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Behaviour Genetics and growing up in poverty

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What is a gene?

- Unit of heredity
- A segment of DNA located on a specific chromosome
- Responsible for the synthesis of a particular product within a cell
- Most genes are constant across individuals but a few have varied forms...



Variation can have physical implications...

- Mendel: genetic effects on pea plants





Genes code for physical features in humans

- This includes physical features
 - Identical twins appear very similar
- This also includes the physical features of their brains (structure, neurotransmitters etc)
 - We know these things are likely to influence behaviour



Complex quantitative traits

- E.g., Height, Cognitive ability, Hyperactivity, Antisocial behaviour
- Lots of different sources of variation
 - Environment influences
 - Lots (100s?) of genes each of small effect



Why worry about genetics?

- Genetic effects appear important in explaining behavioral variance
- “Environmental effects” identified in non-genetic designs may be genetic effects in disguise

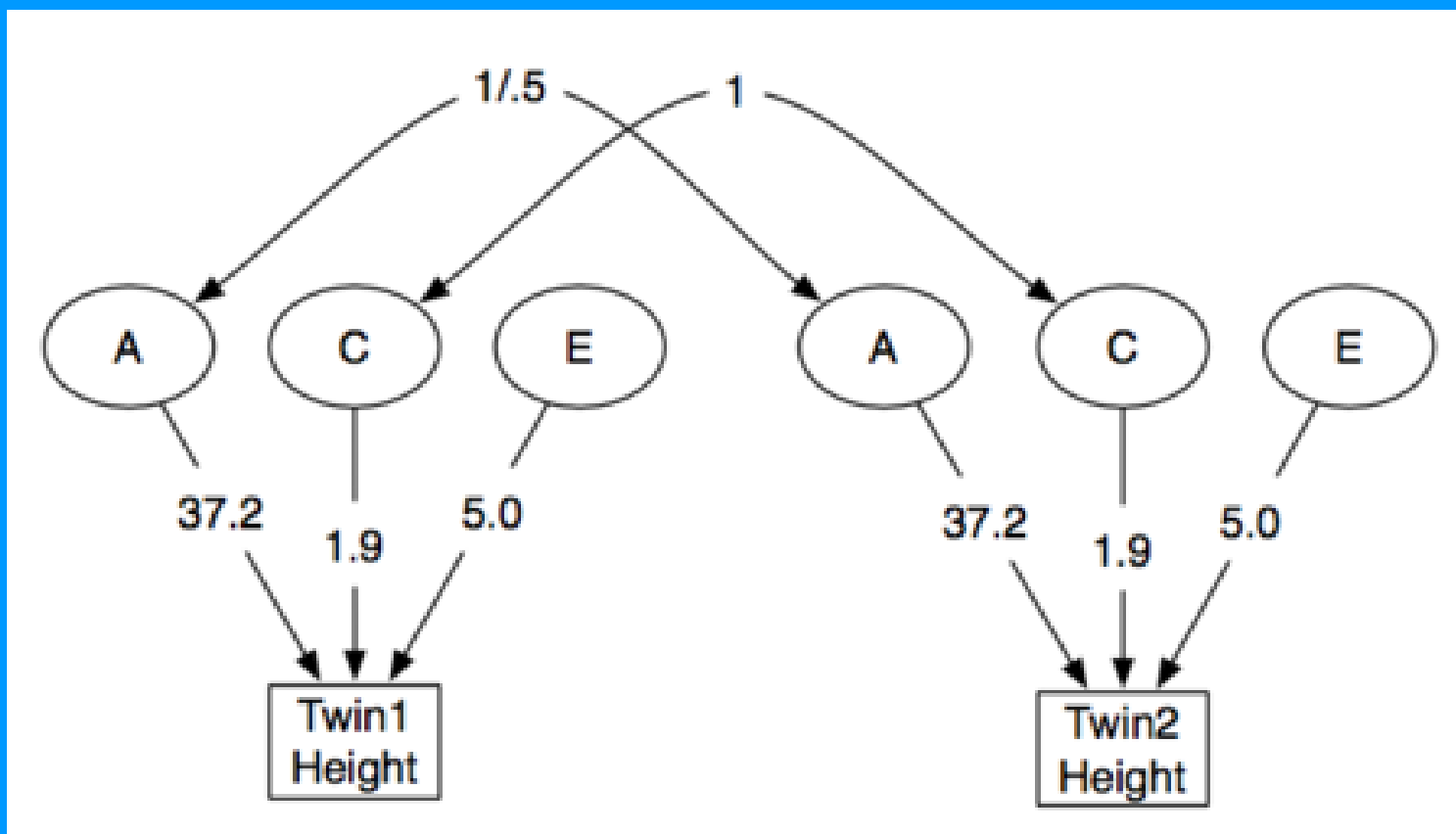


The classical twin study

- Compares MZ (identical) and DZ (50% similar)
- Estimates
 - **A**dditive genetics (heritability)
The proportion of variance in the trait due to genes
 - **C**ommon environment
Environmental effects that make twins similar
 - **E**nvironment specific to each twin
Environmental effects that make twins similar (inc measurement error)



ACE Structural equation model





Conduct Problems

$r_{MZ} = .66, r_{DZ} = .38$

Additive genetics = .56

Common environment = .10

specific Environment = .34

Virginia Twin Study, Eaves et al., 1997



Social class in the Classical Twin design

- Contribute to C estimate?
 - C estimates tend to be low (although upper CI may be high)
 - Effects may differ between children in same family (eg one twin may be more resilient)
- Social class effects may not be simple...



Gene-Environment interaction

- Genes have different effect on behaviour depending on environment
- Response to environmental stimulus moderated by genetic make-up



Genetic x SES interaction for IQ

- Heritability 5% in low SES families, but 50% in high SES families (Tucker-Drob et al., 2010)
- High SES families provide the environment in which genetic potential may be reached?
- But studies not all consistent...



Gene-Environment correlation

- Family environment depends upon heritable parent characteristics
- Genotype passed to children correlates with family environment
- Can result in a spurious correlation between environment and behaviour



Conclusions

- Genetics appear to account for a large proportion of variance in behaviour
- Offer an important opportunity to learn about environmental effects
 - (Also see MZ-Difference designs)
- SEMs being developed to estimate GxE correlation and interaction simultaneously



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