

The background is a light beige color. In the top-left corner, there is a white circle partially cut off by the edge, with several blue dashed wavy lines flowing downwards from it. In the bottom-right corner, there is another white circle partially cut off, with several blue dashed wavy lines flowing upwards from it. A solid orange line also flows from the bottom-right towards the center of the page.

Intelligence



Outline

- + What is intelligence?
- + How is intelligence measured?
- + Nature vs. Nurture
- + Dynamics of intelligence

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What is intelligence?

What is intelligence?

- + Why does this question matter?
- + What are some examples of intelligence?
- + Is it a challenge to produce a coherent definition?

What is intelligence

- + The definition of intelligence depends on who is measuring it
- + *Intelligence: The ability to learn from experiences, solve problems, and use that knowledge to solve new novel problems or situations*

What is intelligence

- + Imagine that someone is a math wiz
 - + Not so great at biology, is this person unintelligent?
 - + Is this evidence of multiple intelligences?
- + Who determines how intelligence is measured and thus what it is?
 - + Psychologists
 - + Physicians
 - + Educational Systems

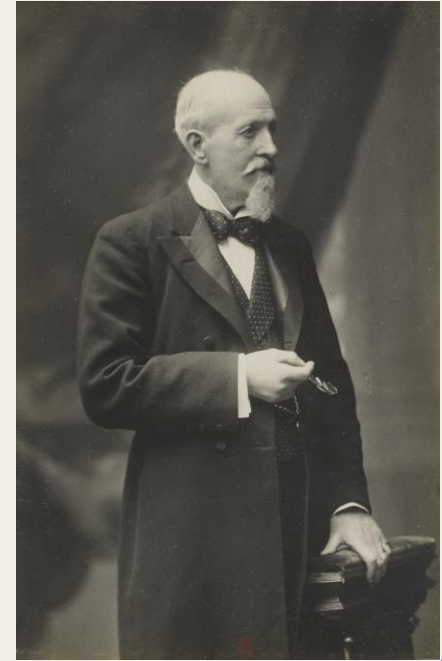
How was intelligence measured?

+ Charles Spearman

- + Measure intelligence through "g" --- the essence of intelligence
 - + If you're good at one thing, you're likely to be good at others
- + What is "g"
 - + g is a composite of multiple intelligence tests
 - + g is the mathematical relationship that accounts for correlations across many different tasks
- + What isn't "g"
 - + It's not a specific location in the brain
 - + It isn't something completely innate --- thought to be approximately only 40-50% heritability rating

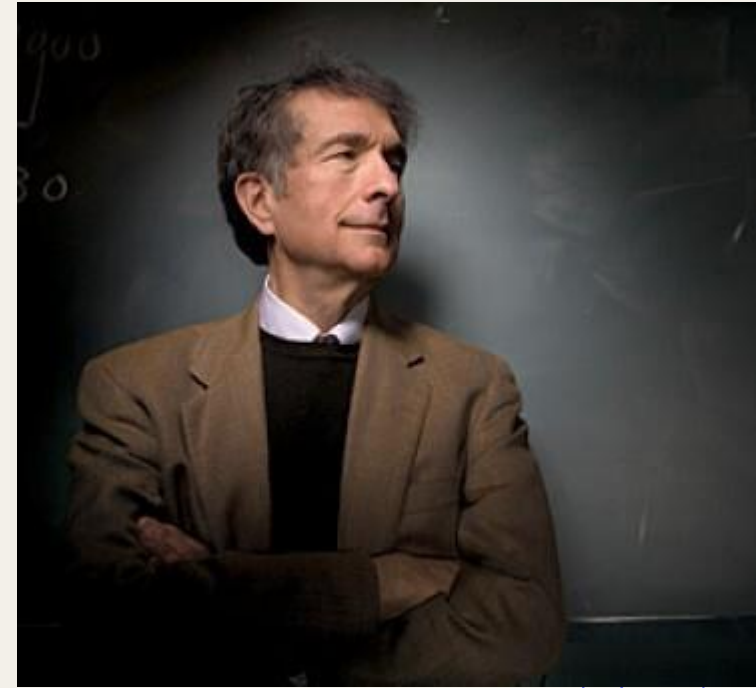
+ Louis Thurstone

- + Many intelligences: word fluency, verbal comprehension, spatial ability, perceptual speed, numerical ability, inductive reasoning, and memory
- + If a person does well on one of these tests of intelligence, they tended to do well on multiple---Helping to validate the idea of "g".



