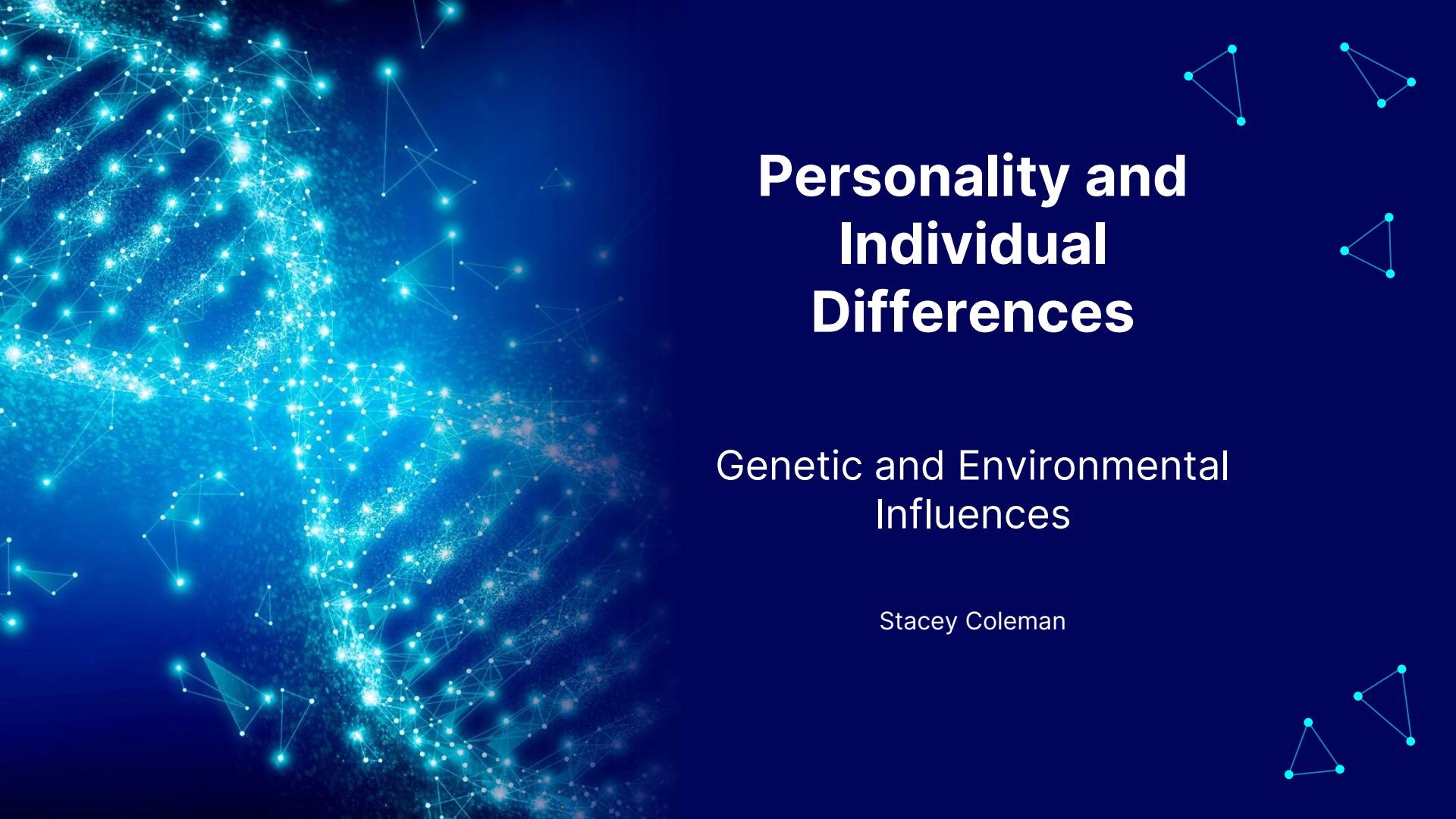




Personality and Individual Differences

Genetic and Environmental
Influences

