

# Chapter

Introduction

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# Introduction

## Why this Working Party is important

- 1.1 Human behaviour is influenced both by the genes that we inherit and the environment in which we live. With the significant advances in our knowledge of genetics and publication of the draft sequence of the human genome, the focus of research has moved once again towards understanding the biological contribution to behaviour.<sup>1</sup> Some researchers are attempting to locate specific genes, or groups of genes, associated with behavioural traits and to understand the complex relationship between genes and the environment. This is called research in behavioural genetics. In contrast to research into the genetic basis of diseases and disorders, researchers in behavioural genetics investigate aspects of our personalities such as intelligence, sexual orientation, susceptibility to aggression and other antisocial conduct, and tendencies towards extraversion and novelty-seeking.
- 1.2 This is a complicated area of research in genetics, often controversial, occasionally explosive and with the capacity to ignite dangerous passions. There are concerns about the validity of some of the scientific methodologies involved. It is difficult to identify and interpret the influence of genetic factors, and it can be just as hard to define and measure the behavioural traits themselves. There is no evidence that research in behavioural genetics can expect to uncover simple correlations between one gene and one behavioural trait. Rather, complex interactions between a number of genes may be involved in an individual's susceptibility to possessing a particular trait. There will also be environmental influences on behaviour and genes, and genetic influences on both the environments we seek out and the activity of other genes. Moreover, the effects of our genes change over time as we develop – they do not have a continuous and unchanging influence on our brains and bodies. A further complication is that one gene, or group of genes, is likely to affect more than one trait. For example, in 1999, researchers in the US produced a strain of mice that had been genetically modified and that appeared to have an improved memory.<sup>2</sup> But in 2001, another group of researchers discovered that mice whose genes had been altered in this way also had the capacity to suffer more from long-term pain.<sup>3</sup>
- 1.3 A useful analogy that has been used to convey this complexity is that of an orchestra playing a difficult score, whereby a particular group of genes (or the notes of the music) can generate a large number of different outcomes (or interpretations of the music).<sup>4</sup> This complexity means that, even if some genes are found to be associated with certain types of behaviour, the contribution they each make may be very small, and the precise effect they have on any particular person may be extremely difficult to predict. This weak contribution of individual genes, or groups of genes, to overall susceptibility, is compounded by the subtle interaction of genes amongst themselves and with the environment, and the relative unpredictability of human development. If, notwithstanding all these difficulties, genes that influence particular behavioural traits are identified, it could become possible to test

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<sup>1</sup> See for example Duster, T. (1990). *Backdoor to Eugenics*. New York: Routledge. This account reports a substantial rise, during the 1980s, in the publication of scientific articles that attempt to explain the genetic basis of behavioural traits.

<sup>2</sup> Tang, Y. P. *et al.* (1999). Genetic enhancement of learning and memory in mice. *Nature* **401**, 63–9.

<sup>3</sup> Wei, F. *et al.* (2001). Genetic enhancement of inflammatory pain by forebrain NR2B overexpression. *Nat. Neurosci.* **4**, 164–9. This effect is called *pleiotropy*.

<sup>4</sup> Schmikle, S. (2002). Intelligence genes prove hard to map. *Minneapolis-St Paul Star Tribune* 18 February. Reporting Professor Jonathan Beckwith (Harvard University).

for the presence of variations in these genes in individual people. No such tests currently exist. Moreover, there is disagreement about whether tests that predict human behaviour accurately could ever be developed.