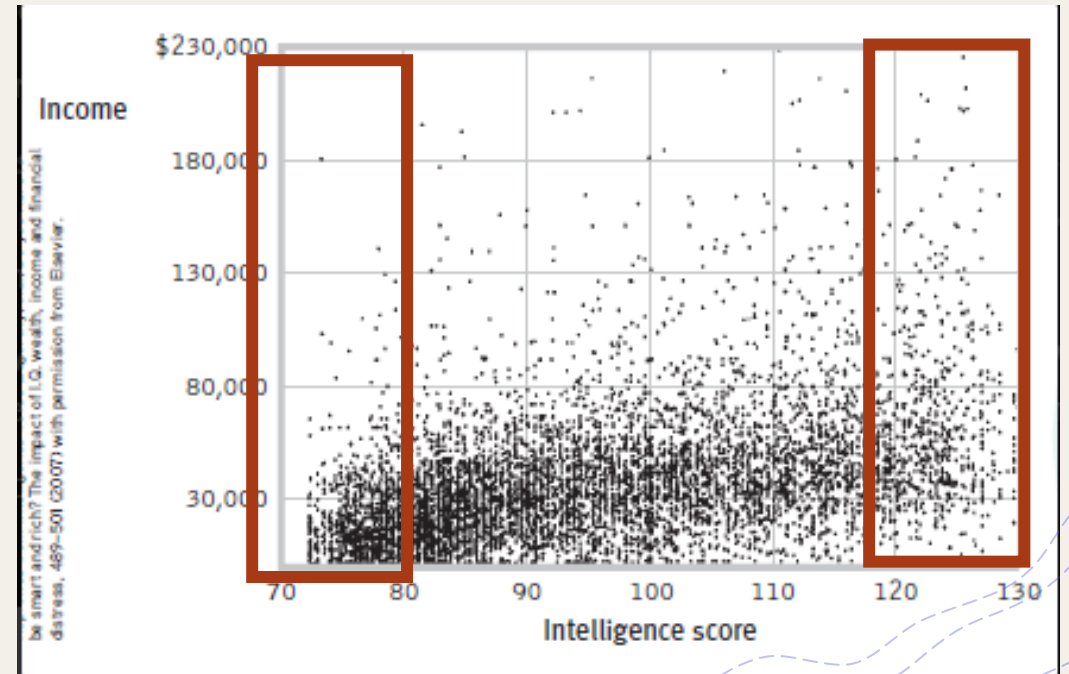
How was intelligence measured?

- + Howard Gardner's theory of multiple intelligences
 - + Naturalistic, linguistic, logical/mathematical, musical, spatial, kinesthetic, intrapersonal, interpersonal
 - + Evidence from brain damage individuals
- + Can you think of any evidence to support the idea of multiple intelligences?



What is the problem with multiple intelligences as a theory?

- + Previous work shows that a person's ability to perform well on complex problems or their general abilities are associated with their income level
- + Truer at the extremes of the distribution.



Zagorsky, 2007

What about emotional intelligence?

- + Researchers have defined what they call emotional intelligence
 - + Gardner's theory on interpersonal intelligence is closely related to emotional intelligence
- + What is emotional intelligence?
 - + Perception of emotions, understanding emotions, managing emotions, using emotions to problem solve
 - + There is evidence that it is associated with people's ability to use and understand emotions and that this ability isn't related to general IQ measures.
- + What's wrong with emotional intelligence?
 - + Criticized that it is too similar to interpersonal intelligence --- a distinction without a difference
 - + It doesn't describe something that hasn't been described before

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How has intelligence been measured?

+

How was intelligence measured: Through the ages

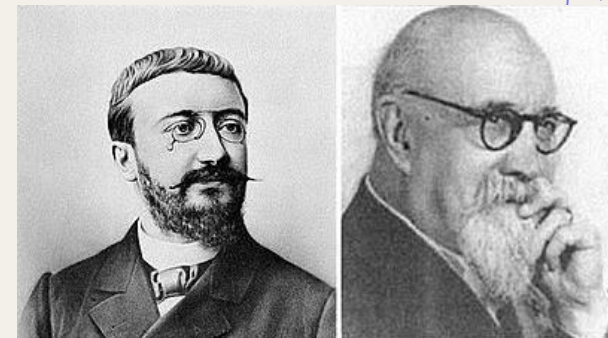
+ Francis Galton

- + Assessed intelligence with sensory processes
 - + These weren't related to socio-economic status or class status
- + Measured intelligence through sensory and motor tests (think reaction times)
- + Natural selection applies to intelligence
 - + eugenics
- + We can get the brightest to mate together :/
- + Sparked the nature vs. nurture debate



+ Simon and Binet

- + Created the idea of mental age to assess a child's ability to perform well in school
- + A child could perform well on a test designed for 9 year olds, and their mental age was 9.
 - + If they performed poorly, they might have a mental age of someone younger.
- + Believe that the environment was paramount—people can become more intelligent through hard work.



