

# Genes and a child's environment: *what a health visitor should know*

A short guide to how a child's development is influenced by a combination of their genes and environment and what this means for health visitor-led intervention



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# The key questions

- Is children's development "in their genes"?
- How do we know it's "in their genes"?
- Should I trust what I read in the media?
- Is intervention always possible?
- What does the future hold?
- Where can I find out more?



# Is children's development "in their genes"?

A child's genes are set from the moment of conception  
... is this when who they are to become is determined?

## Genes:

- our chromosomes contain over 20 000 genes
- pieces of code which carry instructions for all the workings of the cells that our bodies are made up of
- tiny differences in genetic code make us different from each other

Research has shown that all human characteristics, both physical and mental, are influenced by genes



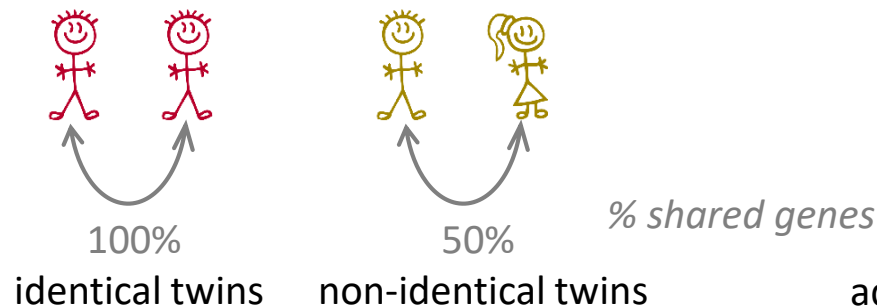
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# How do we know it's "in their genes"?

Answer - *the same way we know it's also "in their environment"*

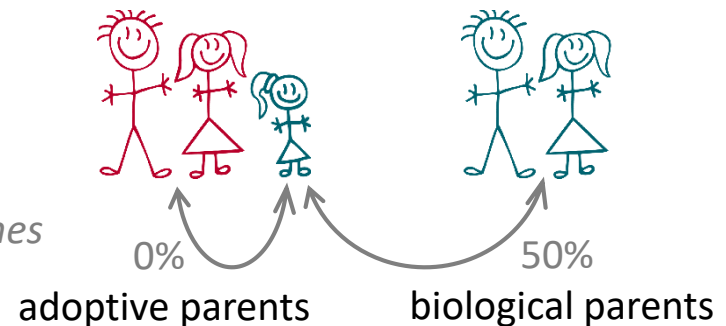
Research comparing how many genes people share with how alike they are:

## twin studies



If genes influence a characteristic, generally identical twins (share 100% of their genes) will be more similar than non-identical twins (share 50% of their genes)

## adoption studies



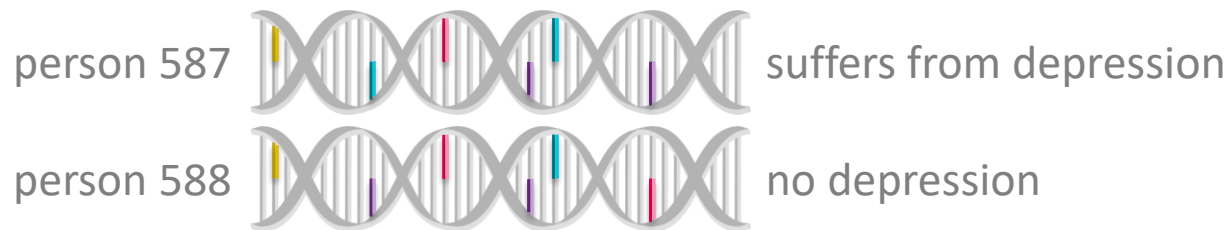
If genes influence a characteristic, generally an adopted child will be more similar to their biological parents (share 50% of their genes) than to their adoptive parents



# How do we know it's “in their genes”?

Research comparing how many genes people share with how alike they are:

- *GCTA analysis* - compares how similar people's actual genes are (by studying the DNA code) with how similar they are in a characteristic



Heritability of personality traits, attitudes and mental abilities are usually found to be in the region of 30-70%

... so **the environment (which can be changed!)** is also very influential



# Should I trust what I read in the media?

Much exaggeration, hype and misinterpretation of the research

*WRONG:*

example 1 - “Genetics outweighs teaching: 70% of a child’s academic achievement is genetically derived and, therefore, their genes are more important than the teaching they receive.” (Dominic Cummings, Government Advisor, 2013)

- Heritability does *not* measure how much of a characteristic is due to the environment and how much is due to genes
- Heritability does *not* say anything about an individual child
- Heritability is *not* a fixed figure
- Heritability does *not* say whether a child’s development can be changed



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# Should I trust what I read in the media?

