Chapter 14
Heritability and Socially Defined Race Differences in Intelligence

Key themes

- Genetic heritability of intelligence
- Genetic and environmental influences on intelligence
- The bell curve
- Socially defined race differences in intelligence
- Eugenics in intelligence research

Learning outcomes

By the end of this chapter you should:

- Understand what is meant by genetic heritability in intelligence
- Be able to outline the different dimensions of genetic and environmental influences that are thought to affect intelligence
- Be familiar with the main points of Herrnstein and Murray's bell curve analysis
- Be aware of some criticisms of Herrnstein and Murray's bell curve analysis

Introduction

In 1994 Arthur Jensen, a prominent IQ psychologist, wrote:

> **Consideration of the book's actual content is being displaced by the rhetoric of denial: name calling ('neo-Nazi', 'pseudo-scientific,' 'racism'), side-tracks ('but does IQ really measure intelligence?'), non sequiturs ('specific genes for IQ have not been identified, so we can claim nothing about its heritability'), red herrings ('Hitler misused genetics'), falsehoods ('all the tests are biased'), hyperbole ('throwing gasoline on a fire'), and insults ('creepy', 'indecent', 'ugly').**
>
> **(Jensen, 1994, p. 48)**

What book created these descriptions, and why did Jensen feel it necessary to defend such a book? In this chapter we address the history, theory and debate that surround the examination of race differences in intelligence, and explore the debates and consequences of some of the conclusions that are drawn from this research. It is not a pretty side of psychology. Assertions and evidence presented are not always palatable to many. Group differences in intelligence are an interesting area of debate, but it is not without its dark side. And as part of this chapter, we are going to explore the actual content of the aforementioned book.

This chapter is slightly longer than many others in the book. In this chapter we deal with some controversial and sensitive issues in the psychology of intelligence. We argue that many areas need to be explained and fully explored. Additionally, we introduce a number of concepts that you have come across in previous chapters, so rather than suggest you spend your time going backwards and forwards through the book, we have spent a little time restating the main issues and findings from other discussions, to make it clear how these issues apply to the debates in this chapter. Consequently, you should find some of this material easier going because you have been introduced to a lot of the arguments in previous chapters.

We realise that there is slightly more material here, so we have split the chapter into two main sections. Please remember, however, that these two areas are intrinsically linked.

- **Section A – The heritability of intelligence** – In this section we will outline what has become known as the nature versus nurture debate, in which we compare and consider genetic versus environmental effects on intelligence. Key themes in this debate include heritability of intelligence and genetic and environmental influences on intelligence.
- **Section B – The bell curve: race differences in intelligence** – In this section we will outline what has become known as the bell curve debate. We consider evidence and arguments regarding race differences in intelligence. Key themes in this debate include an outline and consideration of a bell curve, group differences, most notably race differences in intelligence, and the role of eugenics in intelligence research.

Source: Getty Images/Tim Platt

Section A – The heritability of intelligence

Intelligence: the nature versus nurture debate

Here we will outline what has become known as the nature versus nurture debate. We will compare and consider genetic versus environmental effects on intelligence.

Galton

In 1865, Sir Francis Galton began to study the heritability of intelligence, following his reading of his cousin Charles Darwin's publication *The Origin of Species*, which dealt with the idea that all species gradually evolve through the process of natural selection. In following this work, Galton soon became interested in studying the variations in human ability, and particularly intelligence. In his book *Hereditary Genius* (Galton, 1869), he began investigating why higher intelligence seemed to run in families. He suggested that man's natural abilities are inherited under the same conditions as physical features of the animal world described by Darwin. Galton suggested that children inherit their intelligence from their parents.

To support such an assertion, Galton started analysing the obituaries of *The Times* newspaper so that he could identify the ancestry of eminent men. What Galton did was to compare different degrees of relationship between individuals in terms of being biological relatives (i.e., parents, siblings, cousins) and the eminence of each of these individuals. First-degree relatives are relatives with whom an individual shares an estimated average of 50 per cent (half) of their genes (though note this is an estimated average percentage; you will learn more about why this is an estimated average in this chapter). First-degree relatives include your parents, brothers and sisters and children. A second-degree relative is a relative with whom an individual shares an estimated average of 25 per cent (a quarter) of their genes, that is, grandparents, grandchildren, aunts, uncles, nephews, nieces. A third-degree relative is a relative with whom an individual shares an estimated average of 12.5 per cent (one-eighth) of their genes. Third-degree relatives include your great-grandparents, great-aunts, great-uncles and first cousins. Galton found that the number of eminent relatives of an eminent person was greater for first-degree relatives than for second-degree relatives; and again, the number was greater for second-degree relatives than for third-degree relatives. This result suggested to Galton that there is evidence for the heritability of intelligence.

However, Galton quickly became concerned with whether intelligence was simply heritable, or whether it was also influenced by the environment. It was here that Galton was the first psychologist to make the distinction between 'nature' and 'nurture' (and he was the first to use this now-common phrase). To examine this idea, he surveyed 190 Fellows of the Royal Society, of which Galton was a member (Galton, 1874). The Royal Society is a highly prestigious scientific society dedicated to establishing the truth of scientific matters through experiment. It has had several famous scientists as members, including Robert Boyle, Sir Christopher Wren and Isaac Newton. Galton asked his fellow members of the Society several questions regarding their birth order and the occupation and race of their parents. He wanted to find out whether members of the Society's achievements and interest in science were due to their natural makeup (nature) or to their environment, for example, the encouragement of their talents by others (nurture).

You have to remember that many of Galton's speculations arose before we knew as much about genetics as we do today. That is why many recognise him as a truly great scientist. Galton himself recognised the inherent problems of such studies (Galton, 1875). For example, he speculated about the confounding effects of the environment and realised that eminent people might not have arisen to their current status alone, but with the help of relatives. Galton believed that the question of whether nature or nurture influences intelligence could be examined more carefully by comparing twins. He suggested that comparisons of twins who were similar at birth but had grown up in different environments, and comparisons of dissimilar twins who had grown up in similar environments, might hold the key to examining the nature–nurture debate surrounding intelligence. He also proposed that adoption studies might be useful to analyse the different effects of heredity and environment. His speculations about twins and adoption studies laid the groundwork for modern attempts to examine the nature-nurture debate in intelligence.

Heritability of intelligence

Within the nature versus nurture consideration of intelligence, we find ourselves concentrating on behavioural genetic principles (you will have come across many of these ideas if you have read Chapter 8). One area of behavioural genetics concentrates on the relationships between genes and environment, to compare the similarities and differences between individuals within a particular population and assess the relative influence of genes and the environment on any behaviour. In this case, the behaviour we are looking at is intelligence.

Galton felt there was some value in studying eminent families as an indicator of the heritability of intelligence. How well would such an approach work today?
Source: Stuart Atkins/Rex Features

What do we mean by heritability of intelligence?

Behavioural geneticists such as Robert Plomin have written extensively about behavioural genetics (Plomin, 2004; Plomin, DeFries, McClearn and McGuffin, 2000). Heritability of intelligence begins with the fact that genes are biologically transmitted from biological parents to the child. Children inherit 50 per cent of their father's genes and 50 per cent of their mother's genes. We can use this information as a starting point to explore how genes influence intelligence.

The assessment of the extent to which any phenotype (any outward manifestation of the individual – physical attractiveness, behaviour, intelligence) is passed on from parents to children, from the results of their genes, is termed as **genetic heritability**. The genetic heritability of any phenotype is assessed in terms of variability (i.e., how much they differ) between the parents and the child. This variability is often assessed within the *proportion of shared variance* of that behaviour between the parent and child. Proportion of shared variance is presented as a percentage (i.e., out of 100 per cent). When a parent and child are very similar in a particular characteristic, there is thought to be a low variability between parent and child, and the proportion of shared variance of that behaviour is high (nearer 100 per cent). In other words, the parent and child are not very different in this characteristic. Conversely, when a parent and child are quite different in a particular characteristic, there is thought to be a high variability between parent and child, and the proportion of shared variance of that behaviour is low (nearer 0 per cent).

The heritability of a human physical characteristic, such as having a nose, is entirely genetic and not in any way influenced by factors such as the environment. In fact the environment is seen as having zero variability, or a proportion of shared variance of 100 per cent. However, some aspects of human behaviour (including intelligence), in which the environment is thought to have an influence, have greater amounts of heritable variability and lower shared variance. For example, choosing which football team to support would be heavily determined by environmental factors such as where you are born, your parents' football team, your friends, and the first football team you see. Choosing a favourite football team has high variability between parent and child, but the proportion of shared variance of favourite football team due to genetic heritability would be zero (0 per cent).

In behavioural genetics of intelligence, researchers are primarily interested in *estimating* the extent of genetic heritability of intelligence across a population, and stating the genetic heritability of that behaviour in terms of shared variance. This estimated average of genetic heritability is known as h^2. Therefore, h^2 is the *average estimate* of the proportion of variance for intelligence thought to be accounted for by genetic factors across a population.

You may have noticed we emphasised *estimating*, *estimate* ('estimate' meaning to calculate approximately) and *average*. This is because, for a long time in psychology, for any phenotype (characteristic or behaviour) the estimates of the strength of genetics factors were done and interpreted within a process called the *additive assumption*. This additive assumption suggests that there are only two dimensions that determine heritability of any behaviour (in our case, intelligence): (1) the genetic part, which we've just outlined, and (2) the environment. Consequently, overall, heritability of intelligence is estimated in terms of the relative strength of both (e.g., nature versus nurture). Therefore, the influence of genetic (G) and environmental (E) components, in this theory, will always add together to account for 100 per cent of the variance of intelligence. On the basis of this assumption, the heritability coefficient (h^2) can be subtracted from 100 per cent to calculate the environmental contribution to intelligence. If researchers computed, for example, that genetics accounted for an average of 25 per cent of the variance for intelligence, we would estimate that the environmental factors account for an average of 75 per cent of the variance of intelligence. However, it is important to note that the additive assumption is now considered a starting point for calculating heritability of intelligence and for estimating the amount of genes that people are expected to share (e.g., brothers and sisters are expected to share 50 per cent). We will see later in this chapter that this view of assessing heritability has changed a lot. The idea of determining the relative strength of genetics and environmental factors by simply adding together genetic and environmental factors is more complicated than once thought, and psychologists really do emphasise the words 'estimate' and 'average' when referring to heritability.

Methods for assessing genetic heritability of intelligence

So, how might we assess genetic influences on intelligence? Well, as Galton himself mentioned, the relationship between genes and intelligence has traditionally been studied by concentrating on the similarities and differences between populations of individuals to assess the relative influence of their shared genes in intelligence.

Plomin (2004) identifies three main types of studies that use this technique: family studies, twin studies and adoption studies. As children share an estimated average of 50 per cent of their genes with each of their parents, and they also share genes with their brothers and sisters, it is of interest to behavioural genetics researchers to examine possible associations between parents' and children's behaviours within a family. This leads to the first type of study, family studies. However, these studies on their own potentially tell us very little because all children share an estimated average of 50 per cent of their genes with each of their parents and with their brothers and sisters. As well as this, using observation, interview or questionnaire measures also presents a problem because similarities between personalities might be due to environmental influence (i.e., an intelligent daughter might be like her extraverted mother because she copies her behaviour). These are real concerns until we consider the occasions when families don't typically share genes in this way. There are two main examples: twin studies and adoption studies.

Twin studies provide an interesting area of research, as there is a possibility of comparing different types of genetic makeup so as to compare genetic influences. The term 'twin' refers to two individuals who have shared the same uterus (the uterus or womb is the major female reproductive organ). Identical (or monozygotic) twins occur when a single egg is fertilised to form one zygote, but the zygote then divides into two separate embryos. The two embryos develop into fetuses sharing the same womb. Identical twins are always of the same sex and have the same arrangement of genes and chromosomes (which contain the hereditary information necessary for cell life). These twins share 100 per cent of genes with each other. Fraternal twins (non-identical twins, or dizygotic) usually occur when two fertilised eggs are implanted in the uterine wall at the same time. The two eggs form two zygotes (hence they are dizygotic). These twins share an estimated average of 50 per cent of their genetic makeup. Consequently, some researchers compare behaviours across non-twins, identical and fraternal twins to examine the relative influence of genetics.

The influence of the environment and genetics is often compared in adoption studies. Intelligence can be compared between parents and adopted children, as there is no genetic heritability. Variables are often compared between siblings, or twins, reared apart to examine the extent of genetic and environmental effects. For example, if two twins show similar behaviours, despite being raised in different environments, this suggests that genes may be important in that behaviour.

Once you consider all these types of studies together, in which intelligence is compared between parents and children, and siblings that share 0–100 per cent genetic similarity, you can begin to make assessments of the extent of genetic heritability across a population.

It is important to remember that there is no physiological procedure in these sorts of studies. Behaviour geneticists do not have the ability to assess the genetic heritability of intelligence using advanced biological measures, or a complex scientific genetic analysis (well, not yet). Rather, researchers look for similarities and differences in intelligence among individual people by using observation, interview or questionnaire measures. They look for similarities between parents' and children's intelligence (using intelligence measures) to determine the extent of genetic influence on intelligence. What is also important to remember is that, when we deal with heritability estimates, we don't talk about heritability estimates for particular individuals; rather, researchers estimate the average heritability among certain populations of people – monozygotic (MZ, identical) twins, dizygotic (DZ, fraternal) twins, family members, parents and children. So an heritability estimate of 50 per cent for intelligence does not mean that we all inherit 50 per cent of that intelligence trait from our genes; it means that across the population, the genetic heritability of intelligence has been estimated at an average of 50 per cent.

Heritability estimates of intelligence

What is the heritability of intelligence from these types of studies? Well, some studies have estimated the heritability of intelligence based on family, twin and adoption studies.

For example, there have been a number of findings from Bouchard's Minnesota Study of Twins Reared Apart (overseen by US behavioural geneticist Thomas Bouchard). This research involves not only the medical and psychological assessment of identical (monozygotic) and fraternal (dizygotic) twins separated early in life and reared apart, on which figures are given, but also their intelligence. A well-cited documentation of these studies was recently provided by behavioural geneticist journalist Matt Ridley (Ridley, 1999). Ridley put together all the modern family, twin and adoption studies, which mainly included the findings of Bouchard and McGue's meta-analysis of 111 studies (Bouchard and McGue, 1981). The following analysis by Ridley is the concordance rate of IQ (the presence of the same intelligence level between two individuals) from all these studies (in parentheses are concordance rates given by Bouchard and McGue's meta-analysis; see also Figure 14.1):

- 100%: Perfect concordance rate;
- 87%: Same person tested twice;
- 86%: Identical twins reared together (86%);
- 76%: Identical twins reared apart (72%);
- 55%: Fraternal twins reared together (60%);
- 47%: Biological siblings reared together (47%);
- 40%: Parents and children living together (42%);
- 31%: Parents and children living apart (22%);
- 24%: Biological siblings reared apart (24%);
- 15%: Cousins (Bouchard and McGue only);
- 00%: Adopted children living together;
- 00%: Unrelated people living apart.

Evidence such as this, coming from studies throughout the century, was consistent, and researchers were able to make estimates on the level of genetic heritability of intelligence. You can see from evidence like this how people

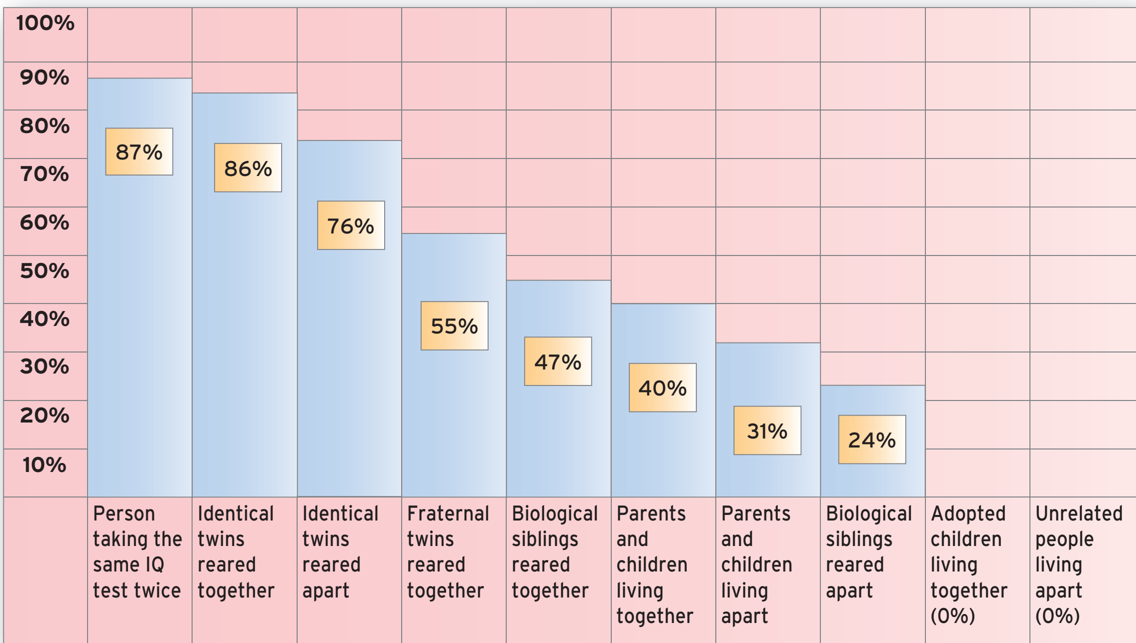

Figure 14.1 Concordance rates of intelligence.
Source: From Ridley, M. (1999). *Genome: the autobiography of a species in 23 chapters*. London: Fourth Estate. Reprinted by permission of HarperCollins Publishers Ltd. © M. Ridley 1999.

would tend to estimate the influence of genetics on intelligence as in some instances relatively high, because the evidence for heritability, in some instances, is over 80 per cent. For example, Professor Hans Eysenck (Eysenck, 1979) used this sort of evidence to suggest that the estimation of heritability of intelligence was around 69 per cent in the general population. Later, Herrnstein and Murray (1994), whose work we will discuss at greater length later, estimated heritability in the general population at 74 per cent.

