



The Role of Genetic Inheritance: Research Studies

This Factsheet outlines a number of research studies that have examined the role of **genetic inheritance** and its likely effects on behaviour. The Factsheet includes examiner comments, and the worksheet gives you the opportunity to apply what you have learned to exam style questions. Words in bold are explained in the glossary.

The examiner will expect you to be able to:

- Explain the role of genetic inheritance on a range of behaviours
- Use empirical research to support the role of genetic inheritance on behaviour
- Evaluate empirical research in terms of strengths and limitations and by comparing with findings from alternative studies

A. Introduction

It is an established fact that genetic inheritance influences physical attributes, including, for example, hair and eye colour, height, and facial features. Psychologists are also interested in the role that genetic inheritance plays on our behaviour. For example, are children of intelligent parents more likely to be intelligent? Do parents who engage in criminal behaviour have offspring who also engage in criminal behaviour? Psychologists have conducted research to explore these questions, specifically focusing on the role of genetic inheritance. Much of the research uses twin or family studies to discover the **concordance rates** of specific behaviours in family members. This Factsheet examines five specific behaviours from the perspective of genetic inheritance and demonstrates how to draw on psychological research to support explanations.



Note: there is an important ethical consideration for psychologists engaged in genetic research. They must obtain **informed consent** from participants before using their data for the purpose of research, and individuals must be specifically informed about the true nature of the study in order to comply with ethical guidelines.

Examiner Comment: In questions that ask you to explain the influence of genetic inheritance with reference to research, too many candidates fail to refer to appropriate psychological studies.

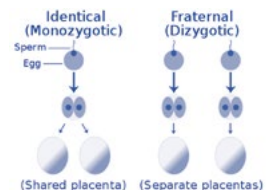
Exam Hint: Although names and dates of studies are less important than findings and conclusions, it is important to write them accurately if they are included. If there is a single researcher, their name should be identified followed by a comma and the date, e.g. *Christiansen, 1977*. If there are two researchers, the format is the same (*Nurnberger and Gershon, 1982*). Where there are more than two researchers, the lead researcher should be identified followed by 'et al.', which means 'and all', followed by the date (*Bouchard et al. 1990*).

Exam Hint: When using psychological research in your answers, make sure you link the research explicitly to the behaviour.

B. Bulimia (Kendler et al. 1991)



- Bulimia is an eating disorder categorized by particular eating behaviours including bingeing and **purging**. One biological explanation for bulimia is that it is the result of decreased serotonin levels; serotonin increases appetite. Those suffering from bulimia have an increased appetite for carbohydrates in particular. Consumption of carbohydrate-rich food has been found to increase serotonin levels, which lends support to this theory.
- **Kendler et al. (1991)** were interested in discovering whether rates of bulimia in family members could be explained by genetic inheritance. They conducted a twin study in the American state of Virginia. From a sample of 1000 twin pairs, they found 123 cases of bulimia. Of those, there was a 55% rate of heredity. The concordance rate was highest in **monozygotic** (MZ/identical) twins where, if one twin had bulimia there was a 26% probability of the other also showing signs of bulimia. In **dizygotic** (DZ/non-identical), twins the concordance rate was 16%.



Discussion

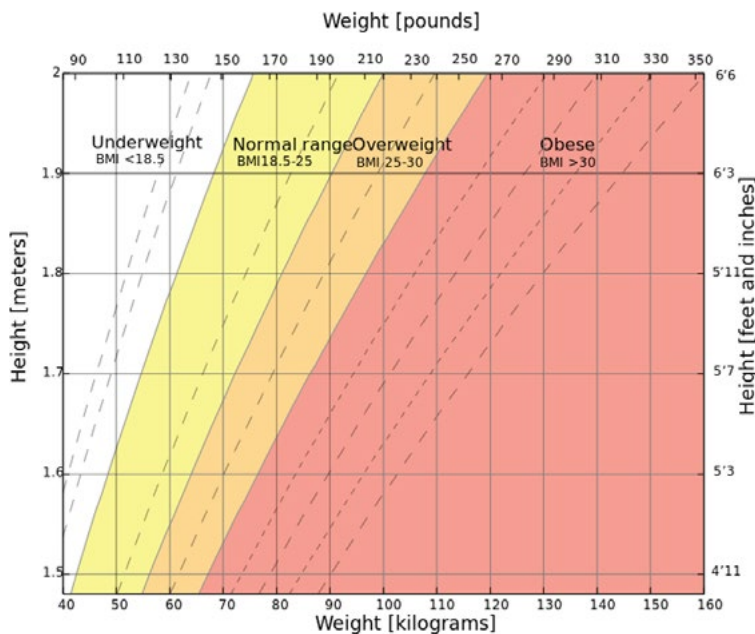
The research of Kendler et al. supports the suggestion that there is a genetic component to bulimia, because genetically similar family members, i.e. MZ twins, who showed a higher concordance rate than less genetically similar family members (such as DZ twins). A later study by **Bulik et al. (2000)** examined 850 pairs of twins and found a concordance rate in family members of 83%, which adds further support to the role of genetic inheritance in bulimia. However, if genetic inheritance was the only factor, concordance rates in monozygotic twins would be 100%. As they are not, it is suggested that other factors must be relevant.

