

Genetics and human behaviour: the ethical context

a guide to the Report

Introduction

Do we inherit our behaviour? Or does it depend on our upbringing? There is little doubt that genes do have some influence on our personality. But how much? Research to find out how our genes influence our behaviour is complex and controversial. There are concerns both about the science itself and the potential applications.

The Nuffield Council on Bioethics has published a Report, **Genetics and human behaviour: the ethical context**, which examines the ethical, legal and social issues that behavioural genetics raises. This summary sets out some of the arguments and recommendations which are discussed in more detail in the Report.

[Notes in square brackets throughout refer to chapters and paragraphs in the Report].

What is behavioural genetics?

Research in the field of **behavioural genetics** aims to find out how genes influence our behaviour. Researchers are trying to identify particular genes, or groups of genes, that are associated with behavioural traits, and investigating the role of environmental factors.

Scientific background

The Report considers behavioural traits such as intelligence, personality (including anxiety, novelty-seeking and shyness), antisocial behaviour (including aggression and violent behaviour) and sexual orientation. The focus is on behaviour within the normal range of variation, rather than diseases or disorders.

Is there a 'gene for X'?

Some diseases are caused by changes to a single gene, such as cystic fibrosis and Huntington's disease. But many diseases are not straightforward. For example, heart disease and diabetes are likely to be affected by many genes, and the environment may also play a role. The relationship between genes and behaviour is even more complex. It is widely agreed that genes do have some influence on behaviour but it is likely that many genes are involved in influencing behaviours. Environmental factors will also have an effect [Chapter 3].

There are several reasons why it is so difficult to find which genes have an effect on behavioural traits:

- more than one gene may contribute to a trait, with many genes each having a small effect;
- a gene may affect more than one trait (for example in mice, memory and sensitivity to pain have been found to be linked);
- the action of a gene depends on the presence of other genes;
- environmental factors may contribute to a trait;
- genes and the environment interact together in different ways; and
- genes do not have a continuous effect throughout our bodies or for all of our lives.

It is unlikely that variation in just one gene contributes to a behavioural trait. The term a 'gene for X' is very misleading and does not convey the complexity of genetic factors. Nor should we overestimate the predictive power of genes. The effects of genes are not inevitable. Genes, like environmental factors, probably just make a behaviour more or less likely to occur. They are part of the cause, but not the only cause.

What is normal?

We use a statistical definition of 'normal' to refer to the range of variation, usually about 95% of the population, which does not contain anyone with clinical disorders or diseases. This use of 'normal' does not imply any value judgement about different forms of behaviour.

Our focus is on traits that are continuously distributed. These traits are not either present or absent, but are found in everyone to some greater or lesser extent. It is likely that most behaviours lie on a continuous spectrum [paras 3.7-3.8].

How is the research conducted?

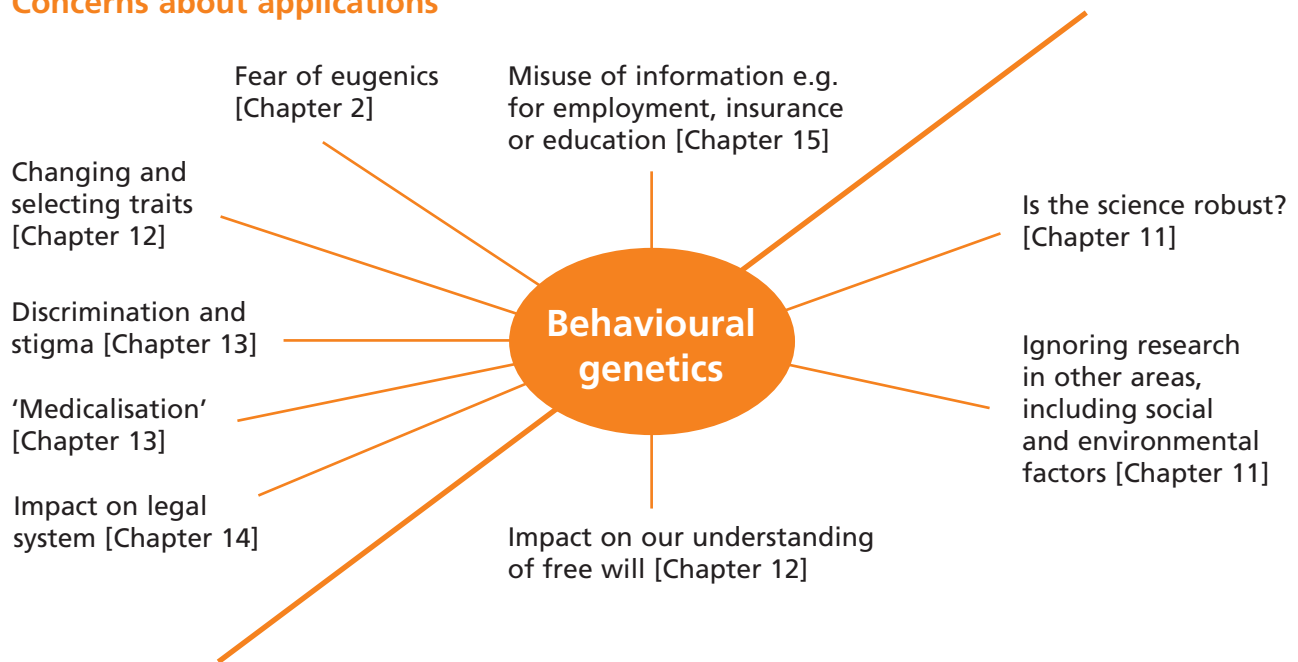
- *Quantitative genetics*: researchers compare different groups of people, for example, identical and non-identical twins, brothers and sisters, families and adopted children. These studies use statistical methods to determine the relative contribution of genetic and environmental factors in influencing behaviour [Chapter 4].
- *Molecular genetics*: researchers aim to identify individual genes, and to understand how different gene variants might influence variation in behaviour [Chapter 5].
- *Animal models*: researchers use animals to try to examine the effects of particular genes on behaviour. Research is mainly focused on mice and rats, but also primates, birds, fish and fruit flies [Chapter 6].