However, we know a lot more about the influences of genetics on intelligence today. We outlined some of these influences in Chapter 8, but we are going to outline them fully here so you can see their relevance to the literature on intelligence as well as how the estimates of the genetic influence on intelligence might be lower than previously estimated.

Considerations within behavioural genetics and intelligence

The idea of how genes and the environment are viewed, and used, to predict the heritability of intelligence has changed over recent years.

Authors such as US psychologist E. E. Maccoby (2000) and Robert Plomin (2004) suggest the additive principle of determining heritability of intelligence (or any phenotype) is not applicable any more. The validity of the additive assumption in computing the relative strength of genetics and environment in determining behaviour has been widely challenged. The first problem is that estimating the environment is usually done without utilising any direct measures of environmental factors. For example, researchers often compute genetic heritability and then subtract that from 100 per cent. Obviously, if the estimates of heritability are indeterminate, or prone to error, so are the estimates of E derived by subtracting heritability from 100 per cent. A further problem with the additive assumption of computing heritability is that when genetic heritability is large, it assumes that all environmental factors associated with that behaviour must be small. Therefore, it is better to see human intelligence as a joint result of an interaction between a person's genes and environmental factors. Intelligence should not be seen as the result of 'genetics + environment' but rather of 'genetics × environment'. For example, it is better to view the relative influences of genes and environment on intelligence as the result of a long-term interaction, with environmental factors triggering certain genetic behaviours and the effects of the environment differing between individuals because of their genetic makeup.

What is important for you to note is that these changes and developments in research and thinking have been suggested, encouraged and developed by both theorists and researchers, many of whom we have already mentioned, who support and criticise the idea of genetic heritability in intelligence. So, what has brought about, and resulted from, such a general shift in thinking, from the additive principle of 'genetics + environment' to the later, more integrative idea of 'genetics × environment'? Well, four considerations surrounding modern-day thinking in behavioural genetics are important when considering any phenotype, particularly intelligence (see Figure 14.2):

- conceptions of heritability and the environment;
- different types of genetic variance;
- the representativeness of twin and adoption studies;
- assortative mating.

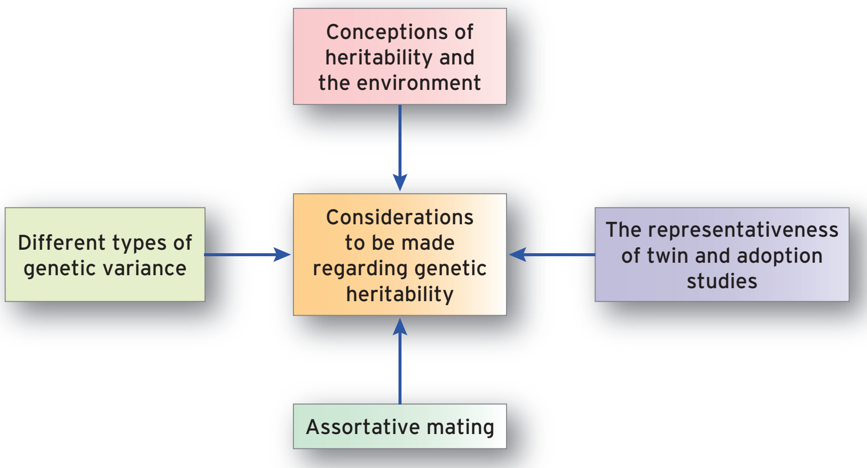

Figure 14.2 Considerations to be made regarding genetic heritability.

Conceptions of genetic heritability and the environment

Gregory Carey (2002) suggests that there are two important contexts within which to consider heritability and environmental influences on intelligence:

- **Abstract concepts** – These are generally theoretical (not applied or practical) concepts. As Carey explains, whatever the numerical estimates of either genetic or environmental influences, they provide us with little information about the specific genes, or specific environmental variables, that influence intelligence.
- **Population concepts** – All of these estimates refer to any group of people considered as a population, but they tell us very little about any single individual. For example, just because intelligence may have a genetic heritability of around 60 per cent, it does not mean, for any one individual, that 60 per cent of their intelligence is due to genes and 40 per cent of their intelligence is due to the environment. Rather, it is estimated across the population that genetic heritability of intelligence is at an average of around 40 per cent, and individuals will vary around that estimate.

Different types of genetic variance

So far, in this chapter, we have treated genetic influence on intelligence only as a single entity, namely, the influence of your genes on your intelligence. However, behavioural genetics researchers such as Thomas Bouchard and M. McGue (Bouchard and McGue, 1981) note that genetic influence does not simply comprise one aspect, but in fact three aspects: (1) additive genetic variance, (2) dominant genetic variance and (3) epistatic genetic variance.

Additive genetic variation is the genetic variance that we have previously described in this chapter, which is genetic variation in behaviour that is the total of the individual's genes inherited from their parents.

However, the two other types of genetic variation are known as non-additive genetic variance.

First, **dominant genetic variance** is part of a process by which certain genes are expressed (dominant genes) and other genes are not expressed (recessive genes). Every one of us has two copies of every gene, one inherited from our mother and one from our father. Sometimes the two genes, which determine a particular trait (for example, eye colour) will actually code for two types of characteristics (for example, blue eyes and brown eyes). If one of these genes is dominant, then only its character is expressed and not that of the other gene. For example, if blue eyes were a dominant gene, and your mother had brown eyes and your father had blue eyes, you would inherit blue eyes.

Secondly, **epistatic genetic variance** (known as interactive genetic variance) refers to a process by which genes interact. It is now known that several different genes not only influence physical characteristics and behaviour on their own, but work and interact together. Unlike dominant genetic variance, which just applies to one gene replacing another, epistatic genetic variance is the result of the way certain genes that we inherit determine whether other genes we inherit will be expressed or suppressed (this process is called **epistasis**).

It is difficult to measure dominant genetic variance and epistatic genetic variance when it comes to intelligence. However, it is now accepted that these three aspects – additive genetic variance, dominance genetic variance and epistatic genetic variance – are thought to make up **total genetic variance** of intelligence.

You can see the genetic side of things is a lot more complicated than just viewing genes as a single entity, as genes interact and suppress other genes. You will see, in the literature, behavioural geneticists referring to terms such as 'narrow heritability' and 'broad heritability'. Narrow heritability is just additive genetic variance. Broad heritability is all three aspects of genetic heritability (additive genetic variance + dominant genetic variance + epistatic genetic variance).

Consequently, authors such as Thomas Bouchard and M. McGue (1981) and US psychologists Heather Chipeur, Michael Rovine and Robert Plomin (1990) have suggested that original estimates of the average percentage of parental genes that children inherit, and siblings share, may have been previously oversimplified. For example, these authors suggest that genetic variations in heritability of any phenotype (including intelligence) should be made in the following terms:

- identical (monozygotic; MZ) twins = additive genetic variance + non-additive genetic variance (where previously it was presumed to be just additive genetic variance);
- fraternal (dizygotic; DZ) twins = 0.5 of additive genetic variance + 0.25 of non-additive genetic variance (rather than just 0.5 of additive genetic variance).

As you can see, computing the level of genetic variance may be more complicated than previously thought. Today, behavioural geneticists take these factors into account when suggesting the strength of heritability estimates of intelligence.

Problems with the representativeness of twin and adoption studies

One of the considerations put forward by psychologists such as Maccoby and by Leon Kamin and Arthur Goldberger (2002) concerns adoption and twin studies. A significant portion of studies examining heritability effects is devoted to twin and adoption studies. Twin studies are important because they allow the comparison of different types of twins to compare genetic influences; monozygotic (MZ, identical) twins who share 100 per cent of their genes, and dizygotic (DZ, fraternal) twins who share 50 per cent of their genes. Adoption studies are important because they include two sets of factors that may account for differences in behaviour: biological parents and environmental parents. Therefore, it is argued that these families aren't necessarily representative of the normal populations. This natural bias in sampling may underestimate or overestimate heritability estimates across the general population because genetic influences in these samples may not be representative of the whole population.

This issue is particularly important when considering research that assesses heritability of intelligence using twin and adoption studies. Leon Kamin and Arthur Goldberger (2002) estimate that twin studies might overestimate the role of genetics, particularly because identical twins have more similar environments than do same-sex fraternal twins. Also, research shows identical twins are treated more similarly by their parents, spend more time together and more often have the same friends. Their environmental experience comprises a greater proportion of each other's social environment than does that of fraternal siblings. Consequently, if genetic heritability estimates are usually larger in twin studies than in adoption studies, then some of the estimated similarity that is attributed to genetic influence might not be correct. Stoolmiller (1998) has also suggested that adoption studies lead to a similar restriction of the measurement of environmental factors. Stoolmiller argues that the placement strategies of adoption agencies might influence heritability estimates. For example, adoption agencies might always place children in affluent or middle- to high-income families; thus the effects of economic status are never fully explored in these studies, because an adopted child would rarely be placed into a household suffering from poverty.

Assortative mating

Nicholas Mackintosh (Mackintosh, 1998), animal-learning theorist at the University of Cambridge, raises the issue that assortative mating can have an effect on genetic variance and, therefore, on estimates of genetic heritability of intelligence. **Assortative mating** is a complicated name for the simple concept that, when couples mate, they either have several traits in common or contrast wildly in their traits. A lot of the understanding of genetic variation is based on the assumption that two individuals mate quite randomly with random people and, therefore, that any genetic similarity between them is by chance. But we know this is not true. We know that people mate with people who they perceive are similar to themselves. For example, we tend to see people mating with people who are of a similar size, or similar in their 'good-lookingness'. This is called positive assortative mating. Equally, we find people mating who are completely the opposite. This is called negative assortative mating. Therefore, in much the same way, the assortative mating principle can be applied to intelligence. That is, individuals may seek to mate with people who are of a similar intelligence. Think about your parents; do they have a similar educational background to each other?

Modern estimates of the genetic heritability of intelligence

In the light of the considerations just outlined, different researchers have tried to estimate the overall heritability of intelligence across the general population. These estimates tend to be broad estimates of genetic variance (additive and non-additive genetic variance) in intelligence. They break down by what percentage of intelligence is determined by genetics and what percentage can be attributed to the environment. As we have already mentioned, higher estimates of heritability have come from authors like Hans Eysenck (1971, 1991), who once estimated it at 69 per cent. There is no evidence to suggest that this is wrong; however, modern-day commentators, given the preceding issues relating to heritability estimates, are more conservative; that suggests heritability falls into a range. The American Psychological Association task force (that we mentioned in Chapter 10), headed by Ulric Neisser, estimates the heritability of intelligence ranges from 40 to 80 per cent (Neisser *et al*., 1996), while Nicolas Mackintosh (1998) suggests a range of 30 to 75 per cent. If you are looking for a more exact figure, Chipeur *et al*. (1990) have suggested the genetic heritability of intelligence at 50 per cent which is a commonly – but not always – accepted viewpoint.

All this discussion, and we haven't even considered the extent of environmental effects on intelligence yet!

Environmental influences on intelligence

The list of possible environmental effects on intelligence could be endless. It could range from the effects on intelligence of long-term poverty (for example, never getting the opportunities to develop skills at home, at school and consequently in a career), through to one conversation with one teacher who suggests that the person will never amount to much. Thomas Bouchard and Nancy Segal (1985) list 21 factors that are related to intelligence, including malnutrition,

Stop and think

? ! ?

Cyril L. Burt

For many lecturers and students across the psychology discipline, Cyril Burt is psychology's equivalent of the bogeyman. Like parents who tell children who are naughty that the bogeyman will come and get them, lecturers inform students who are naughty and make up their data that they will be branded with the Cyril Burt label. No one knows the truth about Cyril Burt; but stories of acts done, a long time ago, are told through generations of lecturers. Your lecturers were told by their lecturers about Cyril Burt, and though many stories about him may be untrue, academics today still argue and swap conspiracy, and counterconspiracy, stories surrounding Cyril Burt.

Cyril L. Burt was born on 3 March 1893 and died 10 October 1971. He was a British educational psychologist. He studied at Oxford in the United Kingdom, and in Germany. Between 1908 and 1971, he worked at the University of Liverpool and had a chair of Psychology at University College, London. He also worked as Chief Psychologist at London County Council. He was President of the British Psychological Society (in 1942), was editor and co-editor of the *British Journal of Statistical Psychology* (between 1947 and 1963) and was the first psychologist to be knighted (in 1946). He founded the field of Educational Psychology in the United Kingdom and helped to establish Eleven-Plus testing in Great Britain.

In his academic work, Burt published nine books and more than 300 articles, lectures and book chapters. Much of his work investigated differences in intelligence among social classes, gender and race, and examined heritability among intelligence of identical twins reared apart. It was this work that was to create the controversy.

During the 1970s Leon Kamin, who was opposed to the idea of genetic heritability, and Arthur Jensen, who was in favour of genetic heritability, both spotted something in Burt's reports on correlations for IQ test scores of identical twins (Jensen, 1973; Kamin, 1974). Burt's original results were published in 1943 for 15 pairs of twins. In 1955 he had results for 21 pairs of twins (including the 15 original pairs of twins), and by 1966 he reported the results for a total of 53 pairs of twins. What Kamin and Jensen noted was that the correlation coefficients between the IQ scores were similar across the samples. In his studies, Burt reported the following coefficients: $r = 0.770$ (1943); $r = 0.771$ (1955); and $r = 0.771$ (1966). Kamin and Jensen suggested that they would expect to see greater variability among the correlations when more sets of twins were added, and that it was very unusual that the correlations had stayed the same.

On 24 October 1976, an article, 'Crucial data was faked by eminent psychologist', was published by Dr Oliver Gillies in the UK newspaper *The Sunday Times*. In this article, Gillies not only pointed to the problems with the correlational data but also claimed that Burt had invented his co-authors, Miss Margaret Howard and Miss J. Conway (who Burt claimed helped him update the twin data), as they could not be traced. Gillies also pointed out that Howard and Conway did appear to have written book reviews praising Burt's work for the *Journal of Statistical Psychology* – but only during the time that Burt was editor. Later, US psychologist William H. Tucker picked up on accusations that Burt would have been unlikely to find so many sets of monozygotic twins reared apart. Tucker (1997) examined the numbers of participants involved in twin studies with similar criteria used by Burt between 1922 and 1990 and found that the combination of all the twins together did not total the number of participants Burt had obtained.

With this, Cyril Burt seemed to be forever denounced as a fraud. However, people have reviewed this evidence. For example, UK psychologist Ronald Fletcher, (1991) set out to locate the missing research assistants. He found proof of their existence. One of the assistants, Miss J. Conway, worked in child care for London County Council. Miss M. A. Howard is listed as a member of the British Psychological Society in 1924. In addition, Fletcher reported that other individuals stepped forward and said they remembered Burt's assistants. Fletcher suggests that this repeated accusation against Burt may be the result of poor investigatory journalism rather than imagined helpers.

This is not the only accusation against the media. Some authors such as Fletcher, Robert Joynson (1989), and J. Phillipe Rushton (1994) have suggested that Burt's reported correlation coefficients indicated a strong relationship between genetics and intelligence – and they point out this was not, and still isn't, a popular finding. This is because such findings have strong implications where differences in intelligence are sexually or racially based. Often, there is the inference that certain groups of people (based on sex or race differences) are genetically inferior in intelligence. We will explore such ideas in full later in the chapter. However, these ideas are surrounded by controversy, and Fletcher and Rushton point out that, if Burt's findings can be discredited, then it seems to some that the case for the genetic heritability of intelligence is discredited. Therefore, Fletcher and Rushton argue that people who disagree with the genetic heritability of intelligence will be more likely to conspire in the media and in academia to discredit Burt's work.

Rushton points to possible conspiratorial behaviour. He suggests that not only the media sought to discredit Burt's findings too quickly, but other academics did, too. He cites the example of Burt's papers being destroyed by his housekeeper immediately after his death – on the advice of Professor Liam Hudson, an educational psychologist at Edinburgh University, an ardent opponent of Burt who had rushed to Burt's flat after learning he had died.

Rushton also points out that new evidence from studies of twins raised apart (as we see from the summary of Ridley earlier in this chapter) indicates results similar to Burt's high heritability estimate. Therefore, the accusations that he simply made up all the data to exaggerate the effects of genetics are somewhat weakened.

Authors like Ronald Fletcher and Robert Joynson suggest that the case of fraud by Burt is not proven. Whatever the truth, and the lessons to be learnt from Cyril Burt, we hope that whatever judgements you make, you understand the importance of giving the full facts before you pass on the story . . . and *never* make up your data.

weight at birth, height, years in school, father's economic status, father's and mother's education and influence, average TV viewing, self-confidence, criminality and emotional adaptation. However, the American Psychological Association task force (Neisser *et al.*, 1996) identified four main areas of environmental effects on intelligence which can be deemed as the most important. This information allows us to concentrate the debate. Some of these environmental effects you will have come across before (for example, nutrition, schooling and occupation) in the last chapter, but we will revisit them so that you can see how they apply directly to the issues of the nature versus nurture debate on intelligence. These four areas are (1) biological variables, (2) family, (3) school and education and (4) culture (see Figure 14.3).

Biological variables and maternal effects

It is well acknowledged by the APA task force (Neisser *et al.*, 1996) that a number of biological factors influence intelligence. These include nutrition, before- and after-birth factors and substances like alcohol and lead poisoning.