Later studies have supported the role of psychological factors in bulimia. For example, **Behar (2001)** found that a strong feminine **gender identity** was a predicting factor in 43% of study participants, compared to 24% of controls. **Jaeger et al. (2002)** found that culture was a factor, with rates of bulimia highest in Mediterranean countries, followed by European countries, and lowest in non-western cultures. These studies suggest that, while genetic inheritance is certainly a factor in behaviour associated with bulimia, psychological and environmental factors should also be considered.

Exam Hint: Discussion of research can include assumptions of findings and conclusions, reference to supporting research as well as reference to research which suggests different conclusions, as illustrated above.

C. Obesity (Stunkard et al., 1990)

Another type of eating behaviour that has been examined, in terms of genetic inheritance, is obesity. The weight of an individual can be categorized as underweight, normal, overweight, or obese by using the **body mass index** (BMI). This is a tool that calculates a person's BMI by dividing weight by the square of their height, which is illustrated in a standardized table. A BMI in the range of 18 – 25 indicates normal weight whereas a BMI above 30 indicates obesity.



Twins	Together/apart	Concordance rate
MZ twins	Together	0.80
MZ twins	Apart	0.70
DZ twins	Together	0.30
DZ twins	Apart	0.20

Discussion

The findings of Stunkard et al. illustrate a higher concordance rate in monozygotic twins than dizygotic twins, which supports the role of genetic inheritance. They suggest that genetics accounts for 70 – 80% of the variance. Although this is high, concordance rates were not 100% suggesting other factors contributed to levels of obesity in the twins. Stunkard et al. also found that twins raised together showed higher levels of similarity in obesity than twins raised apart, which supports the role of environmental factors. Studies conducted in Denmark and the USA have produced similar findings. However, like Sweden, these demonstrate a **cultural bias** as they are Western environments and findings cannot necessarily be generalized to non-western cultures.

Stunkard et al. (1990) identified 25,000 Swedish twin pairs from the national registry. They selected a sample that included both MZ and DZ twins who were both raised together and raised apart. The sample comprised of 154 pairs of MZ twins raised together, 93 pairs of MZ twins raised apart, 208 pairs of DZ twins raised together, and 218 pairs of DZ twins raised apart. A summary of their findings is shown in the table.

Exam Hint: If the question asks you to explain how genetic inheritance influences one behaviour, your answer should focus on one behaviour only as others will not be credited. Tip, if you identify 'eating behaviour' you could discuss both bulimia and obesity.

D. Depression (Kendler, 2006)

Depression is a mental health condition characterized by prevailing low mood, lack of enjoyment, social withdrawal, and lethargy.



Psychologists are interested in whether genetic inheritance plays a role in depression and whether genetic risk factors are consistent across genders.

Nurnberger and Gershon (1982) conducted a **meta-analysis** of seven twin studies that had examined the link between genetic inheritance and depression. They found that the concordance rate for major depressive disorder was consistently higher for monozygotic twins than dizygotic twins. In the largest study of its kind, Kendler (2006) carried out research to explore the genetic inheritance of lifetime major depression. He used an interview method to assess 15,493 twin pairs according to the **DSM-IV** criteria. Results indicated that the inherited **predisposition** to major depression was significantly higher in women (42%) than men (29%). No significant differences were noted in genetic factors across historical periods spanning birth years 1900 – 1958. Kendler concluded that major depression could be predicted by genetic inheritance and that results were not historically influenced.

this could raise ethical implications because knowledge of a genetic predisposition might create a **self-fulfilling prophecy**. For example, if one twin is diagnosed with depression, the other might present symptoms because they are expected to. There is also a suggestion that this finding can lead to social stigmatization. If one member of a family is diagnosed with a mental health disorder, such as depression, another member, particularly a twin, may be stigmatized even if they do not display any of the associated features.