Stacey Coleman

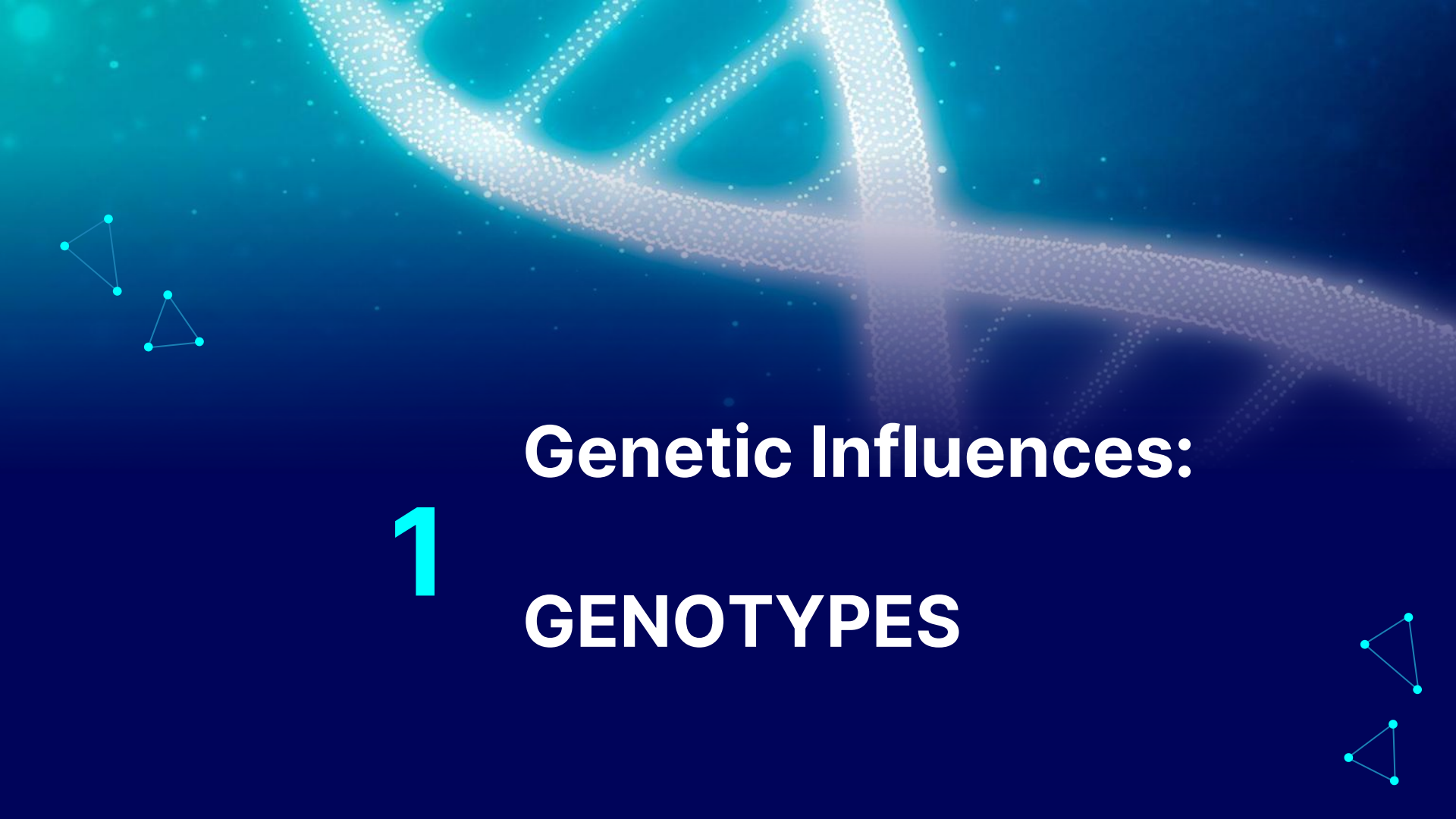
What influences the development of individual differences?