What are the findings so far?

The Report describes the scientific evidence so far, with reviews of research on intelligence, personality, antisocial behaviour and sexual orientation [Chapters 7-10]. Behavioural genetics is still a highly speculative area of research. A few genetic links have been suggested but, despite the newspaper headings, to date no individual gene has been shown conclusively to influence antisocial behaviour, anxiety or intelligence in the normal range, or sexual orientation.

Concerns about behavioural genetics

Concerns about applications



Concerns about the research

Will behavioural genetics research lead to eugenic policies?

Research in behavioural genetics takes place in the shadow of eugenic practices. Eugenics, literally meaning 'well born', is the idea of improving humanity using scientific methods, for example, by selective breeding. But the use of negative eugenics was a central aspect of some of the worst atrocities in recent history. In the US, Europe and elsewhere, hundreds of thousands of people were segregated and sterilised. In Nazi Germany, 'euthanasia' programmes attempted to eliminate entire groups of people. These policies have been widely, and rightly, condemned. The Report outlines the history of the eugenics movement, its impact on research into human behaviour, and the lessons that may be learnt [Chapter 2].

Despite its history, contemporary research in behavioural genetics is not necessarily eugenic. We conclude that it is important to understand and learn from the past, in order to prevent similar abuses happening in the future. Historical and philosophical studies of eugenic practices and policies should be encouraged [para 2.20].

Is the science robust?

Concerns about research in the field of behavioural genetics include:

- the difficulty of defining and measuring behaviours;
- the dangers of misinterpreting or misapplying statistical estimates of heritability;
- the lack of replicated findings; and
- difficulties in predicting how behaviour develops because of the complex interaction between genes and the environment.

Despite these concerns, we think that it is both theoretically and practically possible to identify genes that influence behaviour, and to understand something about the way they work [Chapter 11].

There are currently no practical applications of research in the genetics of behaviour within the normal range. But it is not too soon to examine ethical and social issues raised by potential developments.

Changing and selecting traits

Changing traits

If we can identify which genes influence behaviour, it may be possible to use this information to modify people's behaviour, by developing a range of approaches or treatment [Chapter 13].

How might behavioural traits be changed?

- *Genetic interventions*: gene therapy – the repair or replacement of a gene, or the introduction of a working gene along side a faulty one – could be used to alter behaviour.
- *Medical interventions*: using medicines to alter behaviour, for example, anti-depressant drugs or drugs to reduce shyness or enhance memory.
- *Environmental interventions*: using social policies, such as changes in diet, education or parental care. This type of approach is used already, for example, improving a child's diet and standard of living can improve his or her intelligence.

It is not obvious which of these approaches will be most effective in altering behaviour, and each case should be considered separately. Although we often assume that environmental approaches will be safe and reversible, this is not necessarily true [paras 13.7-13.12].

Medicalisation

One concern is that research in behavioural genetics might exacerbate the trend towards 'medicalisation', where behaviour previously thought to be normal is increasingly thought of as a disorder. This development could lead to people being put under increasing commercial and social pressure to use medical interventions, when they are not always necessary. It may also lead to reduced tolerance of different behavioural traits.