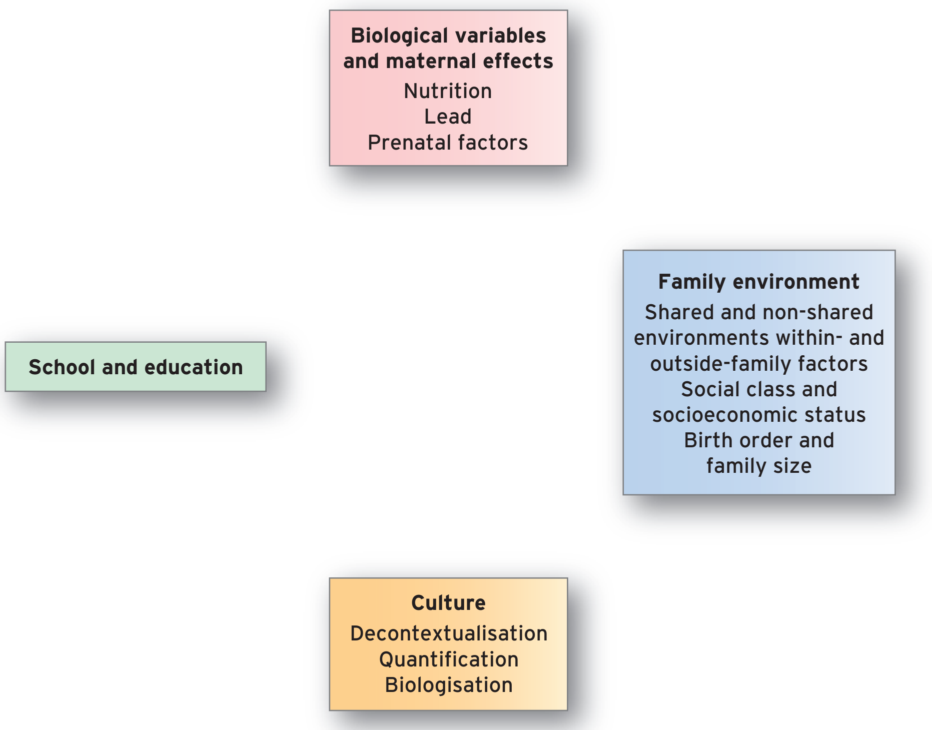

Figure 14.3 Environmental effects on intelligence.

Nutrition

We introduced much of the nutrition hypothesis in the last chapter. Nutrition is the study of food; specifically, the relationship between diet and states of health and disease. You will remember from the last chapter that Lynn (1990) has proposed that nutrition and healthcare improvements are among the main factors of the Flynn effect. However, outside Lynn's hypothesis there are findings that nutritional sources can aid aspects of intelligence.

Australian nutritionist Wendy H. Oddy and her colleagues (Oddy *et al.*, 2004) examined over 2,000 Australian children and followed them from birth until the age of 8 years. Oddy and her colleagues found that stopping breast feeding early (at 6 months or less) was associated with reduced verbal intelligence, while children who were fully breast-fed for more than 6 months scored between 3 and 6 IQ points higher on a vocabulary intelligence test than did those children who were never breast-fed. Similarly, another study conducted by US health psychologist Melanie Smith and her colleagues (Smith, Durkin, Hinton, Bellinger and Kuhn, 2003) examined 439 school-age, low-birth-weight children born in the United States. These authors found differences in IQ test scores between breast-fed children and those who did not receive any breast milk. These were 3.6 IQ points for overall intellectual functioning and 2.3 IQ points for verbal ability. You will also remember the debate in Chapter 13 surrounding the study carried out by two Welsh psychologists, David Benton and Gwilym Roberts (Benton and Roberts, 1988), who found that children given a vitamin-mineral supplement containing several vitamins and minerals were found to show increased IQ scores.

Regardless of the controversy surrounding this work, findings do suggest that nutrition has a positive effect on intelligence. It is important to remember, though, that a number of socioeconomic conditions are often associated with nutrition. You may also remember the words of Lynn (1990), who we discussed in the last chapter: the nutrition hypothesis sees nutrition as a package (or nurturing environment) in which increased intelligence is part of a nurturing environment that includes increased height and life span, improved health, decreased rate of infant disease and better vitamin and mineral nutrition. Where those things do not occur – where there is poverty, malnutrition and low economic and social opportunities – there might be lower intelligence scores.

Lead

However, while nutrition is seen as having a positive effect, there are occasions when other biological factors can have a negative effect on IQ. Neisser *et al.* (1996) highlight research concentrating on the effect that exposure to lead can have on intelligence.

The most comprehensive study was carried out in a place called Port Pirie in Australia. In 1986, Australian psychologist Anthony J. McMichael and four colleagues (McMichael, Vimpani, Robertson, Baghurst and Clark, 1986) examined the possible relationship between body lead burden and pregnancy outcome among 749 pregnant women in, and around, the largest lead smelting facilities in Australia. Among these women, premature deliveries were statistically significantly associated with higher levels of maternal blood lead concentration at delivery. What followed the initial findings was a series of studies in Port Pirie, which looked at the association between environmental exposure to lead and children's intelligence at 2 years (McMichael *et al.*, 1988), 4 years and 7 years (Baghurst *et al.*, 1992) and 11 and 13 years (Tong, Baghurst, McMichael, Sawyer and Mudge, 1996). The Port Pirie cohort study started in 1979 and involved 723 children, though 375 took part in the final study. IQ scores were made on the Bailey IQ scales at 2 years of age, the McCarthy IQ scale at 4 years of age and the Wechsler IQ scale for children at 7 years, 11 years and 13 years of age. At all these ages, IQ scores were significantly associated with lead concentration in people's bodies, even when socioeconomic status, home environment and maternal intelligence were controlled for. This study suggests that there is an association between early exposure to environmental lead and intelligence, and it persists into later childhood.

Prenatal factors

Finally, there are prenatal factors. You are well aware that pregnant women are expected to stop drinking and smoking. According to many health councils, avoiding smoking and alcohol consumption in pregnancy is crucial. Smoking nearly doubles a woman's risk of having a premature or low-birth-weight baby who faces an increased risk of serious health problems. Further, many conditions can arise from the mother's alcohol consumption when she is pregnant; the most common condition is foetal alcohol syndrome (FAS), which is characterised by a pattern of facial abnormalities, growth retardation and brain damage.

Neisser *et al.* (1996) point to these types of consumption by mothers during pregnancy as having an effect on intelligence. Low-birth-weight babies, as well as babies suffering from FAS, show reduced intelligence. Danish scientist Erik Lykke Mortensen and colleagues at the University of Copenhagen (Mortensen, Michaelsen, Sanders and Reinisch, 2005) examined maternal smoking and subsequent IQ scores among 3,044 males aged between 18 and 19 years. The study found that regardless of factors such as parental social status and education, single-mother status, mother's height and age, number of pregnancies, the women who smoked 20 or more cigarettes daily late in their pregnancy were likely to have sons who performed less well on standardised IQ tests at age 18 or 19. Evidence also suggests that FAS is related to a number of cognitive functions. US psychologist Sarah Mattson and colleagues at San Diego State University (Mattson and Riley, 1998; Mattson, Riley, Delis, Stern and Jones, 1996) have found that children prenatally exposed to alcohol exhibit a variety of problems with memory (when they found that children with FAS aged 5 years to 16 years had learned fewer words than children of comparable ages) and demonstrate attention problems. Uecker and Nadel (1996) found that children of mothers who drank heavily during pregnancy performed badly in learning spatial relationships among objects. Furthermore, South African psychologist Piyadasa Kodituwakku and her colleagues (Kodituwakku, Handmaker, Cutler, Weathersby and Handmaker, 1995) have shown that children with FAS show deficits in activities that require abstract thinking, such as planning and organising information.

However, research is by no means conclusive. Other research suggests that the links between factors such as smoking, or alcohol consumption, in pregnancy and intelligence might be moderated, disappear or be highlighted by other factors. US psychologists S. W. Jacobson, J. L. Jacobson, R. J. Sokol, L. M. Chiodo and R. Corobana (2004) found, among 337 inner-city African American children, that prenatal alcohol exposure was not related to IQ scores on the Weschler Intelligence Test. However, they found that among children who had older mothers, prenatal alcohol was related to IQ scores on the Wechsler Intelligence Test. Bailey *et al.* (2004) examined alcohol use among mothers at a prenatal visit, and then IQ among children at 7 years, among 500 black children. Again, no relationship was found between prenatal alcohol exposure and intelligence, though mothers who binge drink when pregnant were 1.7 times more likely to have children who had IQ scores in the mentally retarded range.

These findings suggest that age and excess drinking are further factors in the relationship between prenatal drinking and offspring intelligence. But overall, the findings suggest that smoking and alcohol consumption are factors that, to a greater or lesser extent, are connected with IQ.

Maternal effects model

Today, factors such as prenatal nutrition and alcohol consumption are combined into the maternal effects model. US psychiatrist Dr Bernie Devlin and US statistician Michael Daniels (Devlin, Daniels and Roeder, 1997) showed that prenatal conditions may have substantial effects on the concordance of subsequent scores on IQ for identical twins. Previously, maternal effects had usually been assumed to be small, or non-existent, in terms of affecting genetic variance of intelligence between twins. However, a meta-analysis of 212 studies suggests 20 per cent of genetic variance between twins and 5 per cent between siblings. These authors suggest that broad heritability estimates when including maternal effect (additive and non-additive genetic variance) might have to be reduced from about 60 to 48 per cent. This suggestion indicates that the environmental effects on intelligence may extend to interactions with biological factors.

Family environment

The second environmental factor identified by Neisser *et al.* (1996) is the family environment. There are three sources of related research and evidence that we will concentrate on in this discussion:

- shared and non-shared environments – within- and outside-family factors;
- the social and economic status of the family and the intelligence of the child;
- birth order, family size and child intelligence.

Shared and non-shared environments

We saw in the last discussion that the conception of genetics as a single dimension has developed over time. The same could be said of environmental factors. Within behavioural genetics, the conception of how the environment influences intelligence is through two sets of experiences: shared and non-shared. When growing up, siblings (brothers and sisters) are thought to experience both shared and unique environments. **Shared environments** are environments that are shared between two individuals, while **non-shared environments** are environments that are *not* shared between two individuals who share genes. Siblings growing up within the same family will share many environments. These environments may range from minor experiences to more significant ones. Therefore, two siblings having the same parents, living within the same house, going to the same school and experiencing particular times together (e.g., same family relatives, home environment, chaotic mornings before school, dad's awful jokes) have shared environments. A unique environment is an environment that has not been shared by siblings. Again, these environments may range from minor experiences to significant ones. Examples of unique environments might be when two siblings have been raised by different families. However, siblings raised in the same family might also have unique environments from each other. Siblings may have different sets of friends, may go to different schools, may have different types of relationships with their parents and have different interactions with teachers.

What is important in this area is that the theory and research around the differences between environment influences on intelligence has grown in complexity. To begin with, researchers tend to concentrate on comparing how shared and non-shared environmental factors influence on intelligence. Early consideration by reviewers such as Bouchard (1994) and Eysenck (1990b) suggested that the environmental influences shared by siblings or twins contribute only marginally to intelligence differences. However, one interesting point to emerge from the literature, carried out by such researchers as US behaviour geneticists Braungart, Plomin, DeFries and Fulker (1992a), is that those environmental factors that are unique (non-shared) to family members are influential over *shared* environmental factors. Therefore, non-shared environmental factors, such as different peer friendships, are important mechanisms that explain why members of the same family may differ in their intelligence. This idea is supported by two pieces of research suggesting that the extent of differences in the experiences during childhood among siblings have been found to be related to intelligence differences in adulthood (Baker and Daniels, 1990; Plomin and Daniels, 1987).

Such a finding has led to the development of whole areas of research that have emphasised how important non-shared environmental factors are to intelligence. Most of the research in this area considers how non-shared environmental factors develop (1) within the family and (2) outside the family.

Within-family factors

US behavioural geneticist David Reiss (1997) identifies three ways in which inherited genes form phenotypes (behaviours) based on the family environment (see Figure 14.4):

- the passive model
- the child-effects model
- the parent-effects model.

First is the **passive model**. This model suggests that intelligence is generally explained by the 50 per cent overlap between a child and their parent. Therefore, intelligence may occur in the child because the child and parent share

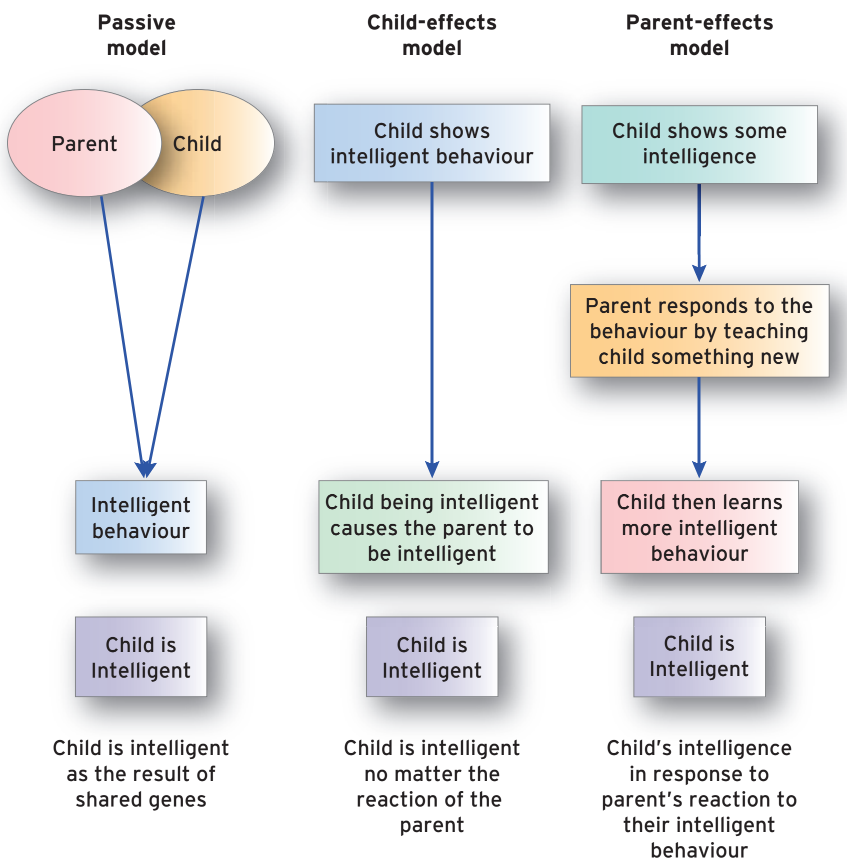

Figure 14.4 Reiss' three models of genetic transmission.

the same genes that influence a particular type of behaviour. For example, if a child is highly intelligent due to genetic influences, they are so because one of their biological parents had the genes that cause this high intelligence. The model, very much, just assumes a general genetic overlap and inheritance of behaviour without considering other possible factors and interactions within the family. This is why it is called the passive model. The other two models very much emphasise other dynamic occurrences.

In the **child-effects model**, the genes cause intelligence in the child, which in turn causes the same or similar behaviour in the parent. Within this model, the parent does not matter in the development of the behaviour, as the child's development of intelligence is the result of genes. An example of this is that the shared genes cause the child to be intelligent (due to their genetic makeup), which in turn causes the parent to act intelligently back to the child (due to their genetic makeup). The parent's own intelligence does not matter in the development of the behaviour, as the child's intelligence is a consequence of genetic makeup of the child rather than the parent.

US psychologist Judith Harris (1995) has expanded this viewpoint to **child-driven effects**, which influence family circumstances that in turn influence the child's intelligence. Harris documents studies showing that adults do not behave in the same way to a child who shows different tendencies. They will treat an attractive child differently to one of their children who is less attractive; they will react differently to the child who shows bad behaviour than to the one who is well behaved. This behaviour will also apply to intelligence. For example, imagine a family with twin children, one of them intelligent and the other not as intelligent. These differences in the children will cause different reactions in the parents. The parents will begin to treat their children differently. The intelligent one may be encouraged to engage in more intelligent activities, while the one perceived to be less intelligent might not be encouraged to do these activities. Harris suggests these reactions by parents to their children's natural intelligence tendencies can be viewed in two ways: *positive feedback loops* and *negative feedback loops*. Positive feedback loops arise from parents reinforcing children's natural tendencies, as in the example described earlier, where children's natural intelligence abilities are encouraged and any differences between children in their intelligence are developed (the intelligent child is encouraged to be intelligent, while the 'unintelligent' child is encouraged and allowed to engage in other activities). Negative feedback loops occur when children are stopped from behaving in ways consistent with their natural tendencies. Therefore, an intelligent child might be encouraged to stop engaging in merely intelligence-stimulating activities, and an 'unintelligent' child might be encouraged to spend more time engaging in such activities.

In the **parent-effects model**, the behaviour of the child is responded to by the parent, which in turn brings out behaviour in the child (see Figure 14.4). Within this model, how the parent responds does affect the development of the child's behaviour. For example, a child may begin showing intelligence; this then leads the parent to show intelligence with the child (as it is part of their genetic makeup). This in turn causes the child to become even more intelligent (as it is part of their genetic makeup). Within this model, the parent's behaviour leads to the development of intelligence, which then leads to the development of intelligent behaviour in the child.