- 1.4 Even if genetic tests could not yield predictions of a *definite* outcome, it may nonetheless be possible that tests that suggest an individual will have an *increased chance* of possessing a particular trait to a greater or lesser degree might be developed. Such hypothetical tests might be undertaken for a variety of purposes. One purpose would be simply to gain more knowledge about the influence of genes on behaviour. For example, studying traits within the normal range of behaviour, such as anxiety, might help in the search for treatments for disorders, such as clinical depression. Another purpose might be that of intervention or treatment, for example to prevent aggressive behaviour by using medicines, or by attempts to change relevant aspects of the environment. A further purpose might be that of selection. This encompasses, for instance, prenatal testing, the streaming of children in schools on the basis of intelligence and aptitude, the screening of employees and jobseekers to exclude those with traits that employers consider undesirable, and the use by insurers of genetic information about behaviour and personality traits in order to estimate risk. Yet another purpose might be to claim diminished legal responsibility for one's actions or to mitigate punishment for criminal behaviour.
- 1.5 These possibilities raise important ethical, legal and practical issues. If genetic tests for behaviour in the normal range are developed, parents who want children with certain traits might be encouraged to select particular embryos or fetuses, or to seek to enhance the traits of their existing children using genetic manipulation. Those with the most desirable genetic endowments could be streamed into the best schools, universities, jobs, while those without the benefit of enhancement would be relegated to a pool of the less educated and less skilled. Although this may be the stuff of science fiction,<sup>5</sup> there can be no doubt that the idea that qualities of the human race could be improved by selective breeding was to some extent taken as justification for acts of genocide by the regime in Nazi Germany. This idea also encouraged the compulsory sterilisation of mentally handicapped people in Europe and North America. While modern behavioural genetics is not in any sense driven by eugenic policies, there is a need to understand why past ideas and practices were unacceptable and to be aware of the potential dangers of genetic discrimination in our open society, where decisions tend to be made by individuals and based on freedom of choice. Other important issues include the protection of the privacy and confidentiality of personal genetic information, and the role of education and the media in influencing mistaken beliefs about the factors that affect particular behavioural traits and the stigmatisation of individuals who display such traits.
- 1.6 In view of considerations such as these, the Nuffield Council on Bioethics agreed that it was important to anticipate the ethical, legal and social implications raised by research in behavioural genetics. The scope of the Council's 1993 Report on *Genetic Screening: The Ethical Issues*, was limited to serious diseases. In focusing on the major psychiatric disorders, the scope of the 1998 Report on *Mental Disorders and Genetics: The Ethical Context* was similarly restricted. The work of the Human Genetics Advisory Council (HGAC) in the UK,

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<sup>5</sup> An extreme form of such a society is imagined in the film *Gattaca* (1997) where the "InValids" who have not been genetically engineered are condemned to the lower ranks of society. While the society envisaged in *Gattaca* is based on parental choice, Aldous Huxley's *Brave New World* (1932) presents a vision of an authoritarian society in which the state is responsible for producing and conditioning the requisite supply of intelligent and less intelligent individuals.

and the Human Genetics Commission (HGC) which replaced it, has also focused on inherited disease and susceptibility to clinical disorders. This Report is intended to fill that gap and to draw attention to the implications of research in genetics which falls outside the medical sphere. The objectives of the Working Party established by the Council were to define and consider the ethical, legal and social issues arising from the study of the genetics of variation within the normal range of behaviour characteristics. In order to provide a factual and contextual background to the issues, this Report first sets out the historical and scientific background and examines the evidence for the relative importance of genetic influences on selected behavioural traits. It then considers the potential applications of this research and the ethical, legal and social implications.

### Defining the normal range of behavioural characteristics

- 1.7 The subject of this Report is human behaviour within the normal range, as opposed to traits that are defined as illnesses or diseases. An important preliminary question is whether it is actually feasible to talk about a 'normal range' of behavioural traits. According to one view, there is no such state as 'normality', and nor is there a 'normal genome', as each individual is subject to different genetic and environmental influences.
- 1.8 There is a danger that, in speaking of the 'normal' range, this Report may be misunderstood as stigmatising certain kinds of behaviour, namely those that are at the extremes of variation. It therefore needs to be emphasised that when we use the phrases 'normal variation' or 'behaviour in the normal range', no moral evaluation or judgement is implied. In these phrases, 'normal' has a statistical meaning – it refers to the range of variation, usually that which includes about 95% of the population, and which is thought not to contain any individuals with clinical disorders or diseases. There are other approaches to defining normal behaviour. They include the theory that abnormal behaviour is that which results in impaired function in society for the individual, either from the individual's own perspective, or from an objective standpoint, regardless of whether the behaviour is statistically rare or not.
- 1.9 We take the statistical approach merely as our starting point, using it to limit the field of inquiry. We have focused on traits, such as intelligence, that are continuously distributed measures, displayed by each individual in the population to a greater or lesser extent, and which are not commonly viewed as disorders. In Chapter 13, we consider further the question of defining normal behaviour with reference to issues such as medicalisation and the distinction between therapy and enhancement. For now, we observe that not only are the boundaries between disorders and variation in the normal range difficult to draw, but also that they can be disputed at any time and can alter as society changes. Homosexuality has, at times, been regarded as a disorder, but today is usually regarded as a variation within the normal range of sexual preferences. We also note the further question, whether patterns of behaviour can properly be seen as lying on a continuum, with disorders as extremes of normal variation, or whether disorders are qualitatively different from behaviour in the normal range. For example, is depression an extreme manifestation of neuroticism, a trait which is present in everyone to some degree, or is it a distinct disorder? At present, it is not known whether there will prove to be any evidence from research in genetics for making a qualitative distinction between normal and abnormal behaviour, or for viewing behaviour as lying on a continuous spectrum. This is one reason why researchers in behavioural genetics and other disciplines consider it important to examine the genes of people considered to be within the normal range as well as those who display extremes of behaviour.