*WRONG:*

example 2 - “Gene for aggression found!”, “Happiness gene discovered!”

- these are influenced by hundreds of genes, each with a tiny effect
- often overhyped studies of rodents (fairly non-human in personality!)





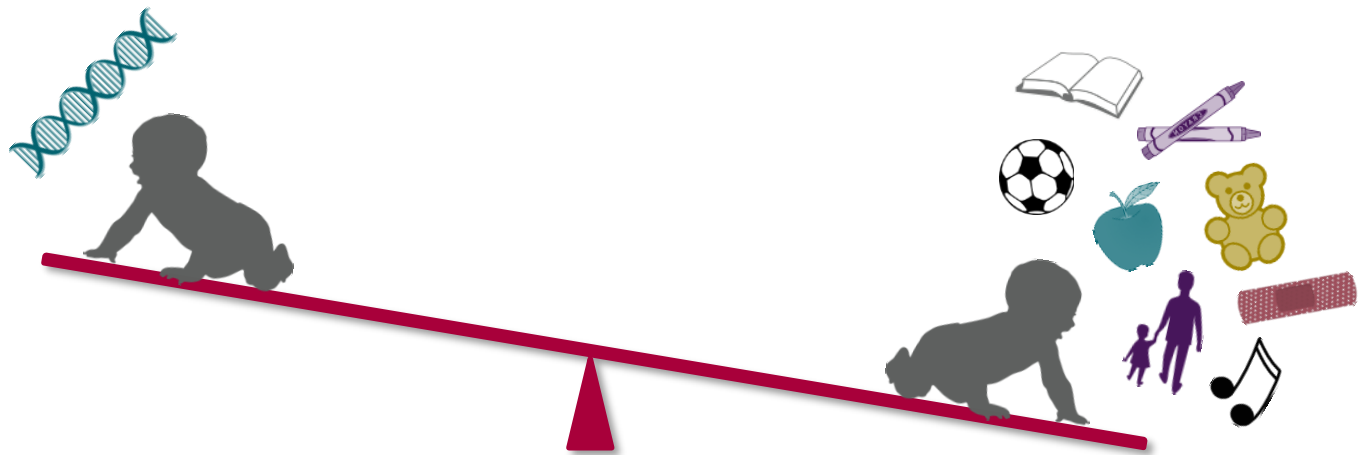
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# Is intervention always possible?

Yes! Genes do *not* determine characteristics.

Yes! Genes do *not* limit how a child's life can be changed for the better.

Genes' influence on a child's development depends on their experiences, *which intervention can change* (this is called gene-environment interaction)







# Is intervention always possible?

- children develop problems such as depression or antisocial behavior when there is a *combination* of genetic predisposition to depression or antisocial behavior *and* being abused/raised in difficult circumstances
  - intervention can “neutralise” genes that have a negative influence
- children with genetic sensitivity to “bad” environments (*e.g.*, more at risk of aggression) might also be more sensitive to “good” environments
  - at risk children could be exceptionally responsive to intervention



# What does the future hold?

This area of research is quite new so there are few findings that can be applied to health visitor practices at the moment ... future potential (probably quite a long way off) for exciting advances

- **Who is at risk?**
  - if the collection of genes influencing a characteristic is identified, genetic testing to find children most at risk would be possible
- **What is the best intervention?**
  - studying how genes and environment interact will reveal which aspects of the environment would be most effectively changed
- **Can intervention be more personalized?**
  - different genes means children respond differently to interventions
  - better understanding will allow personalized approaches



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# Where can I find out more?

<http://www.eif.org.uk/genetics-and-the-environment/>

This web page contains the following resources:

## ***What is known about interactions between genes and the environment in relation to early intervention?***

An ESRC-funded review of the relevant genetics and heritability literature.

## ***Focus articles on “nature-nurture”***

Accessible explanations of what makes us the individuals we are and the implications of the latest research for early intervention

- *“Nature-Nurture” overview*
- *Heritability*
- *Twin and adoption studies*
- *Finding the genes that make us who we are*
- *The complex relationship between genes and the environment*
- *Ethical issues associated with finding the genes that make us who we are*

## ***Multilevel systems problem of gene-by-environment interaction***

A discussion paper on the difficulties involved in researching the interplay between genes and the environment.