Again, Harris extends this idea to within-family situations. In these situations, children might be treated in a particular way by parents, not because of that child's own characteristics, but because of the parents' own beliefs or the characteristics of a child's siblings (brothers or sisters). Let us first look at the example of how the parents' own beliefs shape natural tendencies of children. Again, take our family with the one intelligent twin and the one 'less-intelligent' twin. Our parents of the family may have certain beliefs about behaviour, such as 'children should know the limits of their knowledge and never contradict their parents'. Therefore, the children will be encouraged and directed to behave in such ways. So, in our case of the intelligent and less-intelligent twin, the intelligent child who is likely to contradict their parents will be encouraged not to show their intelligence, and the unintelligent child will be encouraged to gain some knowledge up to their 'limits'. Both children will have had their new behaviour (knowing their limits and not contradicting their parents) driven by their parents' behaviour. Secondly, let us look at how parents might influence children's behaviours in terms of a child's siblings. Harris notes research suggesting that parents who consider their first child to be 'difficult' tend to label their second-born as 'easy'. We can also see how less-intelligent children might be asked, or encouraged, to be more like their intelligent sibling. Equally, the intelligent sibling might be encouraged to spend less time in intelligence-promoting activities and play more like their brother or sister.

What Reiss' and Harris' commentaries do is to suggest that *within-family effects* pose problems when considering genetic heritability. That is, child effects and parent effects can lead to overestimations and underestimations of heritability. Remember, behavioural geneticists looking at intelligence are only looking at the concordance between sets of children based on their scores on an intelligence test at some point. However, let us return to our family with one intelligent twin and one less-intelligent twin. Let us imagine that the parents of these twin children have been engaged in a negative feedback loop. They have been trying to encourage both children to be similar, that is, somewhat intelligent. Therefore, the intelligent child has been discouraged from being intelligent all the time, and the less-intelligent child is being discouraged from being too unintelligent. If we then compared these two children, we would find that these twin children have similar intelligence; but this is, in fact, not due to genetic tendencies at all. It is simply because the parents are trying to encourage similar behaviour in both children (i.e., not too active or not too quiet). Therefore, any estimation of similarities in intelligence being due to genetic heritability of the twins would be an overestimation. However, if the same pair of twins had been reared differently and both had been in a positive feedback loop – the intelligent child had been encouraged to be more and more intelligent and the less-intelligent child had been encouraged to be more and more unintelligent – then any estimation of the similarities in intelligence being due to genetic heritability would be an underestimation because the differences have been exaggerated due to parents encouraging the twins to be more and more like themselves. Therefore, as Harris concludes, children's within-family situations not only play an important role in shaping their intelligence but also are an important consideration in estimating the genetic heritability of intelligence.

Outside-family factors

However, Harris (1995) has suggested that non-shared factors outside the family may in fact be more important in developing people's intelligence. Harris presents the group socialisation theory to explain the importance of non-shared environmental factors in determining intelligence.

Group socialisation theory is based largely on the ideas surrounding social identity theory and social categorisation (Tajfel and Turner, 1986). Social psychologists have provided a lot of theoretical and empirical research work that has looked at how individuals perceive their social world as comprising in-groups and out-groups and suggesting that these groups help us form our social identity. Social psychologists argue that one mechanism humans use for understanding the complex social world is social categorisation. In social categorisation, individuals are thought to place other individuals into social groups on the basis of their similarities and differences to the individual. Put simply, individuals who are viewed as similar to the person tend to be placed within their in-group. Individuals who are viewed as different to the person tend to be placed within an out-group. This is a process by which we come to understand our world. As a consequence, the individual's identity (social identity) is based on and derived from the groups they feel they belong to and their understanding of their similarities and differences to different social groups. Social groups can be anything, but common groups could be sex group, ethnic group, your religion, your peers, your interests, your educational status and so on. As such, your identity is based, to greater or lesser extent, on how much you identify with different social groups. What is also important to our identity is that when we attach ourselves to certain groups, we also try to fit in with those groups; therefore, our intelligence might begin to reflect the characteristics of a certain group (i.e., you might make friends with people who are highly intelligent; you may then do more intellectual activities than you used to, and you may become more intelligent).

Harris uses this theoretical basis to show how social groups can influence people's intelligence and points out how these non-shared environments that occur in children of the same family can have a huge effect on intelligence. As part of this theory, Harris lists five aspects that are important to consider in how non-shared characteristics might influence our intelligence (we go into greater depth on each of these issues in Chapter 8 if you want to read more).

- **Context-specific socialisation** – This aspect refers to the fact that children learn intelligence abilities not only at home but also outside the home. As children get older, they become less influenced by their family life and more influenced by their life outside the family home.
- **Outside-the-home socialisation** – In this aspect Harris makes the point that children may identify with a number of social groups, based on people's age, gender, ethnicity, abilities, interests, personality, intelligence etc. In other words, we have a range of groups that we identify with and share norms with (attitudes, interests, intelligence), and these groups have different influences on our intelligence.
- **Transmission of culture via group processes** – In this aspect Harris makes two points about the transmission of culture via group processes, which establish norms in our social world that influence our intelligence. First, the shared norms that might influence a child's intelligence aren't necessarily the result of parents sharing them with their children; they are really the result of shared norms among the parents' peers and social groups being passed on to the children. That is, your parents' values, abilities, personality and intelligence are not the result of their parents' norms, but rather of their own social identity, their identification with their own social groups. The second point considers that individual norms, which we have developed from our family, are shared with other people only if they are accepted. For example, an individual might be intelligent and like reading books. However, unless their friends approve of this behaviour, they may be unlikely to carry on this pastime.
- **Group processes that widen differences between social groups** – It is important to note that with your intelligence, norms are based not just on how you identify with your in-group but also on whether you identify

with or reject the out-groups. For example, consider sex roles; your intelligence as a male or female isn't just based on your identification with people of your own sex, but on your rejection of characteristics of the opposite sex. For example, some young women at school believe that subjects such as science and mathematics are men's subjects; consequently, these women become interested in what they perceive to be women's subjects, such as English. This behaviour might have an effect on intelligence.

- **Group processes that widen differences among individuals within the group** – So far, we have assumed that all the groups that we are involved in basically share the same structure. However, we know that within all our social circles we play different roles that might influence, or bring out, different aspects of our intelligence. In our family, as a child, we take a less-senior role; with our friends we might be allowed to be more like ourselves. However, the opposite may be true, and we might not feel we lead a group of friends, but tend to do what others say. It may even be possible that among one group of friends you feel more comfortable than others. Harris' point is that our position in groups changes, and that our intelligence – and influences on our intelligence – change due to the hierarchies within a group. For example, if you are in a group of friends and they all look up to you, your intelligence will be influenced because you might think there is an expectation to come up with ideas for things to do or to solve problems within the group.

What is important to consider in both within-family and outside-family factors is that these aspects can influence intelligence of children to a much greater extent than previously thought. It is not Harris' point that behavioural genetics is wrong and that environmental factors are more important, but rather that behavioural geneticists may sometimes have oversimplified family influences. By ignoring these variables, behavioural geneticists might be underestimating or overestimating heritability effects of either genetics or the environment on intelligence.

Socioeconomic status of the family

A family's socioeconomic status is based on its income, parental education level, parental occupation and status in the community. Socioeconomic status is related to various factors, including number of children in the family, opportunities for success in employment, health and area of residence. These factors all might influence intelligence.

Often socioeconomic status is ranked in many countries. For example, in the United Kingdom, one way in which socioeconomic status is measured is by the grading of parents' occupations into five categories:

- Class I: Professional occupations;
- Class II: Managerial and technical occupations;
- Class III: Skilled occupations: Manual (M) and unmanual (U);
- Class IV: Partly skilled occupations;
- Class V: Unskilled occupations.

Socioeconomic status is related to intelligence. Authors such as Linda Gottfredson (Gottfredson, 1986), Arthur Jensen (Jensen, 1993a), Richard Herrnstein and Charles Murray (Herrnstein and Murray, 1994) and J. Phillipe Rushton and C. D. Ankney (Rushton and Ankney, 1996) estimate that in Europe, North America and Japan, socioeconomic status is significantly correlated with scores on standard IQ between $r = 0.3$ and $r = 0.4$, and that there are 45 IQ points between members of the professional occupations (Class I) and those of unskilled occupations (Class V).

In addition, Nicolas Mackintosh (1998) and Nicholas Mascie-Taylor (1984) presented evidence linking socioeconomic status to intelligence using the British National Child Development Study (NCDS) data. The NCDS examined social and obstetric (care of women during and after pregnancy) factors associated with stillbirth and infant mortality among over 17,000 babies born in Britain in 1958. Surviving members of this birth cohort have been surveyed on five further occasions in order to monitor their changing health, education, social and economic circumstances, including IQ, in 1965 (age 7), 1969 (age 11), 1974 (age 16), 1981 (age 23) and 1991 (age 33). Mackintosh (1998) and Mascie-Taylor (1984) present evidence that even when aspects such as financial hardship, birth weight, size of family, overcrowding, type of accommodation and residence area are taken into account, children who had fathers in Class I (professional occupations) scored 10 IQ points higher than did children who had fathers in Class V (unskilled occupations).

Research also suggests that improved socioeconomic status can improve intelligence. Canadian behavioural geneticist Douglas Wahlsten (Wahlsten, 1997) points to a series of adoption studies in France, in which an infant is moved from a family having low socioeconomic status to a home where parents have high socioeconomic status, and the child's IQ score improves by 12 to 16 points. Wahlsten also points to studies in the United States that have demonstrated improvements in children's IQ by the same margin, achieved by improving the lives of infants in families with low educational and financial resources and providing them with additional educational day care outside the home, every weekday from the age of three months to the start of school.

Often evidence of high levels of ability can be found in unexpected places.
Source: Getty Images/Daniel Berehulak

These types of findings turn our attention to the research that has examined the conditions arising in certain families and how those conditions have influenced intelligence. One interesting and extensive debate has arisen from studies examining the influence on intelligence of birth order and family size.

Birth order, family size and intelligence

In 1973 Dutch psychologists Lillian Belmont and Francis Marolla (Belmont and Marolla, 1973) published a study looking at the birth order of the child, the size of family to which the child belonged and the child's overall IQ score on the Raven Progressive Matrices, among 386 nineteen-year-old Dutch men. What Belmont and Marolla (1973) found was that even when social class was controlled for, children from larger families had a lower IQ. Furthermore, the authors found that within each family size, the first-born child always had a better IQ; and to some extent there were declining scores with rising birth order, so that the first-born children scored better than second-born children, second-born children scored better than third-born children and so on. These authors also found that these two factors interacted, and as family size increased and birth order position increased, IQ scores became lower. So for example, a second-born child from a family with three children would score higher than would a second-born child from a family containing four children.

Clearly, birth order, family size and intelligence are of interest to parents, politicians and researchers. Furthermore, if such findings are correct, they would have implications for optimum family size and parental choice regarding children's education. Since then, hundreds of research articles have addressed the relationship between family size, birth order and intelligence, and the proposed relationships between family size, birth order and IQ have been found among many cross-section studies. For example, Russian psychologist T. A. Dumitrashku (Dumitrashku, 1996) found that family size and birth order affected intelligence among Russian schoolchildren.

However, this wouldn't be a section about intelligence if debate didn't fiercely surround these findings. The debate, today, on family size, birth order and intelligence centres on the explanation of why, and whether, such effects occur.

Family size and intelligence

In the research area of family size and intelligence, Joseph Lee Rodgers and his colleagues (Rodgers, Cleveland, van den Oord and Rowe, 2000) published a seminal paper that looked at data from the United States. The National Longitudinal Survey of Youth (NLSY) followed 11,406 young people at yearly intervals from ages 14 to 22 years, and then children born to the original female respondents were surveyed every other year. Rodgers *et al.* found no direct relationship between family size and intelligence. They suggested that previous research has been inaccurate because it combined 'across-family' measures (family size) with 'within-family' (birth order) measures and treated them in the same way. That, is previous authors had treated family size as a within-family effect.

Let us explain what the authors mean. What the authors are highlighting, here, is a statistical fallacy (see Chapter 26 on academic argument) that occurs when comparing populations of people. Say, for example, that a statistical agency released figures for death rates of the UK Army during the recent Iraq War and for death rates in London (the capital of the United Kingdom). The agency found that among the army, death rates were 13 per thousand, while deaths in London were 26 per thousand. You perhaps also would not be surprised to find that the announcement of these figures by the statistical agency caught the attention of the media. You might even find a national newspaper running a headline story suggesting that people were safer in the army in Iraq than they were living in London. However, the problem with this sort of statement is that you are comparing two different populations. In the army population you have men and women who are healthy, and most of them are young. In the second population, London, you have a full age range of people – including those people with high mortality rates, such as old people, and people who are terminally ill. The issue is that you are comparing two populations for which a number of different factors determine death rates.

This fallacy applies to the current debate. Rodgers *et al.* illustrate the fallacy with this example. They suggest comparing the intelligence of three children, but these children are:

- a first-born child in a large middle-class white family in Michigan;
- a second-born child in a medium-sized affluent black family in Atlanta;
- a third-born child in a small low-income Hispanic family in California.

If differences are observed in these children's intelligence, Rodgers *et al.* suggest it is impossible to tell whether the differences are down to birth order, family size, socioeconomic status, region of the country or any other variables related to these dimensions.

Birth order and intelligence

In the area of birth order and intelligence, research still generally supports Belmont and Marolla's findings. However, other authors have sought to explain that this relationship may be an artefact of another relationship rather than a real relationship. There are three models explaining why birth order may be linked to intelligence: the admixture hypothesis, the confluence model and the resource dilution model.

The first is the **admixture hypothesis**. E. P. Page and G. Grandon (1979) and more recently Joseph Rodgers (2001) suggested an 'admixture hypothesis' that explains the relationship between birth order and IQ. What this hypothesis suggests is that parental intelligence, or socioeconomic status, are additional factors to consider in the relationship between birth order and IQ scores, coupled with the fact that parents with lower IQ scores tend to have more children. This has made findings in previous studies look as if higher birth order causes lower intelligence, when in fact lower intelligence results because parents with lower socioeconomic status and IQ scores tend to have more children. For example, a parent with five children is likely to have a lower IQ score and a lower socioeconomic status. Parents with higher IQ scores and higher socioeconomic status tend to have fewer children. Consequently, any calculation of the relationship between birth order and intelligence is problematic because parents with higher IQ scores and higher socioeconomic status do not tend to have as many children. Thus there cannot be equal measurement of the number of children across the population.

The second model is the **resource dilution model**. This model was proposed by Judith Blake (Blake, 1981) and elaborated by Douglas Downey (Downey, 2001), but its ideas were first presented by Galton (1874). The resource dilution model of birth order and intelligence test scores suggests that parental resources (time, energy and financial resources) are finite (i.e. *not* endless) and that, as the number of children in the family increases, the resources (time, energy and financial) that can be gained by any single child decreases. Therefore, the first child will get 100 per cent of available resources from their parents, the second child will only ever get 50 per cent, the third child will only ever get 33 per cent and a fourth child will only ever get 25 per cent. This model also feeds into the idea that children in larger families have lower intelligence test scores because, as that family grows, the resources that can be accessed also diminish.

Third is the **confluence model**, which was originally proposed by US psychologist Robert B. Zajonc (Zajonc, 1976; Zajonc and Markus, 1975) – though, again, Galton (1874) proposed some of these ideas. The confluence model suggests that intellectual development, and therefore intelligence, must be understood within the context of the family, and there is an ever-changing intellectual environment within the family. Zajonc suggests the following factors might influence the relationship between birth order and intelligence:

- First-borns have the advantage of some time in which they do not have to share their parents' attention with any of their siblings.
- Any additional birth automatically limits the amount of attention any of the siblings get, including the first-born.

- First-borns and older siblings have to look after and care for younger siblings to some degree. This means that they undertake some amount of responsibility and may have to explain things to their younger siblings. Zajonc believed that this sort of tutoring helps the older children to develop intelligence abilities, as they have to explain ideas and processes to other people.
- First-born children are exposed to a greater proportion of adult language and ideas from their parents. Those children born later are exposed to less-mature speech and ideas because they listen not only to their parents, but to their other siblings. This means they spend a lower proportion of their time listening to adult language and ideas and a greater proportion of time listening to other children's language and ideas.

These last two findings also feed into the idea that children in larger families have lower IQ scores because, as that family grows, the agenda and the context of the family focuses more and more on the children.

Education and intelligence

We mentioned education and its relationship to intelligence in the last chapter. However, we will remind you of some of the findings and extend your view on this area in this chapter.

Neisser *et al.* (1996) found that education is both an independent and dependent variable in terms of its relationship to intelligence. Going to school is likely to increase your abilities, particularly those that comprise intelligence (intelligence is a dependent variable), and intelligence is likely to influence your attendance at school and your length of schooling (i.e., whether you end up going to university) and the quality of school you attend (intelligence is an independent variable here). Consequently, intelligence and education are intrinsically linked.

You will remember evidence from the last chapter. Overall, reviews by US psychologists Alan Kaufman and Elizabeth Lichtenberger (Kaufman, 1990; Kaufman and Lichtenberger, 2005) provide a review of key papers that have looked at the correlation between general intelligence and school attainment and achievement. They conclude that the average correlation between IQ scores and a number of school indicators is around $r = 0.50$, suggesting that intelligence does predict performance at school. Also, two academics of the Hebrew University in Jerusalem, Sorel Cahan and Nora Cohen (1989), compared the effects of a year of school (controlling for age) with those of a year of age on a number of verbal (e.g., verbal and numerical skills) and non-verbal (abstract and reasoning tests, including the Raven's Matrices) intelligence tests. Length of schooling was important in predicting performance, and mattered more than age, for all the verbal tests. Length of schooling, however, made a contribution – but a smaller contribution – to performance on some of the nonverbal tests, including the items from the Raven's Matrices.