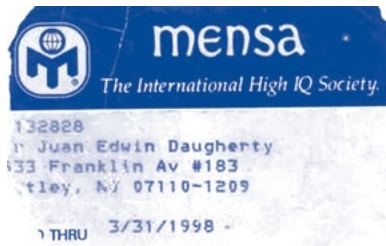
Furthermore, it has been argued that cortisol plays an important role in mental health disorders, but that relatively few studies have paid attention to differences in cortisol levels or to the possible genetic basis. Bartels et al. (2002) conducted a meta-analysis of five twin studies and suggested a heritability of 62% in cortisol levels. They concluded that, to gain a greater understanding of the role of genetic inheritance in disorders such as depression, future studies should take this factor into consideration.

Examiner Comment: Depression could be explained in terms of evolution. Exam answers in this section that refer to evolutionary psychology will only be creditworthy if they focus on how genetic inheritance influences the behaviour.

Discussion

Research supports the suggestion that there are genetic predispositions towards developing depression. However, it has been argued that

E. Intelligence (Bouchard et al. 1990)



Intelligence can be defined as the capacity to acquire, retain and apply knowledge. It can include a range of cognitive abilities including academic performance, logic, abstract thought, memory, and problem solving.

Intelligence is measured by standardized **IQ** tests, which provide an IQ score. The term IQ, or intelligence quotient, comes from the German '*intelligenzquotient*' which was first used by psychologist William Stern. IQ scores are obtained by dividing a person's mental age score by their chronological age. Average IQ is in the range 85 – 115. About 5% of the population has a low IQ score below 75 and about 5% has a high IQ score above 125.

Bouchard et al. (1990) conducted a twin study to investigate genetic inheritance in intelligence. They chose a **self-selected** sample of MZ twins who had been raised together (**MZT**) and MZ twins who had been raised apart (**MZA**) and measured intelligence using standardized intelligence tests. The researchers found a concordance rate for MZT of 88% and a concordance rate for MZA of 69%. They concluded that genetic inheritance is largely responsible for intelligence although environmental factors also play a role, illustrated by the higher concordance rates in twins raised together (MZT) than those raised apart (MZA).

Discussion

The study by **Bouchard et al. (1990)** demonstrates high concordance rates for intelligence in monozygotic twins. However, as it was not 100%, even in the MZT sample, meaning that other factors must be relevant. Furthermore, the study did not control for the effect of environmental variables, which affects its **internal validity**. The participants were a self-selected sample of white, middle-class individuals in Western culture, so findings cannot be generalized to a wider population.

There is a further implication for studies such as this, which suggest that intelligence is determined by genetic inheritance, implying that IQ is pre-destined. If parents or siblings have a high IQ, individuals might feel pressure to excel academically too. On the other hand, if family members have a low IQ, expectations may be low, which could result in a self-fulfilling prophecy and/or underachieving.

There is also a question mark over measures used to test intelligence. IQ tests are designed to measure a particular set of skills but there is much they leave out. As the famous quote from Albert Einstein states, 'Everybody is a genius. But if you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid'.

Exam Hint: The command term 'explain' requires you to give a detailed account of how genetic inheritance may influence a specific behaviour.

F. Criminal Behaviour

Criminal behaviour can be defined as any behaviour, act, activity, or event that is punishable by law. It includes violence, discrimination, firearms, human trafficking, sex crime, cybercrime, and burglary. For criminal behaviour to result in a conviction, both the act and the intent must be proven beyond reasonable doubt. A crime might be deliberate and predetermined or accidental/indirect, and what constitutes a crime can vary between different countries and different historical periods.



It has been suggested, anecdotally, that criminal behaviour tends to run in families. Those families where criminal behaviour is present have a greater tendency towards further criminal behaviour than those where there was no previous criminality. **Crowe (1972)** found that if a mother had a criminal record, her biological child had a 50% chance of acquiring one by the age of 18. This was compared with a control group where biological children of mothers who did not have a criminal record had a 5% chance of acquiring a criminal record by the age of 18. Twin studies have found higher concordance rates for criminal behaviour amongst MZ twins than DZ twins. Researchers in Scandinavia assessed the data of over 3,500 twin pairs. **Christiansen (1977)** found concordance rates in MZ twins of 35% compared with 13% for DZ twins. **Dalgard and Kringlen (1976)** found similar results of 26% for MZ twins and 15% for DZ twins. The findings of these studies suggest that genetic inheritance plays a role in criminal behaviour. However, although concordance rates are higher in MZ than DZ twins, the correlations are low. It has therefore been suggested that MZ twins behave more similarly than DZ twins because they are treated more similarly, that is, their behaviour could be attributed to nurture rather than nature.

