to whether criminal law and procedure acknowledge or allow application of genetic information – either as a defence or as a tool to build a case against a defendant, and what limits or restraints should be put on such its use. It may also be used as a tool in determining release from prison in the future (Wilson, 2015). A further concern surrounds the potential use of bad science, and the subsequent misapplication and misuse of genetic information. The article considers the human rights implications of genetic testing in the criminal justice system, and looks at these issues from a disability perspective. It examines the potential for genetic information to expose the vulnerabilities of persons with disabilities and result in the violation of a range of fundamental human rights. The question arises as to whether genetic predisposition to violent behaviour will be categorised as a 'mental impairment' (Forzano et al., 2010) and therefore whether persons with such predispositions will be categorised as mentally ill and regarded as having a disability (leading to stigma and mistreatment). The article specifically considers the relevance and application of the UN Convention on the Rights of Persons with Disabilities (CRPD) as prohibiting genetic testing in the criminal justice system and safeguarding the rights of persons with disabilities in these settings.

2. Genetics science & evolving technologies

Genetic science and technology is advancing rapidly, offering great opportunities to revolutionise health care and the understanding of the genetic make up of human beings (Collins & McKusick, 2001). It also enables the practice of precision or personalised medicine, which is likely to become a more routine element of health care (Hamburg & Collins, 2010). In addition to offering such insights into an individual's current and future health, new genetic technologies also provide the potential of revealing the expression of future disabilities, including mental illness and behavioural tendencies. However, despite these advances, the science and technology is still developing and it is uncertain whether a genetic test that accurately predicts the development of behavioural traits will be developed (de Paor & O'Mahony, 2016).

This section gives an insight into the field of genetic science and an overview of the current and likely future direction of genetic technologies. The modern study of genetic science began in 1953 (following early discoveries as to the genetic make up of human beings) when the double helix structure of deoxyribonucleic acid (DNA), was uncovered by Watson and Crick, a significant breakthrough in understanding the mechanisms of DNA (Hartl & Orel, 1992; Watson & Crick, 1953). A

* Corresponding author.
E-mail address: charles.omahony@nuigalway.ie (C. O'Mahony).

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key milestone in the field was the Human Genome Project (HGP), an international scientific effort to sequence the human genome. The project commenced in 1990 and by 2003 the human genome had been successfully mapped (Collins et al., 2003).

The triumph of the HGP provoked unparalleled scientific progression in understanding the genetic make up of human beings as well as technological advancement (Collins & McKusick, 2001). These scientific developments also led to an increase in the availability of genetic testing (Casey, 1997; Miller, 2000), for diagnostic, predictive and other purposes (Terhune, 2012). The practice of genetic testing reveals what genes an individual may have that may suggest predisposition to certain diseases and conditions, such as cancer, heart disease and Alzheimer's (Euhus, 2014; Harper, 1997). Genetic technologies are also becoming more available, for example, as reflected in the emergent direct-to-consumer (DTC) genetic testing industry, which markets genetic testing directly to the consumer, such as via the Internet (Hogarth, Javitt, & Melzer, 2008a, 2008b).

Genetic information may also be exposed without the use of genetic tests. For example, an individual may ascertain genetic information through examining their own medical history and their family medical history (Miller, 2000). Family medical history has traditionally been an important source of genetic information from which individuals can acquire significant knowledge (Otlowski et al., 2009–2010). It is therefore important to refer to both genetic test results as well as information gained from family medical history when examining genetic information and its uses and misuses. This is a factor that might require further consideration in the criminal justice system where the right to privacy for prisoners of their medical information and that of their family members (who may have also being prisoners) is contested (Goldstein, 2014a, 2014b).

3. Genetics and behavioural tendencies

In addition to physical disability and disease, developing genetic technologies may detect genetic markers for behavioural and personality traits, with potentially significant application in the field of psychiatry, mental health and other fields. Behaviour manifests as a result of complex traits involving multiple genes that are influenced by a number of other factors, including environment and socio-economic considerations (Coll, Bearer, & Lerner, 2004). In recent years, scientists have been uncovering the genetic basis for various types of behaviour for example, a predisposition towards 'risk- taking' and leadership (Shane, 2010). Leadership qualities, like other traits, are also learned and factors such as environment can impact upon such skills (Kreek, Nielsen, Butelman, & Laforge, 2005).