Other key evidence you need to know when considering education as an environmental factor on intelligence is found in the well-cited papers of US child development psychologist Stephen Ceci (1990, 1991). Ceci did a meta-analysis of studies, and his findings suggest that there are many effects of education on intelligence test scores. The data presented by Ceci includes the overall finding that children who attend school regularly score higher on intelligence tests than do those who attend less regularly, intelligence test scores among pupils decrease over the long summer holidays and there is a rise of 2.7 IQ points for each year of schooling (see also Winship and Korenman, 1997). Douglas Wahlsten (1997) notes that studies have shown that delays in starting school cause intelligence tests scores to drop by 5 IQ points a year (i.e., Winship and Korenman, 1997).

Also, it is worth reminding you of Head Start and other similar programmes that have explored the relationship between education and intelligence. You remember that Head Start, which we mentioned in the last chapter, was started in the 1960s by President Lyndon Johnson and was designed to give America's poorest children a head start in preparing them for school and to start to break the cycle of poverty. Evidence was provided to assess the usefulness of such a programme. US individual differences psychologist Charles Locurta (Locurta, 1991) provides a review of this evidence. In 1969, Arthur Jensen suggested that Head Start had failed. The reason for Jensen's pronouncement was that, although children attending the programme showed an initial increase in IQ points – sometimes as much 7–8 points on IQ tests – after 2 or 3 years these higher IQ points were lost (Locurta, 1991). There has been a lot of debate about the effectiveness of Head Start, but in terms of IQ gains, McKey *et al.* (1985) reported that children enrolled in Head Start had significant immediate gains in IQ scores. However, in the longer term (3–4 years), the IQ test scores of Head Start students did not remain higher than those of disadvantaged children who did not attend Head Start.

Finally, there is evidence to suggest that ideas that we covered in the last discussion regarding socioeconomic status are related to education variables, which together are related to intelligence. Socioeconomic status might influence aspects of education, and then intelligence, in a number of ways:

- Families with a high socioeconomic status often are able to prepare their children for school because they have access to resources (e.g., childcare, books and toys) and information (what are the best schools? what aspects are taught to children?) that enhance children's social, emotional and cognitive development and help parents to better prepare their young children for school (Demarest, Reisner, Anderson, Humphrey, Farquhar and Stein, 1993).

- Families of a low economic status face hard challenges when it comes to providing the best care and education for their children. When basic necessities such as money and time are missing, food, housing, clothing and healthcare come first. Educational toys and books, and time searching out the best schools, are luxuries that parents may not have the time or money to pursue (Ramey and Ramey, 1994).
- Parents from poor socioeconomic backgrounds often grew up in poor socioeconomic conditions themselves. Consequently, parents may have inadequate reading skills or may lack knowledge about childhood nutrition (or not be able to afford it), and these benefits aren't passed on to the children before school (Zill, Collins, West and Hausken, 1995).

Culture and intelligence

The final environmental area that Neisser *et al.* (1996) suggest is important to influencing intelligence is the cultural environment people live in. 'Culture' refers to people's individual values, and the values of their society. Nessier *et al.* suggest culture can have an effect not only on intelligence but also on the type of intelligence that might develop.

You remember that in Chapter 11 of this book, we outlined implicit theories of intelligence. Those theories showed how the definition of what constitutes intelligence shifts across cultures, particularly when you compare Western and Eastern cultures, and how conceptions of intelligence shift across age and through different disciplines. Well, clearly that discussion of implicit theories of intelligence is relevant here (you may want to reread some of that chapter).

However, in addition to implicit theories of intelligence, Serpell (2001) identifies three concepts that explain how intelligence in Western societies is set apart from other cultures in the world. These three concepts are decontextualisation, quantification and biologisation.

Decontextualisation

A lot of Western thinking is inherited from 3,000 years of classical Greek philosophy. Socrates, Plato and Aristotle were all Greek philosophers who have had a profound impact on the way we think in our culture. In Western culture there is a tendency to emphasise mathematics, the scientific method and language. We make clear distinctions between what is right and wrong, what constitutes justice, the need to follow a logical progression and the idea that there are higher and lower planes of ideas and activities – and perhaps a universal truth. **Decontextualisation** is the ability to disconnect, or detach oneself, from a particular situation and think abstractly, and then generalise about it. Serpell (2001) argues that the ability to think abstractly and generalise about things has gained importance in Western society because of industrialisation. With the growth of capitalism there is a need for efficiency, some level of bureaucracy and functionality (the ability to come up with abstract principles) to help govern Western life, including the markets (financial, housing, consumer), industry and education. These needs become increasingly important. Serpell questions the need to always view decontextualisation as a sign of intelligence, and a failure to decontextualise as a sign of unintelligence.

Quantification

Quantification is the act of discovering, or expressing, the quantity of something. Serpell suggests that the study of intelligence is surrounded by quantification in three ways:

- First is the way intelligence theory and research is designed to quantify intelligence. That is, when we ask 'what is intelligence?' we are trying to encapsulate a number of meanings and ideas into one word, 'intelligence'.
- Second is a concept called reification (see also Gould, 1981). Reification is the tendency to regard an abstract idea as if it had concrete or material existence. We see intelligence as something that is located in the brain, but we do not know where it is located. Intelligence isn't just about certain processes; but it encapsulates things that are not measurable, such as beauty or sophistication. For many, the invention of the steam engine, or the wheel, are highly intelligent acts; but they are also acts of beauty to some, and they are certainly of sophistication to many.
- Third is a tendency to quantify intelligence in terms of numbers. We give people intelligence tests, which contain an optimum number of items that should be completed within a certain amount of time. These items have been selected in accordance with studies that have used statistical procedures to determine what aspects of intelligence are out there. The test that is given is determined by the person's age. When participants have finished, they are given scores for their performance, and these scores are then transformed into IQ scores. These IQ scores can then be compared against standardised scores for the tests of people of the same age.

Serpell suggests that consideration of these three points indicates that our understanding of intelligence is surrounded by quantification. All this is not to say that quantification is not a good process to understand intelligence. To produce meaning and conceptual understanding of words; to try to define, measure and locate concepts; and to use numbers as objective criteria are excellent methods by which to ensure the progress and understanding of intelligence. However, Serpell suggests that when we are dealing with something like intelligence, we must be sure that we do not seek to over-quantify this concept.

Biologisation

Serpell (2001) raises our awareness that biological and evolutionary theories have grown in prominence in late twentieth century and early twenty-first century thinking (**biologisation**). You will be aware that, in our psychophysiological and evolutionary chapters (Chapters 8 and 9), we outlined the dramatic developments in the understanding of genes, and that evolutionary psychologists are able to link the evolution of the human species to animals who lived billions of years ago. Many of the arguments put forward by biological and evolutionary psychology are convincing, and inspiring, in the understanding of why we behave the way we do. However, Serpell suggests some caution in overemphasising these models. It must be remembered that many of these models talk about developments over millions of years, and our advanced study of ourselves is relatively new. Therefore, we must be careful to ensure that our understanding of genetics, evolutions over a long course of history, and genetic variation are not used to explain intelligence within a relatively short period of history.

Final comments on genetic heritability and environmental influences on intelligence

Perhaps the last word in this section goes to Bouchard and Loehlin (2001), who suggest a framework for observing sources of population variance in psychological traits (see Figure 14.5). We presented this framework in Chapter 8 and think that it is applicable to intelligence.

To assess population variations in intelligence, Bouchard and Loehlin's framework is not only a good overview of the debate but also sets some prudent criteria in terms of assessing elements such as genetic effects and environmental effects on intelligence. So, in all, we must consider:

- **Genetic influences** – including questions about what gene is involved and what type of genetic variation (for example, additive or non-additive). Is there a sex limitation (e.g., brain size)?
- **Environmental influences** – including, to what extent does environment influence the genes, what types of environments are involved (e.g., education, culture) and are there gender effects?

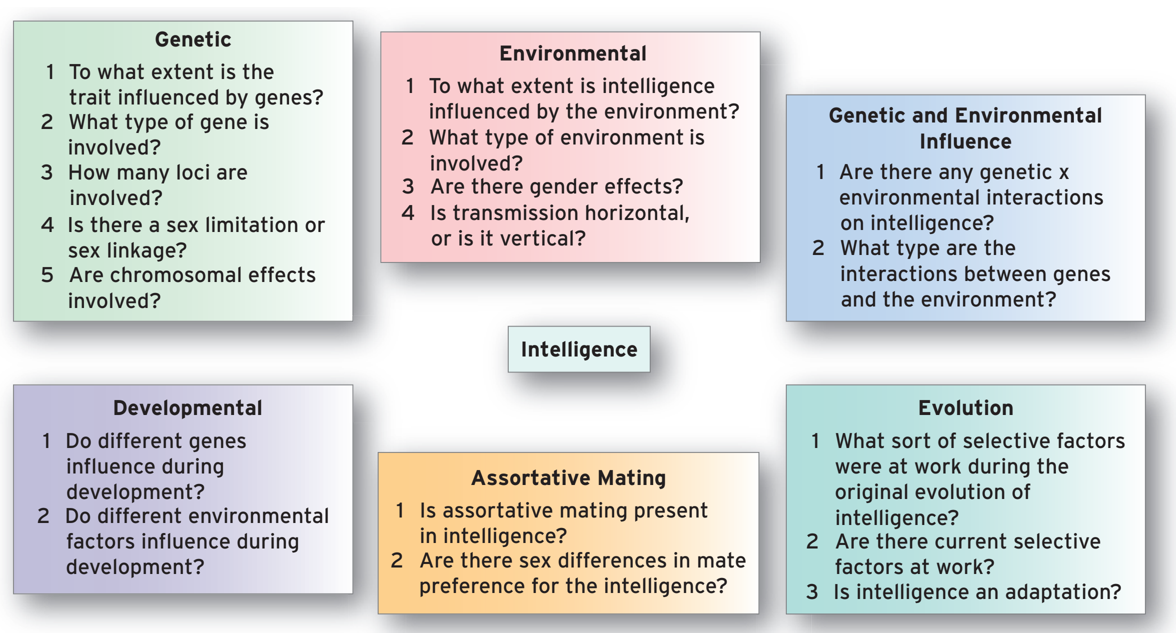

Figure 14.5 Framework and questions regarding sources of population variance in intelligence.
Source: Based on Bouchard and Loehlin (2001).

- **Interaction between genetic and environmental influence** – including what type are the interactions between genes and the environment (e.g., nutrition, prenatal causes)?
- **Developmental influences** – including do different genes influence during development, and do different environmental factors influence during development?
- **Assortative mating** – including is assortative mating present in intelligence, and are there sex differences in mating preference for intelligence?
- **Evolution** – including what sort of selective factors were at work during the original evolution of intelligence (e.g., different need for intelligences across different areas of the world)? Are there current selective factors at work?

Clearly, when it comes to intelligence, some of these areas are easier to identify or consider than others. For example, no one has discovered whether there is a gene for intelligence; nor can we be certain about what the different evolutional demands on intelligence are. However, many of the areas – assessing the level of genetic influence, the types of environmental influence, and the possible interactions between genes and the environment – are known, or at least provide sources of evidence which provide evidence for a debate. Applying Bouchard and Loehlin's model to intelligence provides a focus to an area that debates the relative influences of (1) genes, (2) the environment and (3) the interactions between genes and the environment on intelligence.

Section B – The bell curve: race differences in intelligence

In this section we will outline what has become known as the bell curve debate. Here, we consider evidence and arguments concerning race differences in intelligence.

The bell curve

We have deliberately held back on discussing this material until now, although it covers some of the topics we have discussed in this and other chapters, because we wanted you to be prepared for this discussion. In psychology, the discussion of differences in intelligence, particularly race differences, raises a lot of emotions and debate. We will, later in this chapter, highlight this area of psychology further, in the area of eugenics. We would like to think that your reading of this material also raises emotions, not only as a psychologist but also as a human being. However, we would also like to think that you can see past some of your emotions, pick out the argument and debate that exist here, and use argument, rather than emotion, to decide on the relative merits that are put forward (if you're worried about seeing this distinction, read more about academic argument and fallacies in online Chapter 26 of this book).

The bell curve: intelligence and class structure in American life

In 1994 two authors from the United States, Richard J. Herrnstein and Charles Murray, published a book called *The Bell Curve: Intelligence and Class Structure in American Life* (Herrnstein and Murray, 1994). The book is an analysis of IQ test scores in the United States. The term 'bell curve' refers to the shape of the distribution of a large number of IQ scores in the United States – it looks like a bell (see Figure 14.6).

The book caused huge debate because it reported many things about intelligence, particularly the extent to which intelligence is genetically inherited. It claimed to describe the rise of a 'cognitive elite' in the United States – a social group of persons with high intelligence, with an increasingly good

Stop and think

? ! ?

Smoking and IQ scores

In 2005, Lawrence Whalley of the University of Aberdeen and his colleagues (Whalley, Fox, Deary and Starr, 2005) investigated smoking as a possible risk for intelligence decline from age 11 to 64. In 1931, the Mental Survey Committee in Scotland met and decided (due to there being no reliable way of getting a representative sample) to measure IQ scores for everyone in Scotland. So, on Wednesday, 1 June 1932, nearly every child attending school in Scotland who was born in 1921 took the same intelligence test ($n = 89{,}498$); this exercise was repeated in 1947, testing almost all people born in 1936 ($n = 70{,}805$). Whalley *et al*. analysed a subsample of these respondents between 2000 and 2002, looking not only at smoking and IQ scores but also at childhood IQ scores, level of education, occupational status, presence of heart disease, lung function and hypertension. Whalley *et al*. found that current smokers and nonsmokers had significantly different IQ scores at age 64 and that differences remained after accounting for childhood IQ score. All in all, smoking appeared to predict a drop in IQ by just under 1 per cent.

What do you think are possible explanations for smoking contributing to a fall in IQ scores?

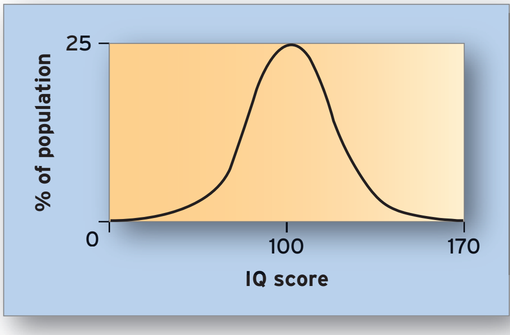

Figure 14.6 The distribution of IQ scores: A bell curve.

chance of succeeding in life. This book noted several cultural differences in intelligence, but its authors also made some suggestions regarding the intellectual inferiority of certain cultural groups. Such work was perceived by many as difficult for US society. The authors' findings were seen as having implications for social and public policy as well as pointing to potential sources of inequality in the United States. We will now briefly describe the main arguments put forward by Herrnstein and Murray.

Herrnstein and Murray's main arguments are built on six premises (or as they present them, conclusions) about intelligence. We have used Herrnstein and Murray's original words here, but have put simpler wording in parentheses:

1 'There is such a thing as a general *factor* of cognitive ability on which human beings differ.' (*There exists a general factor of intelligence, and individuals differ in their intelligence; i.e., high, low, average intelligence.*)
2 'All standardised tests of *academic* aptitude, or achievement, measure this general factor to some degree, but *IQ* tests, expressly designed for that purpose, measure it most accurately.' (*There are many tests of academic aptitude or achievement, but IQ tests, which are specifically designed to measure intelligence, measure intelligence most accurately*).
3 'IQ scores match, to a first degree, whatever it is that people mean when they use the word *intelligent or smart* in ordinary language.' (*IQ scores reflect whatever most people mean by the word intelligent.*)
4 'IQ scores are stable, although not perfectly so, over much of a person's life.' (*Throughout an individual's life, their IQ score remains relatively stable.*)
5 'Properly administered IQ tests are not demonstrably biased against social, economic, ethnic, or racial groups.' (*IQ tests, when they are properly administered, are not biased against any social, economic, ethnic or racial groups.*)
6 'Cognitive ability is substantially heritable, apparently no less than 40 per cent and no more than 80 per cent.' (*Genetic heritability of intelligence is between 40 and 80 per cent.*)

Herrnstein and Murray then go on to discuss four main ideas in their book: (1) the cognitive elite, (2) socioeconomic variables and IQ scores, (3) the relationship between race and intelligence and (4) the implications for social policy.

Profiles

Richard Herrnstein and Charles Murray

Richard Herrnstein (1930–1994) was a prominent researcher in comparative psychology. He was Charles Sanders Pierce Professor of Psychology at Harvard University. During his career, he worked with B. F. Skinner (advocate of behaviourism, which seeks to understand behaviour as a function of environmental histories of reinforcement) in the Harvard pigeon lab, where he did research on choice and other topics in behavioural psychology.

In the 1960s, as part of this work on pigeon intelligence, Herrnstein formulated the 'matching law', which outlined how reinforcement and behaviour are linked. The matching law addresses the idea of choice. It views choice not as a single event or an internal process of the person, but as a rate of observable external events over time. Some have suggested that the matching law is an important explanatory account of choice behaviour, and its applications spread from psychology into other fields, notably economics.

Charles Murray was born in 1943 in Newton, Iowa, in the United States. He studied for his undergraduate degree in history at Harvard. In 1965 he immediately joined the Peace Corps for five years in rural Thailand (Peace Corps volunteers travel overseas and work with people there). By 1974 Murray had returned to the United States, where he completed his PhD in political science at the Massachusetts Institute of Technology. He has written extensively on economics, crime and poverty and has become one of the nation's most influential thinkers. His book *Losing Ground: American Social Policy*, 1950–1980 (Murray, 1984), was used by President Ronald Reagan in developing his domestic policy. Murray has been the subject of articles in *Newsweek, The New York Times Magazine* and *The Los Angeles Times Magazine*.