It is important that genetic or medical interventions are not routinely adopted without adequate consideration being given to environmental approaches. We recommend that health service providers should ensure that the deliberate prescribing of medicines for behavioural traits within the normal range be monitored and, if necessary, controlled [paras 13.13-13.24].

How should we evaluate interventions to change behaviours?

There are five questions to consider when deciding whether it is acceptable to try to change a behavioural trait [paras 13.26-13.43]. These apply to all types of intervention:

- Will it be effective?
- Is it safe?
- Is it reversible?
- Who makes the choice?
- What are the implications for individuality?

Should gene therapy be allowed?

In the future, gene therapy could be used to alter genes that influence behaviour. There are two types of gene therapy: somatic gene therapy which modifies the DNA in the body, usually in targeted cells, and germline gene therapy where the reproductive cells are altered and the changes are transmitted to future generations.

Behavioural variation within the normal range is not life-threatening and does not have serious implications for health. We consider that gene therapy to change normal behavioural traits is currently too risky, but we recommend that GTAC (Gene Therapy Advisory Committee) should develop guidelines for research into gene therapy for such traits. We do not think that germline gene therapy for behavioural traits within the normal range can be justified [paras 13.31-13.32].

Is an intervention accessible to everyone?

Who should be able to make use of genetic tests and interventions? Who should pay the costs? There are concerns that only wealthy people might be able to afford interventions, which could exacerbate social inequalities. Public provision of new tests and interventions could require significant resources. How can we ensure that equality is encouraged? One option would be to ban a procedure or intervention entirely so that no one has access to it. Another would be to try to ensure that the intervention is available as widely as possible.

We believe that equality of opportunity is crucial. There are particular concerns if a society is divided into groups that are likely to increase inequalities across generations. We recommend that any genetic interventions should be evaluated with this in mind [para 13.48].

How should tests be regulated?

In the UK there is currently no specific legislation that would regulate genetic tests for behavioural traits. It is crucial to ensure there are safeguards for consumers because these tests touch on sensitive areas of personal vulnerability. There is also potential for exploitation, and it is therefore important to ensure privacy and confidentiality.

We recommend that genetic tests for behavioural traits need stringent regulation and monitoring. It is particularly important to assess whether tests, and associated interventions, are reliable, accurate and effective. We encourage the Human Genetics Commission (HGC) to give thorough consideration to the issues raised [paras 13.49-13.56].

Selecting traits

If we can identify genes that influence a particular behavioural trait, it may be possible to identify and select people who have that trait. This is an area of particular concern because the information could also be used to select which people should (or should not) be born. It is important to stress that this is not currently possible and there are huge practical difficulties [paras 13.57-13.78].

Is prenatal selection for behavioural traits acceptable?

Prenatal diagnosis (PND)

It is possible to test a fetus during pregnancy, for example, using ultrasound scanning, serum screening or amniocentesis. Parents may then decide to abort a pregnancy if an abnormality is found, such as Down's syndrome.

Selecting a child by prenatal diagnosis would involve the termination of a pregnancy. We conclude that the use of selective termination following PND on the basis of information about behavioural traits in the normal range is morally unacceptable [para 13.65].

Preimplantation genetic diagnosis (PGD)

As part of the IVF process, several eggs are fertilised. In PGD, the embryos are tested before implantation and parents may choose which embryo is implanted. The use of PGD is currently restricted to serious diseases.

The issues raised by the use of PGD to select for behavioural traits are different, because the technique involves a choice between which embryo to select rather than deciding to end a life. Those in favour of PGD argue that parents should be allowed to have reproductive freedom and make their own decisions (the 'right to procreative autonomy'). Those opposed argue that selection of 'desirable' traits could send signals about the value of different types of life (the 'expressivist' argument), that we should accept what we are given, and not try to choose and control our children (the 'natural humility' argument). These arguments are explored in more detail [paras 13.61-13.78].

We do not think the arguments in favour of using PGD are convincing at the moment. We recommend that, for now, PGD should not be used to select embryos for behavioural traits within the normal range [para 13.78].

Therapy versus enhancement

Therapy: aims to treat, cure or prevent a disease, to bring someone into the normal range.

Enhancement: to improve something that is already within the normal range.

The difference between therapy and enhancement is often used to justify the distinction between interventions that the state should provide and those that individuals should pay for themselves. For example, cosmetic surgery may be seen either as a therapy, to treat severe burns, or as an enhancement, for example, a face-lift.

There is a fine line between therapy and enhancement. We consider that the decision to give public support should be based on the severity of the problem itself, rather than the cause of the problem. This view should be applied to interventions in behavioural genetics [paras 13.41-13.43].