In order to tackle this issue, researchers have used adoption studies to compare the behaviour of adopted children with biological children. **Hutchings and Mednick (1975)** found that 11% of sons whose adoptive fathers had a criminal record were likely to develop one. In sons whose biological fathers had a criminal record, the likelihood rose to 21%, which supports the suggestion of genetic inheritance. In families where neither the biological nor the adoptive father had a criminal record, sons had only a 10% chance of acquiring one. Where both the adoptive and biological fathers had a criminal record, sons had a 36% chance of acquiring a criminal record. While these findings support the role of genetic influence on criminal behaviour, they also highlight the role of environmental factors.



Discussion

There are several limitations to studies that aim to determine a genetic role in criminal behaviour. Research may lack internal validity because criminal behaviour is difficult to **operationalize**. Bohman et al. (1982) suggested that alcohol abuse is associated with violent crime. According to this theory, it is argued that a predisposition towards alcoholism is biologically inherited, rather than a predisposition towards criminal behaviour. Criminal behaviour is also linked with environmental factors such as poverty, unemployment, and low socio-economic status. As family members share the same environment, they share the same risks. Maternal stress during pregnancy can also be a risk factor for behavioural disorders, antisocial, and criminal behaviour in children, again supporting an environmental rather than a biological cause.

G. Conclusion

Twins studies demonstrate a higher concordance rate for several types of behaviour in MZ than DZ twins but correlations vary greatly and are never 100%. It has been suggested that MZ twins behave more similarly than DZ twins because they are treated more similarly, that is, their behaviour could be attributed to nurture rather than nature and similarities could be explained as self-fulfilling prophecies. Similarities in the behaviour of biological parents and their children does support a genetic influence. However, similarities between children and their adoptive parents suggests an environmental influence. It has also been argued that because most adopted children are not adopted at birth, their behaviour might be influenced by their experiences prior to adoption. The role of genetic inheritance provides one explanation of behaviour from a biological perspective. Further research suggests that psychological and sociological factors should also be considered.

Glossary

Body mass index: (BMI) standardized tool used to assess an individual's weight as healthy, underweight, overweight or obese.

Concordance rates: numerical value that signifies similarities in findings between one group and another.

Cultural bias: slant towards the norms of one culture, ignoring another.

Dizygotic (DZ): non-identical or fraternal twins develop from two different eggs and share 50% of same genes.

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, fifth edition.

Gender identity: sense of self related to femininity and/or masculinity, which is related to but separate from biological sex.

Genetic inheritance: features and behaviours passed on through genes from parent to child.

Informed consent: agreement to participate in research based on full knowledge of its method and purpose.

Internal validity: the extent to which a research study satisfies its aims.

IQ: intelligence quotient is a score obtained from standardized tests to denote levels of intelligence.

Monozygotic (MZ): identical twins develop from one zygote, which splits and forms two embryos, so twins share 100% of the same genes.

MZA: MZ twins raised apart.

MZT: MZ twins raised together.

Operationalize: precise definition of the variable being tested.

Predisposition: likelihood, for example, genetic tendency based on heredity.

Purging: attempts to eliminate food through self-induced vomiting or the use of laxatives to increase defecation; behaviour associated with bulimia.

Self-fulfilling prophecy: something happens because we expect it to happen.

Self-selected: participant sample of volunteers.

Worksheet: The Role of Genetic Inheritance: Research Studies

Name _____

1. Explain the importance of informed consent in genetic research.

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2. What conclusions can be drawn about the role of genetic inheritance in bulimia from psychological research studies?

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3. Create a bar chart to illustrate the findings of Stunkard et al.'s (1990) study of obesity rates in MZ and DZ twins.

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4. To what extent can intelligence be explained in terms of genetic inheritance?

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5. *'His father was a criminal, his mother was a criminal, and there is no doubt that Steve will become a criminal.'*
Draw on psychological research to discuss the prediction about Steve.

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