The cognitive elite: looking at the higher end of the bell curve

In their book, Herrnstein and Murray begin by looking at the high end of the bell curve – that is, at those who score higher on intelligence tests – and examine the relationship between intelligence and education. Herrnstein and Murray analysed IQ scores and admissions to universities and colleges over 50 years, and they found that the most important factor in college attendance was the intelligence of the students, not social class or wealth. It is this fact, Herrnstein and Murray maintain, that places the most intelligent people in US society in the same place – university and colleges.

Herrnstein and Murray argue that the next stage of this process is the relationship between university and colleges and the workplace. University and college graduates are often placed within a select few occupations, reserved for those obtaining college and university degrees including teaching, engineering, law, research, medicine and accounting.

The authors then draw on studies showing that intelligence is related to efficient and proficient (advanced degree of competence) employees. You may remember the finding of two US psychologists, John E. Hunter and R. F. Hunter (1984), who did a meta-analysis (a meta-analysis is a technique that combines the results of several studies) that put together the results of studies examining various predictors at the start of a job with eventual job performance. They found that the correlation between intelligence and job performance was much larger than job performance and the individual's curriculum vitae, their previous experience, the job interview and education ($r = 0.10$). With findings like this, Herrnstein and Murray conclude that intelligence is the single most powerful predictor of job success and workplace productivity.

Herrnstein and Murray suggest that there is the emergence in the United States of the cognitive elite, based on a separation of society through education (university and colleges) and the workplace (certain professions such as teaching, research, law and medicine), in which the central factor is intelligence. Consequently, Herrnstein and Murray predict that intelligence will soon become the basis of the American class system, and people with higher intelligence will be at the top of this class system.

IQ scores and social and economic problems: looking at the lower end of the bell curve

Next, Herrnstein and Murray turn their attention to the lower end of the bell curve – that is, people with low scores on intelligence tests. What Herrnstein and Murray do is to look at several factors in the context of IQ scores; these factors include poverty, schooling, unemployment, family life, welfare dependency and crime.

An example of the type of analysis they performed is given in Table 14.1. This table is adapted from Linda Gottfredson (1997), who summarised Herrnstein and Murray's (1994) analysis, and we have picked out just a few of their findings to illustrate their analysis. The first row of the table shows the percentage of people who fall within the range of standardised IQ scores (remember that IQ

Table 14.1 Social and economic indicators broken down by sample, and divided in terms of IQ score category and expressed as a percentage of the overall population.

	IQ				
Social and economic indicators	Less than 75	75–90	90–110	110–125	Greater than 125
US population distribution	5%	20%	50%	20%	5%
Men who are unemployed for more than 1 month out of year	12%	10%	7%	7%	2%
People who are divorced within 5 years of marriage	21%	22%	23%	15%	9%
Mothers with children with IQ less than 75	39%	17%	6%	7%	0%
Lives in poverty	30%	16%	6%	3%	2%
Ever been in prison	7%	7%	3%	1%	0%
Mothers in receipt of long-term welfare support	31%	17%	8%	2%	0%
Dropping out from high school (secondary education)	55%	35%	6%	0.4%	0%

Source: Reprinted from Gottfredson, L. S. (1997). Why g matters: the complexity of everyday life. *Intelligence,* Vol. 24, pp. 79–132. Copyright © 1997, reproduced with permission from Elsevier.

scores are transformed to a mean of 100). This standardisation into a normal distribution is consistent with the practice of standardising scores into a mean of 100 and a standard deviation of 15 (there is more on this process in Chapter 12 if you need to refresh your memory). Therefore, the greater percentages of people are concentrated in the middle, with lower percentages at either end of the curve. As shown in the first row of numbers in Table 14.1, 50 per cent of people fall within the middle category of 90–110 IQ points range, with 20 per cent of individuals falling within the 75–90 and 110–125 IQ points range, and 5 per cent of people scoring less than 75 and greater than 125 IQ points.

Herrnstein and Murray examined each sample (i.e., number of people in poverty, number of people in prison) in terms of their IQ scores distribution and expressed this as a percentage of the overall population (i.e., less than 75; between 90 and 110 points). As you can see, larger percentages of people (expressed in terms of the overall population) in each of the social and economic subsamples are concentrated towards the lower end of the IQ curve, that is, less than 75 IQ points and 75–90 IQ points.

Herrnstein and Murray used these statistics to develop their argument. For Herrnstein and Murray the statistics on poverty, schooling, unemployment and crime clearly show that intelligence underlies many of these social and economic problems. They suggest that low IQ scores are a strong precursor to poverty, more so than any socioeconomic conditions. With schooling, low IQ scores predict whether people are likely to drop out of high school (secondary education) and decrease the likelihood of a person gaining a degree. The authors point out that the figures suggest that a person with a high IQ score is likely to finish high school regardless of their social or economic circumstances. Herrnstein and Murray find that low IQ scores are related to unemployment and are seen in people who are injured more often or who have given up work. They find that the best predictor of unemployment among men is not socioeconomic status or education, but IQ scores. The authors conclude that low IQ scores are associated with higher rates of divorce, lower rates of marriage and higher rates of illegitimate births. They also find that IQ scores are related to family structure, with families comprising a nuclear or traditional structure (2 parents, 2 children) scoring higher on intelligence tests than did families with extended members living in the family home. They suggest that the disappearance of the traditional nuclear family in the United States was a result of low intelligence. Additionally, Herrnstein and Murray point to the fact that the average US criminal has an IQ score about 8 IQ points lower than that of the average US citizen, suggesting intelligence is linked to a propensity for crime in the United States.

In other areas, Herrnstein and Murray are less certain, but also suggest that long-term welfare dependency and parenting are related to IQ scores. They argue that low intelligence is the primary factor in predicting people's first use of welfare, but then a culture of dependency (learnt from childhood experiences of parents and relatives being on welfare) may emerge that leads to individuals using welfare in the long term. Finally, Herrnstein and Murray point out that low IQ scores among mothers correlate with their children's poor motor skills and with social development and behavioural problems from four years and upwards. Herrnstein and Murray point out that although being of lower intelligence does not prevent individuals from being good parents, family environments where damage is done to a child's intellectual development occur when parents are on the lower end of the intelligence distribution.

In considering the relationships between these factors and intelligence, Herrnstein and Murray build an argument where they suggest that an individual's intelligence is more important than their socioeconomic status in predicting their eventual economic and social welfare.

The relationship between race and IQ: implications for social policy

Herrnstein and Murray next turn their attention to the differences that occur between various ethnic groups. They examine the different fertility patterns of groups on the intelligence distribution, but generally they adopt the position that intelligence is largely genetically heritable.

Herrnstein and Murray compared IQ test scores by ethnicity. For example, they found that individuals of Asian and Asian American ethnic origin scored on average around 5 IQ points higher than white Americans, particularly on measures of crystallised (verbal) intelligence. However, it is in the comparison between white Americans and black Americans that larger differences emerge.

On the Wechsler Intelligence test (remember this is a measure of verbal and non-verbal [crystallised/fluid] intelligence), Herrnstein and Murray reported that white Americans score 15 IQ points higher than black Americans. On the Stanford-Binet test (remember this is also a measure of verbal/non-verbal intelligence), Herrnstein and Murray reported that white Americans scored 18 IQ points higher than black Americans. Therefore, on both intelligence tests, the gap between the two races is almost 1 standard deviation (15 IQ points). In terms of normed IQ scores, white Americans averaged 102 IQ points, while black Americans averaged 87 IQ points. Herrnstein and Murray also note that the average IQ scores of immigrants coming into the United States were 95 IQ points, lower than the national IQ average (see Figure 14.7).

It is here that Herrnstein and Murray move towards the most controversial part of the book. They say the evidence suggests that certain social factors in the United States are pushing down its citizens' intelligence. These factors

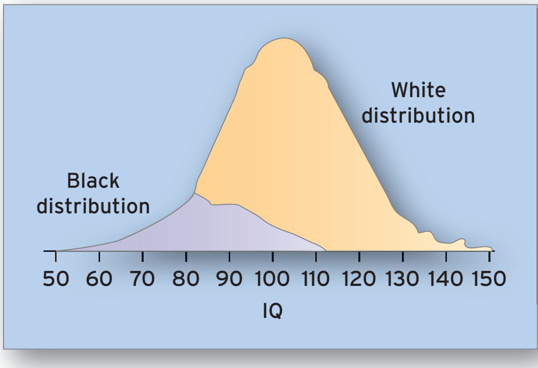

Figure 14.7 Distribution of IQ scores for white Americans (average 102) and black Americans (average 87 IQ points).

Source: Adapted with the permission of The Free Press, a Division of Simon & Schuster, Inc., from *The Bell Curve: Intelligence and Class Structure in American Life* by Richard J. Herrnstein and Charles Murray. Copyright © 1994 by Richard J. Herrnstein and Charles Murray. All rights reserved.

include the number of children produced, which is greater for women who have lower IQ scores than for those with higher IQ scores; consequently, the United States is producing more and more children born into lower-intelligence environments. They suggest that as more and more immigrants come into the country, they show lower levels of intelligence. They suggest, then, that these factors are causing a downward pressure on intelligence in the United States; and as the average intelligence of the nation falls, social problems such as poverty, unemployment and crime will increase as these social problems are associated with people with low intelligence scores. Additionally inherent in Herrnstein and Murray's argument is that, at least by implication, those groups of people in the country with lower intelligence (for example, immigrants, African Americans), are potentially part of these social problems.

Moreover, Herrnstein and Murray suggest that the way forward is not to address social problems by trying to compensate for individual differences in intelligence through supporting and increasing these people's intelligence. They point to previous attempts to raise intelligence, such as nutrition (as mentioned earlier and in the last chapter) or preschool programs (such as Head Start) that have not been successful in permanently raising intelligence. They also suggest that as intelligence has a 40 to 80 per cent genetic heritability, there should be little expectation that intelligence should rise in these situations.

Furthermore, they argue against affirmative action programmes in the United States. Affirmative action (or positive discrimination) is a policy providing advantages for people of a minority group who are seen to have traditionally been discriminated against. The aim of affirmative action is to create a more equal society. Herrnstein and Murray suggest that preferential access to education or employment for African Americans and immigrant groups (where institutions increase the selection and promotion of candidates from these ethnic minority groups in the United States) has also failed. The authors argue that such approaches have not only led to a decrease of intelligence in education and the workplace (leading to further downward pressure on intelligence in US society and, therefore, increasing the potential of social problems) but also caused racial tension in education and the workplace. This tension arises from resentment between ethnic groups due to lower levels of student attainment – or more dropping out in education – and poorer job performance in the workplace as a result of people with lower intelligence undertaking study or jobs to which they are not suited.

Herrnstein and Murray's position is that American education and the workplace have been 'dumbed down' as they take on people with lower intelligence. The authors suggest that while US education and work institutions have been good in helping the underprivileged, this success has been at the expense of gifted students. Thus, by being ignored, gifted students have not been able to develop their true potential. Herrnstein and Murray argue that their aim is to point to places of inequality; they observe that pretending inequality does not exist has not been sensible. Instead, they suggest, we should try living with inequality; doing so is preferable because it is reality.

Herrnstein and Murray suggest that the money for education should be shifted from supporting disadvantaged programmes for those with a low intelligence (where there is a predominance of African Americans and other ethnic minorities) to programmes that support those with a high intelligence (where there is a predominance of white Americans and Asians). They argue that it is in promoting and further valuing the gifted, and in raising the intelligence of the nation, that the future of the United States lies. An educational system that aids the gifted will value and raise intelligence throughout society, particularly the workplace; and social problems such as poverty, unemployment and crime will be reduced.

Criticisms of *The Bell Curve: Intelligence and Class Structure in American Life*

When first published, the *The Bell Curve* received a great deal of positive publicity, including cover stories in *Newsweek* and articles in *Time, The New York Times* and the *Wall Street Journal*. But there was a large amount of negative response, particularly in the scientific community, suggesting the book was oversimplified and had flawed analysis. Much of this commentary was in response to the authors' discussion of race differences in intelligence. In reaction to this publicity and controversy surrounding *The Bell Curve*, the American Psychological Association (the largest and most influential psychological society in the world) established a special task force to publish an investigative report on the research presented in the book as well as an analysis of what is known and unknown about intelligence. This task force was headed by Ulric Neisser, then at Emory University in the United States. After an extended consultative process, Neisser chose a range of academics representing a broad range of expertise and opinion in the literature of intelligence, including Thomas J. Bouchard Jr, Stephen J. Ceci, Diane F. Halpern, John C. Loehlin and Robert J. Sternberg (who are all mentioned in these chapters). After analysing Herrnstein and Murray's conclusions regarding race and intelligence, the task force agreed that, while large differences exist between the average IQ scores of African Americans and white Americans, there is no definite evidence suggesting these differences are genetic; they may, in fact, be cultural.

More extensive critical considerations of Herrnstein and Murray's book can be found in the literature. However, in the following discussion, we are going to highlight some of the critiques that appeared at the time of *The Bell Curve* so that you can develop a critical analysis of the arguments contained within Herrnstein and Murray's analysis.

There are three main areas of criticism of Herrnstein and Murray's book that we will now outline:

- analysis of the assumptions used by Herrnstein and Murray in their analysis (led by comments by Stephen Jay Gould);
- statistical and evidence-based problems in Herrnstein and Murray's analysis (led by comments by Leon J. Kamin);
- a darker side of psychology related to Herrnstein and Murray's analysis (led by comments by Stephen Jay Gould and Leon J. Kamin).

Analysis of the assumptions used by Herrnstein and Murray

Stephen Jay Gould (Gould, 1995), an academic at Harvard, starts to dismantle some of the premises within Herrnstein and Murray's book to attack their arguments regarding what should happen in the United States (for example, that money for education be shifted from supporting disadvantaged programmes for those with a low intelligence to programmes that support those with a high intelligence).

Premises are the foundation of any argument. You can read (online) Chapter 26 of this book for more details on the importance of premises in arguments (though Gould used the term 'assumption', in this example they can be treated to mean the same thing). For example, imagine you criticise a particular person as useless (your argument about them) because they haven't done a job you asked them to, and you assume they have not done the job because they are lazy (your premise). If you find out later that they haven't done the job because they had hurt themselves, then this makes your argument invalid (that they are useless) because the premises that form your argument (that the person is lazy) are wrong.

Well, in the same way, Gould begins to dismantle some of the premises informing the arguments that Herrnstein and Murray develop in their book about what should happen in the United States. We will now look at each of the premises that Herrnstein and Murray use – and Gould seeks to attack (though we have supplemented them with evidence and argument from more recent considerations so as to bring the debate up to date).

Assumption 1: 'There is such a thing as a general *factor* of cognitive ability on which human beings differ.'

In Chapter 12 we outlined Spearman's theory of a general factor of intelligence ('g'). However, we know from our discussion of intelligence in Chapters 12 and 13, that there are

Profile

Stephen Jay Gould

Stephen Jay Gould (1941–2002) was born and raised in New York. He obtained his PhD at Columbia and served as a member of the faculty at Harvard beginning in 1967. Gould's expertise was varied; he was a palaeontologist (a person who studies the forms of life existing in prehistoric or geologic times), evolutionary biologist and historian of science. At the end of his career he was the Alexander Agassiz Professor of Zoology at Harvard.

In 1972 he worked with Niles Eldridge to develop the evolutionary theory of punctuated equilibrium. In this theory, Eldridge and Gould suggested that evolution does not always represent long, drawn-out processes; instead, evolutionary change may sometimes work in fits and starts and can happen relatively rapidly, particularly in times of environmental stress.

difficulties in assuming that there is a general factor of intelligence (g). These difficulties reflect the work of theorists and researchers who:

- Use factor analysis to identify general factors of intelligence and suggest intelligence is better understood as comprised in a hierarchy of intelligence abilities. For example, see Carroll (intelligence in three strata) or Cattell (intelligence comprised of two related but distinct components, crystallised intelligence and fluid intelligence) (Chapter 12).
- Challenge, entirely, the notion of a general intelligence, and suggest it is best represented by a number of different, and separate intelligences. For example, see Sternberg's triarchic theory and Gardner's multiple intelligence theory (Chapter 12).
- Emphasise cognitive psychology processes and argue that intelligence is about not only general factors of abilities but also cognitive processes. For example, see the Kaufman's ability tests and Das and Naglieri's Cognitive Assessment System (Chapter 13).

As we can see, the assumption that there is a general factor of cognitive ability (intelligence) on which human beings differ is open to debate.

Assumption 2: 'All standardised tests of *academic* aptitude, or achievement, measure this general factor to some degree, but *IQ* tests expressly designed for that purpose measure it most accurately.'

If we accept the previous counterargument, that a general factor of cognitive ability (intelligence) on which human beings differ is 'open to debate', then the assumption that the intelligence tests expressly designed for measuring IQ can measure intelligence most accurately is also open to debate, as such tests cannot measure the many different definitions of intelligence proposed by the different theorists.

We have seen that, even with established general intelligence (IQ) tests (described in Chapters 12 and 13), there are distinctions between psychometric-based intelligence tests that measure verbal and non-verbal general intelligence (e.g., the Wechsler tests and the Stanford-Binet IQ), psychometric based non-verbal intelligence (e.g., the Raven's Matrices) and cognitive-based intelligence tests that measure intelligence abilities and intelligence processes (Kaufman's abilities tests and the Cognitive Assessment System). Therefore, we can see that this assumption is open to debate, and may be particularly important because Herrnstein and Murray rely heavily on psychometric IQ test scores to build their arguments.

Assumption 3: 'IQ scores match, to a first degree, whatever it is that people mean when they use the word *intelligent* or *smart* in ordinary language.'

There is a problem with this assumption if we consider implicit (or everyday) theories of intelligence (which we covered in Chapter 17). Implicit theories of intelligence specifically address what people mean when they use the word 'intelligent' in ordinary language.