## The scope of research in behavioural genetics

1.10 We focus on four areas of research in behavioural genetics: research into intelligence, personality traits, antisocial behaviour and sexual orientation. These were selected to illustrate the range of topics that are being investigated, and because of the important issues they raise.

- *Intelligence* is a complex phenomenon and there is considerable debate about whether it can be measured effectively. There is substantial disagreement regarding the extent to which genetic and environmental factors influence intelligence.
- *Personality traits* have been studied by psychologists for many years. Five core traits have been the focus of research in both psychology and behavioural genetics: neuroticism, introversion/extraversion, openness, agreeableness and conscientiousness.
- *Antisocial behaviour* is classified differently by mental health clinicians, criminologists and psychologists, but a common factor is that it is behaviour which violates the rights and safety of others. It includes traits such as aggression and violent behaviour.
- *Sexual orientation* is regarded by some as a matter of choice and by others as a matter of biology. What role, if any, do genetic factors play in sexual orientation? The answer to this question is bound to influence the way in which people react to homosexuality.

1.11 We acknowledge that terms such as ‘antisocial behaviour’ and ‘extraversion’ arise from particular disciplines, for example psychology, and that there is often dispute about what they refer to. However, since certain behavioural traits, thus defined and labelled, are the focus of research into behavioural genetics, we use these terms. In discussing these characteristics we have found it useful to compare them to certain other quantitatively varying human characteristics, such as height, which are more amenable to definition and measurement than behavioural traits.

## The structure of the Report

1.12 The first two parts of the Report explain the historical and scientific background to research in the field of behavioural genetics. Chapter 2 outlines the history of the eugenics movement and its profound effect on the development of clinical genetics and developmental psychology since the Second World War. There is a brief account of evolutionary psychology as a reaction to the behaviourism of the 1950s and 1960s.<sup>6</sup> Chapter 3 attempts to explain what is meant by the suggestion that genes influence or affect human behaviour. It does so by examining what genes are and how they work, what is meant by genetic variation, what we mean by human behaviour within the normal range, and how genes might influence such behaviour. There are different ways in which one can study the contribution that genetic factors make to human behaviour. Chapter 4 examines one of these approaches, namely quantitative genetics. This field of research aims to determine the extent to which variation in a trait is genetically influenced in a population. It uses statistical methods to examine and compare groups of people without focusing on

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<sup>6</sup> The Report has been confined to behavioural genetics. Evolutionary psychology, which attempts to provide explanations for similarities in human behaviour rather than variation between individuals, raises different scientific and ethical issues and is not discussed in the Report.

particular genes. Chapter 5 explains another approach, that of molecular genetics. This attempts to identify differences in particular genes that contribute to variation between particular individuals. A third approach is the use of animals to try to examine the effects of particular genes on behaviour. Chapter 6 examines this type of research.

- 1.13 The third part of the Report, Chapters 7–11, contains reviews of the findings that have been obtained to date in each of these methods of research, with respect to the behavioural traits already listed: intelligence, personality, antisocial behaviour and sexual orientation. The principal themes that emerge from the reviews of the evidence are summarised in Chapter 11. The Report has been written so that readers not wishing to digest the scientific information contained in the reviews of the evidence can refer to this summary chapter instead, without compromising their understanding of the overall Report.
- 1.14 The fourth part of the Report examines the ethical, legal and policy issues and offers a series of conclusions and recommendations. A starting point is the recent United Nations Educational, Scientific and Cultural Organization (UNESCO) *Universal Declaration on the Human Genome and Human Rights* which states that the 'human genome underlies the fundamental unity of all members of the human family, as well as the recognition of their inherent dignity and diversity'.<sup>7</sup> Chapter 12 begins by discussing whether there is an inherent conflict between understanding the genetic influences on behaviour and human dignity, as it is expressed in the concepts of free will and moral responsibility. Chapter 13 then addresses some of the potential applications of the research including genetic, medical and environmental interventions aimed at changing behavioural traits, as well as prenatal selection. Chapter 14 is concerned with the implications of research in behavioural genetics for the criminal justice system, in relation to attributions of legal responsibility and sentencing, and in predicting antisocial behaviour. Chapter 15 considers genetic testing and selection with regard to education, employment and insurance.

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<sup>7</sup> United Nations Educational, Scientific and Cultural Organisation. (November 1997). *Universal Declaration on the Human Genome and Human Rights*.