Practical applications

Employment

In the future, employers might want to use genetic tests for intelligence or for behavioural traits such as aggression or anxiety, to help choose appropriate employees or to veto unsuitable applicants. Employers currently use a series of tests to assess applicants, including psychometric tests, handwriting tests and IQ tests. Would genetic tests for behaviour lead to unfair discrimination? If a genetic trait might put other people at risk, is it more defensible to test for that trait?

We conclude that employees should be selected and promoted on the basis of their ability to do a job. Employers should not demand that an individual take a genetic test for a behavioural trait as a condition of employment. Any inquiry into the use of genetic tests in the workplace should also examine the use of other methods, such as psychometric tests [paras 15.4-15.22].

Education

A wide range of tests are already used to classify children, for example, reading ability, verbal ability and IQ scores. Genetic information about behavioural traits could have a greater impact. Children could be streamed in schools according to their genetic markers, or kept out of classes on the basis of their potential for disruptive behaviour. Should genetic information be used to determine what type of education a child is given? Should genetic tests be used to identify children who have behavioural traits that could affect their own education, or the education of other children?

The implications for education have not yet received much attention. The issue needs further research and discussion, and until this has been undertaken, genetic information about behavioural traits should not be used in the context of education [paras 15.23-15.26].

Insurance

Insurers might wish to use genetic information about behaviour and personality traits, such as aggression or novelty-seeking, in order to estimate risk. However, there are concerns that vulnerable groups may be excluded from obtaining insurance. So far, discussion about the use of genetic information by insurers has not considered the use of information about behavioural traits and this should be encouraged.

We recommend that genetic information about behavioural traits in the normal range should be interpreted as falling under the scope of the current moratorium in the UK and should therefore not be used by insurance companies in setting premiums. If genetic information is going to be used, it is essential that the tests are accurate and reliable [para 15.27-15.37].

The impact on the criminal justice system

There are three ways that information about genetic influences on behaviour could be used in the criminal justice system [Chapter 14]:

As an excuse

Our legal system is based on the idea of personal responsibility. A person is answerable for their actions and so can be held legally responsible for a crime. There are some exceptions to this, for example, a person with a mental disorder may be said to have diminished responsibility and so may not be held responsible for their behaviour. Should genetic information about a behavioural trait be used to explain a crime, or even to excuse the offender?

The Report discusses whether behavioural genetics affects our notion of free will [Chapter 12]. It has been argued that if genes influence behaviour and character, and we cannot choose our genes, then our behaviour is outside our control and we are not responsible. However, we take the view that genes are not deterministic, and that there is scope for an explanation of human behaviour that allows for genes to have some influence over our characteristics but also holds that we are responsible for our actions.

We conclude that genetic information about behaviours within the normal range does not absolve an individual from responsibility for an offence. Research in behavioural genetics does not pose a fundamental challenge to our notions of responsibility [para 14.25].

When sentencing

Should genetic information affect the way in which we sentence convicted offenders? Judges already use additional information about offenders to help decide what sentence to give, including the offender's previous criminal record, the extent to which the crime was premeditated, and any mitigating, or explanatory, factors. These can include information about environmental influences, such as poverty or an abusive childhood, which may affect the likelihood of criminal behaviour.

We conclude that genetic information could be taken into account by judges when sentencing. If the information is to be used in this way, it is vital that the genetic link is convincing, and that the tests are accurate and reliable [paras 14.26-14.33].

Prediction

It is unlikely that genetic information will be accurate enough to justify using it on its own to predict antisocial behaviour. However, when combined with environmental information it might allow more accurate predictions to be made. This information could be used in two ways: to detain someone as a precaution, or to target an intervention to help someone.

We conclude that, where a person has not yet been convicted of a crime, neither genetic nor non-genetic information should be used to predict future behaviour with a view to detaining an individual. However, if information could be used for the benefit of the individual, for example, as a reason for improving particular environmental conditions, this may be justified. We recommend that genetic information should not be used in isolation in such cases [paras 14.34-14.45].

Summary

- *We conclude that research in behavioural genetics does have the potential to advance our understanding of human behaviour, and so should be allowed to continue. However, it is important to ensure there are safeguards to protect against its misuse.*
- *As yet, there are no practical applications of research in behavioural genetics but it is not too early to start thinking about future developments. We call on policy makers to begin to consider how to monitor and regulate the potential applications of this research. It is also important that organisations which fund research are aware of the concerns of the public.*
- *There is a need for well-informed public debate about these issues. Using phrases like a 'gene for X' is misleading, and claims of discoveries are often exaggerated. This is an extremely sensitive, and potentially explosive, area of research, and we stress the need for careful reporting.*

Copies of the Report are available to download from the Council's website:
www.nuffieldbioethics.org

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