Genetic factors



Environmental factors





Genetic Influences:

1

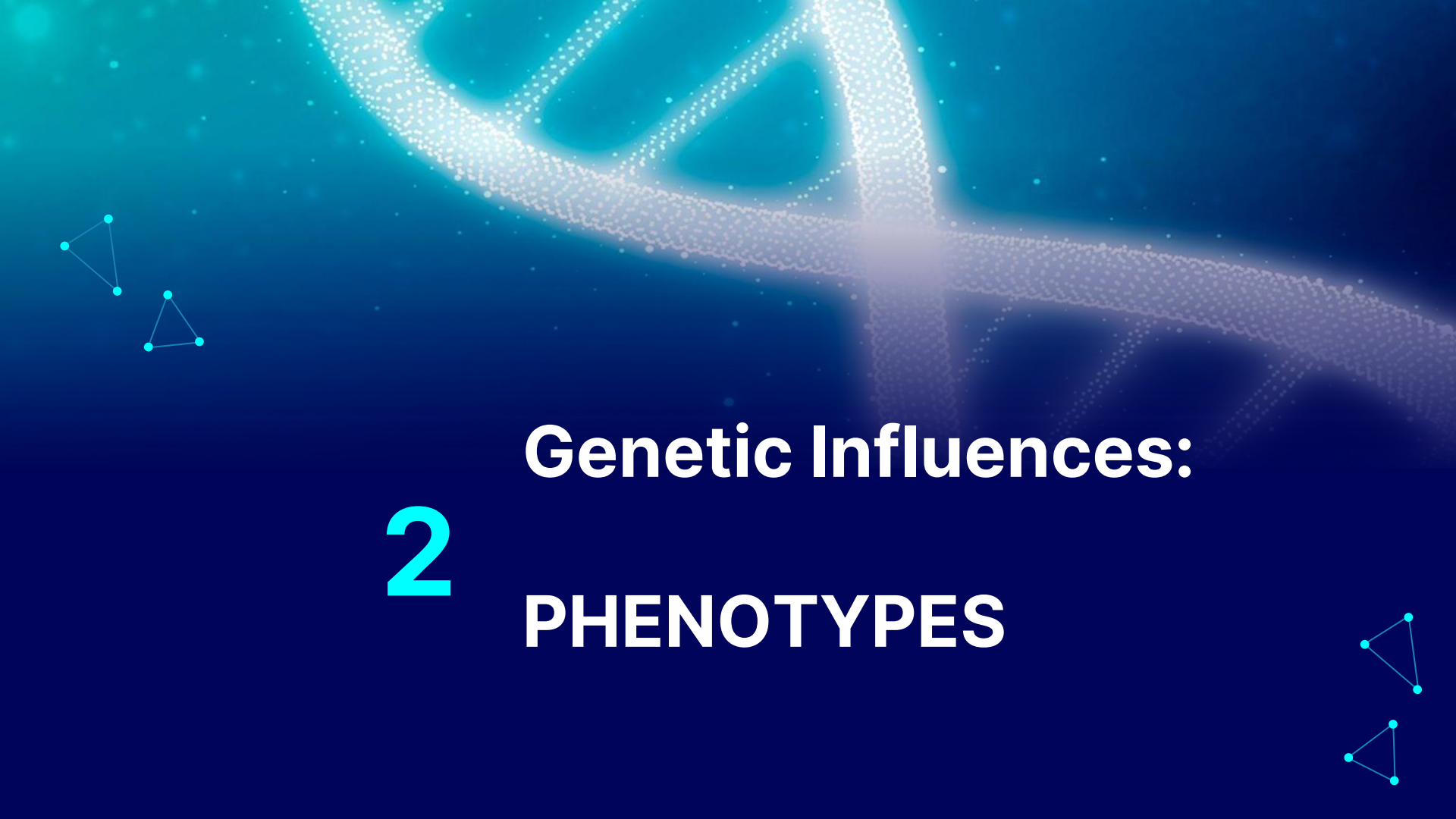
GENOTYPES

Genotype

Internal genetic code / blueprint

A genotype is genetic code that is biologically inherited





2

Genetic Influences:

PHENOTYPES

Phenotype

Outward manifestation of a person

Most obvious phenotypes are our physical appearance

Information in our genotypes determines what we look like

- We share characteristics with parents



Phenotype can also be our personality





 Genotypes → phenotypes

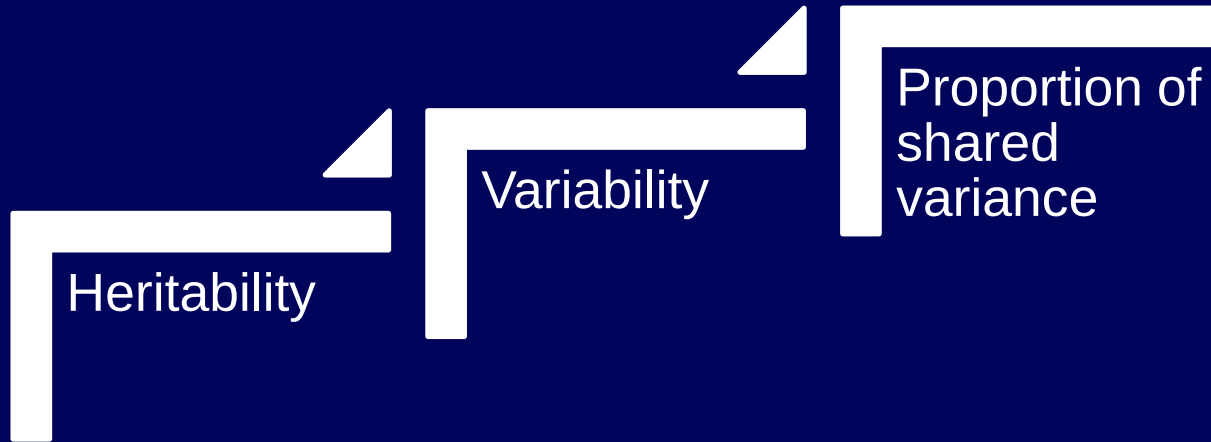
What are some phenotypes that are influenced by genotypes (inherited genes)?





Behavioural Genetics

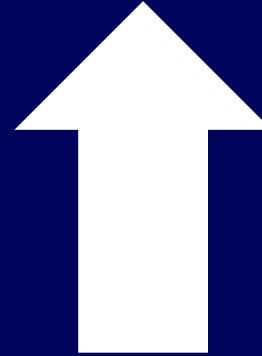
Behavioural genetics explore how our genotype influences our personality



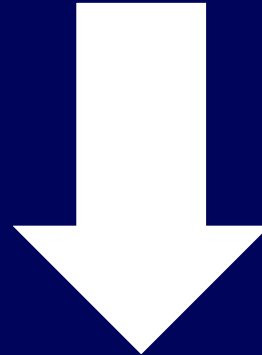
Behavioural Genetics

Heritability

Genetic heritability of any phenotype is assessed according to **variability** between parents and child



High heritability = genetic factors play a significant role in explaining the observed variation in a trait