There is also a growing scientific understanding of the links between genetics and mental illness. Predisposition to mental illness results not just from one genetic mutation, but also from the complex interaction of multiple genes, as well as environmental factors (Hyman, 2000). It is recognised that the probability of mental illness is hereditary and therefore runs in families.

In a number of recent studies on mental illnesses from the US it was found that there is an evident genetic link to mental illness albeit with a strong environmental association (Craddock & Jones, 1999; Dunn et al., 2015; Flint & Kendler, 2014; Foley, Neale, & Kendler, 2001; Kendler, 1994; Ledford, 2015; Lee et al., 2013; Malhi, Moore, & Mcguffin, 2000; Mcguffin, 1996; Risch et al., 1999). This research underlines the potential for the further development of the genetic basis of mental disorders, behavioural tendencies and personality traits. While the findings in these studies are statistically noteworthy, the identified genetic associations alone merely account for a small amount of risk for mental illness. It has been acknowledged that the findings are 'insufficient for predictive or diagnostic usefulness by themselves' (National Institute of Mental Health, 2013). Nonetheless this research is arguably a stepping-stone 'toward diagnostic classification informed by disease cause' indicating the potential for the development of reliable and more accurate genetic testing for mental illnesses and behavioural traits.

3.1. The "warrior gene", violent behaviour and criminal responsibility

Building upon developments in the field of genetics and behavioural science, there has been growing discussion in recent years of the genetic link or association with aggression, violent behaviour and other antisocial behaviour. There has been emerging research and particular interest in the existence of what is commonly known as the "warrior gene" (Gibbons, 2004). The warrior gene is regarded as having the potential to explain why some individuals might be predisposed to certain socially undesirable behaviour, including violence and crime. The MAOA gene, found on the X chromosome, encodes for monoamine oxidase A (MAOA) and is part of the family of genes that deal directly with chemical messengers, or amine neurotransmitters such as dopamine, serotonin and norepinephrine in the brain (González-Tapia & Obsuth, 2015; Raine, 2008). When these neurotransmitters are not broken down in the body, excess neurotransmitters inhibit communication among neurons, leading to unusually aggressive and antisocial behaviour (Raine, 2008). The positive aspects of the gene have been noted from an evolutionary perspective. It has been indicated that the gene does not simply and exclusively create the potential for violent behaviour, but that there may have been a time when it was needed to provide protection in dangerous situations and that it may therefore have been evolutionarily favourable (Gibbons, 2004). However, the identification of the gene in today's modern world has provoked a renewed interest in identifying such traits and suggests adverse associations with socially undesirable behaviour.

Several studies have been published in recent years on the genetic make up associated with these types of behaviours, and have highlighted the expression of these genes, particularly in conjunction with environmental factors. The majority of these studies focused on men (although women also inherit the gene), as the effects of the particular gene are easier to study in men, who only have one X chromosome (Gibbons, 2004). In 2002, a study in the United Kingdom, linked the MAOA gene and the impact of environmental factors, particularly mistreatment during childhood (Caspi et al., 2002). The study found low levels of MAOA expression to be associated with aggressiveness and criminal conduct of young boys raised in abusive environments. The study explained why not all victims of mistreatment during their childhood grew up to victimise and mistreat others. The study indicated that a child's genetic predisposition could leave him or her more sensitive to environmental attacks, perhaps leading to aggressive behaviours (Caspi et al., 2002).

Another study from 2002 that tracked boys from birth in New Zealand found that men who had the particular genetic make up and were mistreated as boys were four times more likely than other men to have perpetrated violent crimes such as assault, robbery and rape. In 2006, a study in the United States found that former victims of child abuse with high levels of MAOA were less likely to commit violent crimes — but only if they were white. The effect was not evident in non-white children (Widom & Brzustowicz, 2006), indicating a potential correlation between the gene and race or ethnicity.

In 2009 a study found that MAOA impacts aggression in situations where provocation is more heightened (Mcdermott, Tingley, Cowden, Frazzetto, & Johnson, 2009). The study indicated that aggression occurs with more intensity and more frequently as provocation is experimentally manipulated upwards, especially among low activity MAOA (MAOA-L) subjects. In this study, subjects paid to punish those they believed had taken money from them by giving certain amounts of offensively spicy sauce to their opponent (Mcdermott et al., 2009). There is some evidence of a main effect for genotype and some evidence for a gene by environment interaction, such that MAOA is less associated with the occurrence of aggression in a low provocation condition, but significantly predicts such behaviour in a high provocation situation.