The first point to emerge from studies looking at implicit theories of intelligence is the difference between Western and Eastern cultures of intelligence. You will remember that intelligence in Western cultures suggests an emphasis on the speed of mental processing and the ability to gather, assimilate, and sort information quickly and efficiently. In Eastern cultures, these ideas do not fully apply; instead, intelligence extends to social, historical and spiritual aspects of everyday interactions, knowledge and problem solving. It would be unfair to extend this observation to debate Herrnstein and Murray's *Bell Curve* assumption as they were talking about only one Western culture, the United States. Nonetheless, they did build some of their arguments on the fact that immigrants coming into the United States are scoring lower than the national IQ score average and exerting a downward pressure on the intelligence of the United States. Might it be that these immigrants are coming from other countries where different types of intelligence are emphasised?

Other findings with studies of implicit theories of intelligence do extend directly to Herrnstein and Murray's argument. For example, our conceptions of intelligence do change across the age range, or across academic disciplines, in Western cultures. Remember the study mentioned in Chapter 12 by Canadian psychologist Prem Fry (Fry, 1984) who found that intelligence at the three main stages of educational development – primary school (5 to 11-year-olds), secondary school (11 to 18-year-olds), and tertiary (college and university) levels (18+-year-olds) – differed strongly. Also remember Sternberg's study examining implicit theories of intelligence among art, business, philosophy and physics professors (Sternberg, 1985). He found that conceptions of intelligence across these experts differed greatly.

Therefore, Herrnstein and Murray's assumption that intelligence test scores match, to a first degree, whatever it is that people mean when they use the word 'intelligent' in ordinary language, is widely open to debate.

Assumption 4: 'IQ (intelligence test) scores are stable, although not perfectly so, over much of a person's life.'

The assumption rests on whether intelligence can substantially change over a person's life. This is still a major debate;

in the intelligence literature, it is referred to as the fixed versus malleable intelligence debate. There are two areas to consider in examining this assumption.

First is the view that intelligence does not substantially change during one's lifetime (that is, it remains fixed). As you will remember from Chapter 13, some authors have reported that IQ scores remain stable over long periods of time; these findings support the view that intelligence is generally fixed. Jones and Bayley (Jones and Bayley, 1941) found that IQ scores of children at 18 years were positively correlated with their IQ scores at 12 years ($r = 0.89$) and 6 years ($r = 0.77$). Deary, Whalley, Lemmon, Crawford and Starr (2000) found that over a period of 60 years, IQ scores were correlated high (at least $r = 0.63$). Also, evidence that educational schemes such as Head Start among disadvantaged children (outlined in this chapter and Chapter 13), in which initial gains in IQ scores were *not* sustained, supports the view that intelligence is fixed.

However, the second area to consider points to evidence suggesting that intelligence is malleable (does or can change). We described, in this chapter, Ceci's (1990, 1991) meta-analysis of hundreds of studies. His results suggest that there are many effects of schooling and education on IQ scores, including the findings that children who attend school regularly score higher on IQ tests (a rise of 2.7 IQ points) and that delays in starting school cause intelligence scores to drop (by 5 IQ points per year missed). We also described Wahlsten's (1997) mention of adoption studies in France: an infant is moved from a family with a low socioeconomic status to a family with a high socioeconomic status, and the child's IQ score improves by 12 to 16 points. Finally, you will remember our discussion of the role of nutrition in intelligence, particularly the role of vitamin supplements on IQ scores among children. Reviews of these studies suggest that in the majority of cases, there is a positive effect on intelligence as the result of vitamin and mineral supplements in at least some of the children on non-verbal (fluid) measures of intelligence (Benton, 1991).

The question of whether intelligence is fixed or malleable is open to debate. Consequently, there is some evidence in this area to question the assumption that IQ scores are stable, although not perfectly so, over much of a person's life.

Assumption 5: 'Properly administered intelligence (IQ) tests are not demonstrably biased against social, economic, ethnic, or racial groups.'

The first thing to acknowledge in this area is that it was agreed by the APA task force (Neisser *et al.*, 1996) that properly administered intelligence tests are not demonstrably biased against social, economic, ethnic, or racial groups. The argument that they are biased is often put forward by opponents, but this view that intelligence tests, themselves, are biased against such groups may be misguided. Rather, a more sensible position to adopt at this stage is not that intelligence tests are biased against such groups, but that the theory from which they are developed may be biased. For example, there is a general factor of intelligence, or the view that intelligence comprises *only* speed of mental processing and the ability to gather, assimilate and sort information quickly and efficiently, that is strongly emphasised in Western culture.

Assumption 6: 'Cognitive ability is substantially heritable, apparently no less than 40 per cent and no more than 80 per cent.'

As we noted earlier in this chapter, a number of sources, including the APA task force (Neisser *et al.*, 1996) agree that cognitive ability is substantially heritable – apparently no less than 40 per cent and no more than 80 per cent. As you already know, there is some convincing evidence that intelligence, to some extent, is genetically inherited. However, it is worth noting that this margin, of 40 to 80 per cent, is quite large.

Gould's issue with this assumption is that heritability can then be used to explain differences for intelligence scores between ethnic groups. You remember that earlier we outlined a fallacy in comparing populations and gave the example of comparing death rates among a population of army recruits and the death rates for the population of a capital city from the same general population. We noted that you have to be aware of several different factors determining death rates between these two different populations. Well, this fallacy also exists in Herrnstein and Murray's application of genetic heritability to explain differences between black and white Americans (though Herrnstein and Murray do acknowledge this problem in their work). However, Gould argues that substantial heritability of intelligence within a population group (e.g., white or black Americans) cannot be used to explain average differences between groups (white Americans versus black Americans).

To extend this argument, evidence from geneticists could even ask whether race is a valid distinction to make between populations. In terms of understanding differences in intelligence between populations, such as race, one important context to consider in genetic influence is the amount of variance that is accounted for by race in the first place. We all know the saying that the colour of one's skin is only skin deep. Well, as we also know, this is a scientific fact. Typically, people looking at race differences make those distinctions based on what they can see; this is called

socially defined race. As R. S. Cooper and his colleagues note, researchers tend to define race within broad concepts of white, African, Asian, Chinese or Hispanic (Cooper *et al.*, 2000). However, these distinctions generalise across a huge number of different cultures and languages. For example, are white Americans the same as white individuals from the United Kingdom, Italy and Australia?

Due to advanced techniques in understanding our physiology, our understanding of race differences have dramatically changed. Authors such as US evolutionary biologists Masatosi Nei and Arun Roychoudhury (Nei and Roychoudhury, 1982, 1993) and Joseph Graves (Graves, 2001) note that the genetic variance within a population is around 10 times greater than genetic variance between races. In fact, two people who are closely related in terms of their 'race' may differ many more times in their genetic makeup than will two people of two separate 'races'. Today, biologists suggest the criterion by which we determine race, which is mainly based on skin colour, does not make sense in genetic terms. There are virtually no expressed genes (where the gene's information is converted into a living cell) that can be found in all the members of one race.

In fact Mei also suggests that within genetic research, most of the genes that influence appearance are not known. However, biologists have used the similarities between our common proteins to map human populations. Proteins are essential to the structure and function of all living cells and viruses, and play structural and mechanical roles in our genetic makeup. When scientists do this mapping, they get a different genetic picture of the world to socially defined race. For example, when geneticists have mapped the human population in terms of our blood types (remember, there are A, B, AB and O blood types), they find that the English, Spaniards, Eskimos and Norwegians cluster together; the Australians, Aborigines and Sicilians cluster together; the Icelanders and Japanese cluster together and the Swedes and the Ethiopians cluster together.

In all, these considerations suggest that the validity of the arguments that Herrnstein and Murray develop from intelligence having some genetic heritability, and from race differences in IQ scores, is seriously questionable.

Gould's analysis, in which we are asked to consider the strength of Herrnstein and Murray's premises, begins to undermine some of their arguments. Though none of the assumptions are entirely wrong, there clearly exists debate around four or five of them. This suggests that the premises on which Herrnstein and Murray base their arguments and recommendations are less secure than originally presented.

If you want to see the two arguments presented in the final form, go to Stop and think: The arguments of Herrnstein and Murray and Gould. (It will help you to read Chapter 26, Academic Argument and Thinking which can be found on the book website.)

Statistical and evidence-based problems in *The Bell Curve* arguments

Leon J. Kamin (a professor of psychology at Northeastern University in the United States) questions some of the statistical thinking and research evidence used by Herrnstein and Murray (Kamin, 1995).

You may remember this statement from your first statistical classes in psychology: 'Correlation does not mean causation'. It is important to remember, when reporting any sort of correlation, not to infer immediately that one variable *causes* another. Therefore, if we found a relationship between optimism and depression, it would usually be the case that we would not infer causation. Often you will hear it is likely that the two variables influence each other (you can read more on this in Chapter 26). It is this criterion that Kamin applies to much of the evidence used by Herrnstein and Murray. Kamin suggests that Herrnstein and Murray, in a lot of their work, ignore that principle in interpreting correlations.

He also suggests that in Herrnstein and Murray's pursuit of determining what factors may cause differences in intelligence, and what factors are caused by differences in intelligence, they begin to blur the fact that they are just using correlational data. They end up ignoring the 'correlation, not causation' rule. Kamin uses as an example Herrnstein and Murray's analysis of the relationship between socioeconomic status and intelligence, which is central to many of their arguments. In exploring this relationship, Herrnstein and Murray use data from the National Longitudinal Survey of Labor Market Experience of Youth, in which over 12,000 children provided data on a number of variables, including their socioeconomic status and their intelligence. As part of their analysis, Herrnstein and Murray conclude that the intelligence of a person is more important than their socioeconomic status in predicting their eventual economic and social welfare. However, as we know from discussions in this chapter and Chapter 13, socioeconomic status is bound up in a number of factors – including nutrition, educational success and poverty – that are related to intelligence. Kamin's problem with Herrnstein and Murray's analysis is that they force causal relationships on the variables when this approach is not appropriate. They do so by treating both IQ test scores and socioeconomic status as causal variables of eventual economic and social welfare. They then remove socioeconomic status as a factor, as it is not as powerful as intelligence in predicting eventual economic and social welfare. This hides the fact that intelligence and socioeconomic status are intrinsically linked not only with each other, but with economic and social welfare success. Kamin argues that this type of analysis is not valid.

Kamin also raises some questions regarding the research basis of Herrnstein and Murray's arguments. His first

Stop and think

? ! ?

The arguments of Herrnstein and Murray and Gould

Let us take you through the two major arguments presented around Herrnstein and Murray's theories. Also remember that when we use the term 'true' here, we actually mean that 'a majority of evidence suggests', because in psychology we deal with probability estimates of findings. We cannot ever say anything is completely true, proved or disproved (see Chapter 26 if you want a full explanation of academic argument).

Argument 1: Herrnstein and Murray's argument

Major premises

- If it is true there is such a thing as a general factor of cognitive ability on which human beings differ;
- and it is true that all standardised tests of academic aptitude or achievement measure this general factor to some degree, but IQ tests expressly designed for that purpose measure it most accurately;
- and it is true that IQ scores match, to a first degree, whatever it is that people mean when they use the word;
- and it is true that IQ scores are stable, although not perfectly so, over much of a person's life;
- and it is true that properly administered IQ tests are not demonstrably biased against social, economic, ethnic or racial groups;
- and it is true that cognitive ability is substantially heritable, apparently no less than 40 per cent and no more than 80 per cent;

Minor premises

- and if it is also true that one population group identified by their ethnicity had an average IQ score lower than another population group identified by their ethnicity;

Conclusion

- therefore, it must be true that the population group who had the lower average IQ score must be less intelligent than the population group who had the higher average IQ score.

Argument 2: The counter argument based on Gould's analysis

Major premises

- *it is not neccesarily true* there is such a thing as a general factor of cognitive ability on which human beings differ (because of multifactor theories of intelligence);
- *it is not neccesarily true* that all standardised tests of academic aptitude or achievement measure this general factor to some degree, but IQ tests expressly designed for that purpose measure it most accurately (because general intelligence tests are very different today and there is a real distinction between psychometric and cognitive ability tests);
- *it is not neccesarily true* that IQ scores match, to a first degree, whatever it is that people mean when they use the word (because implicit theories of intelligence suggest conceptions of intelligence vary between and within cultures);
- *it is not neccesarily true* that IQ scores are stable, although not perfectly so, over much of a person's life (because there is evidence that suggests intelligence does or can change substantially);
- it is true that properly administered IQ tests are not demonstrably biased against social, economic, ethnic or racial groups (mainly due to the conclusion drawn by the APA Task Force);
- it is true that cognitive ability is substantially heritable, apparently no less than 40 per cent and no more than 80 per cent:

Minor premises

- and if it is also true that one population group identified by their ethnicity had an average IQ score lower than another population group identified by their ethnicity;

Conclusion

- therefore, it can't be necessarily true (due to faults with four of the major premises) that the population group who had the lower IQ score must be less intelligent than the population group who had the higher IQ score.

Which argument would you support?

concern is with the validity of some of the measures used by Herrnstein and Murray to assess key variables. One of these is the variable mentioned earlier – socioeconomic status data from the National Longitudinal Survey of Labor Market Experience of Youth. The measurement of socioeconomic status was achieved by getting students' self-report of their socioeconomic status. No check was made in this study on whether students were accurate in their reporting of socioeconomic status (for example, by asking their parents). Kamin suggests that while such reports are not completely unreliable, they do cast doubts on the reliability of Herrnstein and Murray's building of arguments and analyses based on this data.

Kamin also suggests that there are problems with some of the research studies used to support some of Herrnstein and Murray's arguments. Kamin suggests that Herrnstein and Murray rely too heavily on the work of certain academics in the world of intelligence, particularly that of Arthur Jensen and Richard Lynn. Kamin argues that there are problems with Jensen's and Lynn's work. One such piece of work is Herrnstein and Murray's reliance on a review paper by Lynn in which he examines the evidence for the evolution of race differences in intelligence and discusses the genetic components of intelligence as explaining differences between ethnic groups (Lynn, 1991). In his review paper, Lynn describes a publication by Ken Owen (who is with the Human Sciences Research Council, Pretoria, in South Africa) as the best single study of racial differences in intelligence (Owen, 1989). The study compared white, Indian and black pupils (including pupils from a Zulu tribe) on an intelligence measure called the Junior Aptitude Tests. In this study Owen did not assign IQ scores to any of the groups he tested; he merely reported test-score differences between groups. Owen also noted that the lower scores of black children (which there were) would be due to the poor knowledge of English among the black participants. Also, Owen reported that the tests used figures of items such as electrical appliances and microscopes, which were unknown to Zulus. However, Kamin notes that despite these reservations by Owen about his data, Lynn constructed IQ scores from the data and based many of his conclusions in this review on apparent differences between white, Indian and black children in the study.

Kamin points to other questions that surround Lynn's (1991) review paper and are then reported by Herrnstein and Murray. Lynn also refers to a finding by A. L. Pons, who tested 1,011 Zambian copper miners on the Raven's Matrices (Pons, 1974). Pons presented his data orally at the 1974 26th Congress of the South African Psychological Association. However, later D. H. Crawford-Nutt reported this finding alongside some other data, when reporting on test and item bias in the use of the Junior Aptitude Test as a suitable measure of IQ among white, Indian and black pupils (Crawford-Nutt, 1976). Pons had found that the copper miners performed poorly on the Raven's Matrices, and Lynn used this finding in his review paper to support racial differences in intelligence. Yet, Kamin points out that in his paper, Crawford-Nutt also presented data among 228 black high school students in Soweto, South Africa, who had scored slightly higher on the Raven's Matrices when compared to the norms for the test for white students of the same age in the country. Yet, Lynn ignores this finding in his review paper.

Kamin also points to problems owing to Herrnstein and Murray's citing some of Jensen's work (Jensen, 1993b) regarding race differences in reaction time (an indicator of IQ). In this work, Jensen had tested black and white reaction responses to stimuli. As you may remember, there are different ways of measuring reaction time. Simply, reaction time measures how quickly a participant responds to any particularly stimulus. However, Jensen had also developed a measure of 'choice reaction time', a more complex task, which required participants to react to various stimuli presented in a random order. Jensen found that black participants did better than white participants (suggesting they have higher intelligence), but the result was reported as an inconsistency.

For Kamin, the fact that Herrnstein and Murray have used problematic research evidence, as well as faulty statistical thinking, to build their arguments, casts doubts on the validity of their final arguments.

A darker side of psychology related to Herrnstein and Murray's analysis

Gould referred to the 'ghosts' of *The Bell Curve*. We noted at the beginning of this chapter that Jensen referred to a number of comments about Herrnstein and Murray's book, including it being described as 'neo-Nazi'. What are these authors referring to? Why did *The Bell Curve* book attract such comments? The answer is that many thought *The Bell Curve* was raising issues regarding eugenics.

Eugenics

To say the role of eugenics in psychology is a controversial one is an understatement. It is something that is rarely talked about in psychology undergraduate classes, but psychology has a dark history.

Eugenics refers to a selection process within human reproduction with the intent to create children with desirable traits. Generally, eugenics policies are divided into two aspects: positive and negative eugenics. *Positive eugenics* refers to the practice of encouraging increased reproduction in those who are seen as having superior traits (for example, higher intelligence). *Negative eugenics* refers to the practice of discouraging or eliminating reproduction in those perceived to have poor hereditary traits (for example, lower intelligence).

To look at one of the first developments of eugenics, we must go back to where we first began in this chapter, with Francis Galton. Galton, you will remember, became interested in studying the variations in intelligence after reading Charles Darwin's *The Origin of Species*, which described how all species evolve through a process of natural selection and survival of the fittest. In 1865, Galton outlined eugenics principles (Galton, 1865). He felt that human society sought to protect the weak, and that these principles were at odds with the process of natural selection that suggested the survival of the fittest.