Low heritability = environmental factors have a stronger influence



Behavioural Genetics



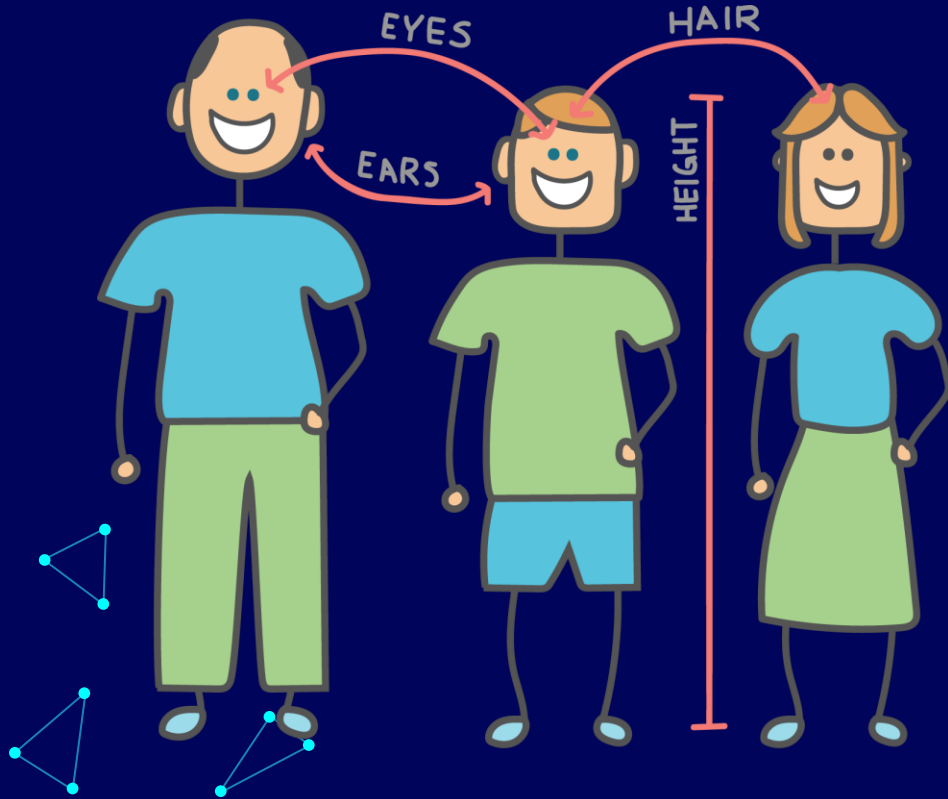
Variability

Variability is considered to be the proportion of **shared variance** (out of 100%)

This is a quantification of how much of the variance in a specific trait is due to genetic factors versus environmental factors



Parent Child Parent



Very similar
characteristics

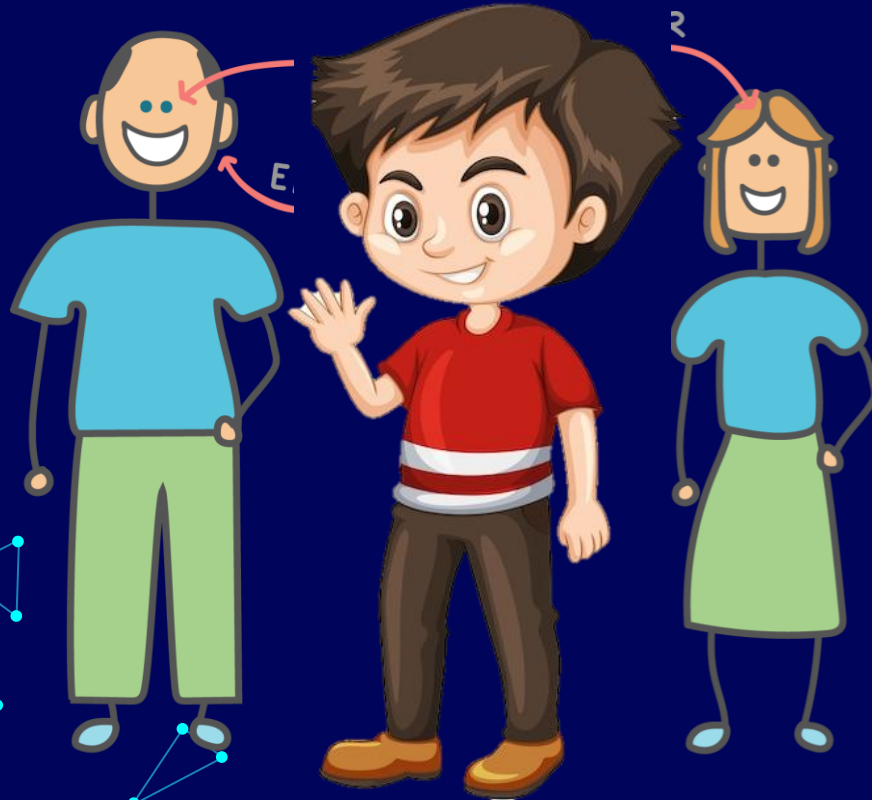


Low variability
between parent and
child



High proportion of
shared variance

Parent Child Parent



Very different in
characteristics



High variability
between parent and
child



Low proportion of
shared variance



Behavioural Genetics

There are some physical characteristics that are entirely genetic



Having eyes has zero environmental influence

But there are other aspects of human behaviour that the environment is thought to have an influence on

There are greater amounts of **heritable variability**



A close-up, low-angle shot of a soccer player's right foot, wearing a black cleat with yellow studs, positioned just above a worn, black and white soccer ball on a green grass field. The player is wearing red socks with white stripes at the top. In the background, a large, blurred crowd of spectators fills a stadium under bright, hazy sunlight, creating a lens flare effect.

Heavily determined by
environmental factors...

??

Summarising behavioural genetics

1

Aims to estimate the extent of genetic heritability of behaviour or characteristics

2

States the genetic heritability of that behaviour in terms of shared variance



The background is a deep blue gradient. A large, glowing DNA double helix structure, composed of many small white dots, curves across the upper half of the image. In the lower-left and lower-right corners, there are small, faint geometric shapes made of white dots connected by lines, resembling triangles or molecular structures.