As Galton felt that intelligence was something that was inherited through the genes, he argued that one could use artificial selection to increase intelligence among humans. He argued that such selection was needed as the less-intelligent people were reproducing more than the intelligent people, and this was causing the human race to become weaker.

Galton's theories were adopted by other psychologists. One notable supporter was Lewis Terman (whom we mention in Chapter 12), at one time a president of the American Psychological Association, who had used the Binet-Simon test among California schoolchildren and later adapted it into the Stanford-Binet test. However, Terman continued Galton's ideas. In *Genetic Studies of Genius* (Terman, 1925; Terman and Oden, 1947, 1959), he argued that low intelligence was often found in Spanish-Indian, African American and Mexican families, and such low intelligence was inherited. He argued that such groups should be segregated into special classes and could only ever be trained to be efficient workers. He also expressed concerns that these families seemed to breed more than white Americans did, and from a eugenics point of view (the selection of certain traits), this presented a problem as it was necessary to preserve the United States from low intelligence.

By then, eugenics views had made their way into social policy, politics and the law. By 1922 the process by which human selection was to be initiated was being made abundantly clear: sterilisation (the act of making a person infertile, unable to reproduce). A member of the US House of Representatives Committee on Immigration and Naturalization, H. H. Laughlin, published the Model Eugenical Sterilization Law. This bill formed the basis of state sterilisation laws, and in it Laughlin listed the types of people who were to be subjected to mandatory sterilisation. He included the feeble minded (low intelligence), the insane, the criminal, the epileptic, the blind, deformed and the dependent (e.g., orphans, homeless).

In 1927, the US Supreme Court ruled in the case of *Buck* v. *Bell* and supported a new legislative law in the state of Virginia. The law concerned a 17-year-old woman named Carrie Buck, who was a resident at the Virginia Colony for the Epileptic and Feebleminded – an asylum home for epileptics, the mentally retarded and the severely disabled. Carrie had the IQ score of a 9-year-old, and her mother, who also resided at the colony, had a mental age of less than 8. Carrie Buck had given birth to a daughter who, at 1 year old, was given an infant IQ test and was found to be less than normal. In response to this, the state of Virginia wanted to have the child sterilised against her will. The US Supreme Court ruled in favour of the enforced sterilisation; and in writing up the decision, Justice Oliver Wendell Holmes wrote, 'three generations of imbeciles are enough'. By that part of the twentieth century, 29 US states had laws allowing the compulsory sterilisation of individuals thought to be mentally retarded, alcoholic or 'having a criminal nature'. In 1945, information from the *Journal of the American Medical Association* suggested that over 42,000 people were sterilised in the United States between 1941 and 1943.

But the United States was not alone. During the twentieth century, Canada, Sweden, Australia, Norway, Finland, Denmark and Switzerland all had various types of eugenics programmes. These included promoting different birth rates among populations, compulsory sterilisation, marriage restrictions, birth control and immigration control. However, it was in Germany that eugenics became a central focus, with Hitler, the Nazi Socialist Party and the Second World War.

In 1925, Adolf Hitler had published *Mein Kampf* (the book outlines Hitler's major ideas, including violent anti-Semitism) in which he identified the 'mentally unworthy' among the African race and suggested that they mustn't be allowed to perpetuate their race. In 1933, Adolf Hitler and the Nazi Socialist Party set up the sterilisation law, which was directly based on the Model Eugenical Sterilization Law introduced by H. H. Laughlin in 1922. In Germany, before the Second World War and between 1933 and 1939, over 20,000 people were sterilised for being feeble minded. Then the Holocaust occurred. The Holocaust was the attempt to eradicate entirely particular target groups. By that time, sterilisation of target groups such as the mentally retarded had extended to the extermination of whole groups of people and races including the Jews, the Poles, Russians, Communists, homosexuals, the mentally ill, the disabled, intelligentsia and political activists, Catholic and Protestant clergy, some Africans and common criminals. During the Second World War, Germany occupied a number of countries, including France and part of the Soviet Union. In 1939, seven million Jews were killed in central and eastern Europe, three million in Poland and over one million in the Soviet Union.

Following the Second World War, and the experience of Nazi Germany and Hitler with his aspirations for the perfect race, eugenics fell into disrepute. The Nuremberg Trials were trials of Nazis involved in the Second World War and the Holocaust, and these trials revealed to the world the Nazis' genocidal practices. Clearly, governments couldn't condone those policies that had been advocated by Hitler, and many re-examined their eugenics-based policies. In 1948, and in response to this gross abuse, the United Nations affirmed that men and women of full age, without any limitation due to race, nationality or religion, have the right to marry and to found a family.

Stop and think

? ! ?

To tell the truth, the whole truth and nothing but the truth

Consider the following story. It is part of an obituary written about Richard Herrnstein in 1994, after his death, by Charles Murray (Murray, 1994). Think about this statement with regard to reporting group differences in intelligence.

> **About four years ago, shortly after Dick (Richard Herrnstein) and I had begun to collaborate on a new book about intelligence and social policy (*The Bell Curve*), we were talking over a late-evening Scotch at his home in Belmont, Mass(achusetts). We had been musing about the warning shots the prospective book had already drawn and the heavy fire that was sure to come. The conversation began to depress me, and I said, 'Why the hell are we doing this, anyway?' Dick recalled the day when, as a young man, he had been awarded tenure. It was his dream fulfilled – a place in the university he so loved, the chance to follow his research wherever it took him, economic security. For Dick, being a tenured professor at Harvard was not just the perfect job, but also the perfect way to live his life. It was too good to be true; there had to be a catch. What's my part of the bargain? He had asked himself. 'And I figured it out,' he said, looking at me with that benign, gentle half-smile of his. 'You have to tell the truth.' (Murray, 1994, p. 22)**

Eugenics and *the bell curve*

However, what has eugenics got to do with *The Bell Curve*? Well, critics of the book, such as Gould, felt that some of the issues raised by Herrnstein and Murray echoed eugenics thoughts and practices. Their emphasis on singling out people with low intelligence and segregating aspects of society, their emphasis on genetic influence on intelligence and their concerns about immigration brought up some issues that surround eugenics. These sorts of concerns about Herrnstein and Murray's work were not helped, as Kamin points out, by the fact that one main advocate of eugenics in modern intelligence research is an academic on whose evidence Herrnstein and Murray largely relied – Richard Lynn.

Richard Lynn, known for his work on race and a firm supporter of the genetic heritability of intelligence, wrote a book on dysgenics (the biological study of the factors producing degeneration of genes in offspring, especially of a particular race or species), which argued that eugenicists were right in their belief that modern populations have been deteriorating genetically in respect to their intelligence (Lynn, 1996). In a second book (Lynn, 2001), he considers what measures could be taken to rectify the effects of dysgenics and argues that genetic improvement is likely to evolve when women use in vitro fertilisation (IVF; fertilisation of an egg in the laboratory) to grow a number of embryos, then have them genetically assessed and before selecting those with genetically desirable qualities. However, it is important to note that Lynn does not condone Hitler's actions of genocide. Instead, he sees eugenics as purely a scientific pursuit to establish what is known about genetic inheritance and that the aims and objectives of eugenics should be open to scientific scrutiny.

It is also crucial to note that at no point do Herrnstein and Murray discuss eugenics research or policy. However, it is the discussion of a number of issues in Herrnstein and Murray's work that have been previously linked to eugenics (low intelligence, genetic inheritability of intelligence, race differences, their concerns about immigration past) that Gould is pointing to when he mentions the ghosts of *The Bell Curve*'s past.

Final comments

Phew! What a debate! That certainly may have got your blood boiling, but please remember when discussing such things in class and in essays that the arguments arising from the discussion must generally be academically based, not personally based (to read more on fallacies, go to the online chapter, Chapter 26, Academic Argument and Thinking). Notwithstanding the discussion, you should now be able to outline:

- what is meant by genetic heritability in intelligence;
- the different dimensions of genetic and environmental influences that are thought to impact on intelligence;
- the main points of Herrnstein and Murray's *Bell Curve* analysis;
- some criticisms of Herrnstein and Murray's *Bell Curve* analysis.

Summary

- Sir Francis Galton suggested that man's natural abilities are inherited under the same conditions as physical features of the animal world that had been described by Darwin. Galton suggested that intelligence is passed down to children through heredity.
- Heritability of intelligence is the estimated assessment of the extent to which intelligence is passed down from parents to children through their genes on average across the population.
- There are largely three types of study that you will regularly see in the heritability of intelligence: family studies, twin studies and adoption studies.
- Heritability estimates of intelligence vary greatly, ranging from an average of 40 per cent to an average of 80 per cent.
- There are four general issues surrounding genetic heritability estimates: conceptions of heritability and the environment, different types of genetic variance, the representativeness of twin and adoption studies and assortative mating.
- We identify five main areas in which to consider environmental effects on intelligence.
- The first area is biological variables (nutrition, lead and prenatal factors) and the maternal-effects model.
- The second area is the consideration of family environment and shared and non-shared factors. Non-shared environments consider within-family factors and outside-family factors, including context-specific socialisation, outside the home socialisation, transmission of culture via group processes, group processes that widen differences between social groups and group processes that widen differences among individuals within the group.
- The third area is socioeconomic status variables that also include consideration of birth order, family size and intelligence.
- The fourth and fifth areas are education and culture, respectively, the latter comprising consideration of factors such as decontextualisation, quantification and biologisation.
- In 1994 two US authors, Richard J. Herrnstein and Charles Murray, published a book called *The Bell Curve: Intelligence and Class Structure in American Life* (Herrnstein and Murray, 1994). The term 'bell curve' refers to the distribution of a large number of IQ test results in the United States.
- Herrnstein and Murray analyse the distribution of scores, comparing the high end and low end of the distribution of IQ scores and discussing the emergence of the cognitive elite, social and economic problems and the relationship between race and IQ.
- There are huge criticisms of the arguments presented by Herrnstein and Murray. First, these criticisms centre on analysing some of the premises used in the argument, including whether (1) there is such a thing as a general factor of intelligence, (2) all standardised tests of IQ measure intelligence accurately, (3) IQ scores match what people mean by intelligence and (4) IQ scores are stable, although not perfectly so, over much of a person's life.
- Other criticisms of *The Bell Curve* focus on the consideration of the use of statistics and research ethics and its perceived link with eugenics ideas.

Connecting up

- This chapter should be read after Chapters 12 and 13.
- There are also some links to Chapter 8 (Biological Basis of Personality I: Genetic Heritability of Personality and Biological and Physiological Models of Personality), which outlines to a greater extent some of the issues surrounding heritability estimates.
- Also Chapter 26, the supplementary chapter that we have provided online may need to be read in order to gain better insight into some of the elements of academic argument.

Critical thinking

Discussion questions

- Discuss the relative importance of genes and the environment in determining IQ.
- Do differences in average IQ scores have any relationship to, or infer anything about, the race of an individual?
- Discuss the view that without Herrnstein and Murray's work, the public today would know a lot less about what factors influence intelligence.
- Critically examine the implications for schooling and work, assuming that intelligence consists of one general ability and is inherited.
- The second part of this chapter outlines a discussion around a book written by Hernstein and Murray in 1994. In 2007, a researcher in intelligence found himself at the centre of a controversy when he made comments about differences in intelligence between different parts of the world. As Hawkes (2007) notes, this controversy seems to occur once a decade. There are some online newspaper articles detailing this 2007 controversy (the web locations of these articles are given below). Read these articles. What are the main issues emerging from these articles? Why do you think this controversy keep reoccurring?
  - **http://www.timesonline.co.uk/tol/news/uk/science/article2687364.ece**
  - **http://www.timesonline.co.uk/tol/news/uk/article2677098.ece**
  - **http://www.timesonline.co.uk/tol/news/uk/science/article2687425.ece**
  - **http://www.guardian.co.uk/science/2007/oct/20/genetics**
  - **http://www.guardian.co.uk/international/story/0,,2193899,00.html**
  - **http://news.bbc.co.uk/1/hi/sci/tech/7052416.stm**

Essay questions

- Critically discuss the view that intelligence is largely genetically inherited.
- Critically assess the view that genetics is more important than the environment in determining intelligence.
- Critically discuss the view that there is a 'cognitive elite'.
- How important are socioeconomic status and variables in assessing the heritability estimates of intelligence?
- How do narrow and broad definitions of IQ heritability differ? How has our understanding of genetics informed the nature versus nurture debate on intelligence?
- To what extent do racial group differences in intelligence exist? Identify some important considerations relating to these findings.
- The main problem with Herrnstein and Murray's bell curve is that there are major flaws in the premises of the argument they present. Critically discuss.

Going further

Books

- Herrnstein, R. J. and Murray, C. (1994). *The Bell Curve*. New York: Free Press.
- Jacoby, R. and Glauberman, N. (eds). *The Bell Curve Debate*. New York: Times/Random House.
- Plomin, R. (2004). *Nature and nurture: An introduction to human behavioral genetics*. London: Wadsworth.
- Plomin, R., DeFries, J. C., McClearn, G. E. and McGuffin, P. (2000). *Behavioral Genetics: A primer*. London: Freeman.

Journals

- Zyphur, M. J. (2006). On the complexity of race. *American Psychologist*, *61*, 179–180. In this chapter we explained that the analyses of race within mainstream psychology usually relies on simple social categories, but we also argued that there are problems with this method as it bears little resemblance to those methods used in the genetic analysis of race. If you want to read more about this issue, then a good short starting point is this article. *American Psychologist* is published by American Psychological Association. Available online via PsycARTICLES.
- In this chapter and the last, we looked at the notion of whether IQ and intelligence can change. A good article summarising the main issues is Howe, J. A. (1998). Can IQ change? *The Psychologist*, *11*, 69–72. This is freely available online. You can find *The Psychologist* on the British Psychological Society Website (**http://www.bps.org.uk/**).

- Maccoby, E. E. (2000). Parenting and its effects on children: On reading and misreading behavior genetics. *Annual Review of Psychology*, *51*, 1–27. *Annual Review of Psychology* is published by Annual Reviews, Palo Alto, California. Available online via Business Source Premier.
- Baker, L. D. and Daniels, D. (1990). Nonshared environmental influences and personality differences in adult twins. *Journal of Personality and Social Psychology*, *58*, 103–110. Published by the American Psychological Association. Available online via PsycARTICLES.
- Bouchard, T. J. Jr and Loehlin, J. C. (2001). Genes, personality, and evolution. *Behavioural Genetics*, *31*, 243–273. Published by Kluwer Academic Publishers. Available online via Kluwer or SwetsWise.
- Harris, J. R. (1995). Where is the child's environment? A group socialization theory of development. *Psychological Review*, *102*, 458–489. Published by the American Psychological Association. Available online via PsycARTICLES.
- If you are interested in looking deeper into the genetics of brain structure and intelligence then a possible article to read is Toga, A. W. and Thompson, P. M. (2005). Genetics of brain structure and intelligence. *Annual Review of Neuroscience*, *28*, 1–23.

Articles on the intelligence issues discussed in these chapters are often found in these journals.

- ***Intelligence: A multidisciplinary journal***. Published by Elsevier Science. Available online via Science Direct.
- ***American Psychologist***. This journal has a number of articles relating to the heritability of intelligence. Published by the American Psychological Association. Available online via PsycARTICLES.

Web links

In this chapter we have covered a number of topics including heritability of intelligence, the bell curve and birth order. Some of these topics are controversial and evoke a lot of emotions, and therefore there are a lot of websites that discuss these issues; but the evidence they use is not appropriate. We would suggest that when it comes to topics like these it is best to adhere to academic books and journals. However, if you want to search the web, then the place to start is the Hot Topics section of the Human Intelligence website (**http://www.indiana.edu/~intell/**).

Film and literature

- ***David Copperfield***, by Charles Dickens (1869) and ***Under the Greenwood Tree***, by Thomas Hardy (1872). Our first discussion of intelligence in this chapter was to do with Galton's view of intelligence and the reasons underlying it at the beginning of the twentieth century. Galton looked to members of the Royal Society and saw eminence as an indicator of intelligence. However, the argument of what surrounds intelligence was demonstrated in many novels of the time. The writing of Charles Dickens (for example, *David Copperfield*) and Thomas Hardy (*Under the Greenwood Tree*) used intelligence to distinguish the main characters. In both books, there is a contrast made between the small village family, whose members are intelligent in terms of the countryside around them and have inherited wisdom passed through generations of their family, and the city family, whose members are eminent, rich and own businesses but are actually portrayed as incredibly unwise compared to the village families. This treatment contrasts greatly with Galton's assumptions about the study of eminent people living in London as reflecting intelligence.
- ***Gattaca*** (1997, directed by Andrew Niccol). Vincent (played by Ethan Hawke) is one of the last 'natural' babies born into a sterile, genetically enhanced world, where a person's life expectancy and the likelihood of disease are ascertained at birth. Born with a heart defect and due to die at 30, Vincent has no chance of a career in a society that now discriminates against your genes, instead of your gender, race or religion. This film suggests a natural progression of eugenics, and raises some issues about what happens to those who fall foul of the perfect genetic world.
- ***The Intelligent Man*** (1984, Educational Resources Film). This video looks at the sometimes controversial work of Sir Cyril Burt and his work with intelligence tests and theory. The filmmaker looks at the experiments and findings of the work carried out by Cyril Burt and contrasts intelligence theories. BBC Videos for Education and Training.

Explore the website accompanying this text at www.pearsoned.co.uk/maltby for further resources to help you with your studies. These include multiple-choice questions, essay questions, weblinks and ideas for advanced reading.