3 Environmental Influences

Environmental Influences

Includes parenting styles, socioeconomic status, and family dynamics

Family

Social /
Cultural

Broader context in which people are raised can shape values, beliefs, and behaviours, contributing to individual differences.

Peers

Peers play a crucial role in shaping individual differences. Can influence behaviour, attitudes, and beliefs.



TASK



Consider how genetics and/or environmental factors have influenced individual differences in one of the following sets of celebrity siblings



The background is a deep blue gradient. A large, glowing DNA double helix structure is the central focus, composed of many small white dots connected by lines. To the left of the helix, there are two small, light blue geometric shapes, each consisting of three dots connected by lines. In the bottom right corner, there are two more similar light blue geometric shapes, one above the other.

Assessing Genetic Influences on Personality



Assessing differences in personality

Three main types of study:



Family Studies

Twin Studies

Adoption Studies



Assessing differences in personality

Three main types of study:

Family Studies



All children share an average of 50% of genes with each of their parents and their siblings

Twin Studies

Adoption Studies

Observations etc not always useful

- *Similarities may not be because of genetics...*





Assessing differences in personality

Three main types of study:

Family Studies

Allow for the comparison of genetic makeup to compare genetic influences

Twin Studies

Twins share the same uterus (internal environment)

Adoption Studies

1. Monozygotic Twins

MZ twins = identical
Single egg → two embryos
100% of genes shared (*MZ twins are always the same sex*)





Assessing differences in personality

Three main types of study:

Family Studies

Twin Studies →

Adoption Studies

Often the case that MZ, DZ and non-twins are compared to assess the influence of genetics

2. Dizygotic Twins

DZ twins = non-identical (fraternal)

Two eggs → two embryos

Around 50% of genes shared (DZ twins can be different in sex)





Assessing differences in personality

Three main types of study:

Family Studies

Allows for the influence of genetics **and** the environment to be compared

Twin Studies

e.g., personality characteristics between parents and adopted children can be compared because there is no genetic heritability

Adoption Studies



Common to explore twins and/or siblings reared apart to examine the extent of environmental / genetic influence





Assessing differences in personality

Three main types of study:

Family Studies

Twin Studies

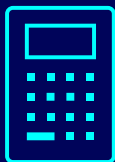
Adoption Studies

Considering all of these together, we can start to make assessments of the extent of **genetic heritability**



Assessing differences in personality

Genetic heritability estimates (h^2) from twin studies



$$h^2 = 2 (rmz - rdz)$$



rmz = correlation for MZ twins

rdz = correlation for DZ twins

Personality dimension	MZ twins	DZ twins	Heritability estimate
Openness	.54	.35	38%
Conscientiousness	.54	.18	72%
Extraversion	.56	.28	56%
Agreeableness	.42	.19	46%
Neuroticism	.53	.13	80%



Assessing differences in personality

Adoption studies

Note: when measures have been obtained from both biological and adoptive parents, children have been found to have similar personality characteristics to their biological parents

1. *Pedersen et al. (1988): Extraversion and Neuroticism*
160 x MZRT, 99 x MZRA, 212 x DZRT, 229 x DZRA

- Correlations in personality for MZ twins reared together AND apart are larger than for DZ twins reared together and apart
 - Suggests a genetic influence on personality for both E and N
- 



Assessing differences in personality

Adoption studies

2. *Hershberger et al. (1995): Extraversion, Neuroticism and Openness*
58 x MZRT, 35 x MZRA, 81 x DZRT, 68 x DZRA

- Correlations show evidence for the genetic influence on Extraversion and Neuroticism, but not so strongly for Openness
- Again, suggests a genetic influence on personality for (at least) both E and N





Assessing differences in personality

Adoption studies

2. Bergeman et al. (1993): Openness, Agreeableness and Conscientiousness
132 x MZRT, 82 x MZRA, 167 x DZRT, 171 x DZRA

- Genetic influence for O and C similar to previous findings (N and E)
- A = less genetic influence

Each of these adoption studies suggest a genetic influence on personality for most aspects of personality





Assessing differences in personality

Warning on assessing genetic variance

1. Dominant and recessive genes
2. Interactive genetic variance

Assessing genetics is much more complicated than assuming that genes are one single entity... but it is a start





Your turn: Genetic heritability of personality disorders