How was intelligence measured: Through the ages

+Lewis Terman

- + First developer of the IQ scale --- (mental age / chronological age) * 100
- + Took the ideas of Simon and Binet and applied them to adults.
 - + This didn't work very well.
- + Believed that if you stopped reproduction of those with a lower IQ you could curtail crime, poverty, etc.
- + This idea was used to promote immigration to the US of people who were Anglo-Saxon and stop other immigrants from entering the US.



How is intelligence measured: A Modern Take

+David Wechsler

- + Commonly used measures of intelligence called the Wechsler Adult / Child Intelligence Scale (WAIS/ WISC).

- + 4 Subscales

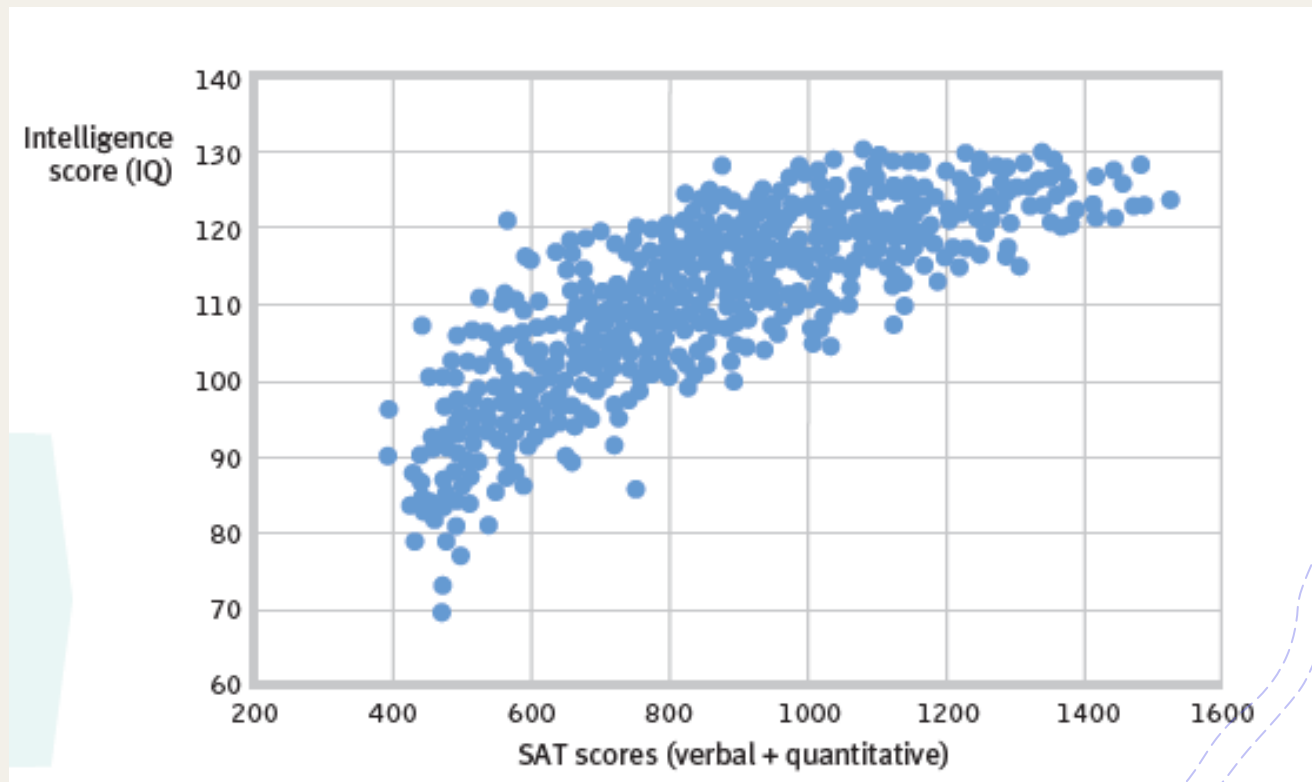
- + Similarities--- reasoning how similar objects/ concepts are
 - + Vocabulary
 - + Block design - Visual abstract processing
 - + Letter Number Sequencing - repeating letters and number given in a random order and you must put them in alpha-numeric order

- + This test yields IQ and subscale scores



How is intelligence measured: A modern take

- + We want to derive a number based on someone's performance on an exam
- + Two ways of assessing intelligence through tests
 - + Aptitude tests: designed to determine your ability to learn new skills
 - + Achievement tests: designed to test what you have already done.



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Nature vs. Nurture

Nature vs. Nurture

- + This idea was born out of the debates surrounding Galton and Simon/Binet work
- + Galton: Intelligence is genetic
 - + What if intelligence runs in a family?
 - + Are there repercussions to this?
- + Intelligence is a product of your environment
 - + How is intelligence a product of the environment you are raised in?
 - + What are the repercussions of this idea?

Nature vs. Nurture: Genetics

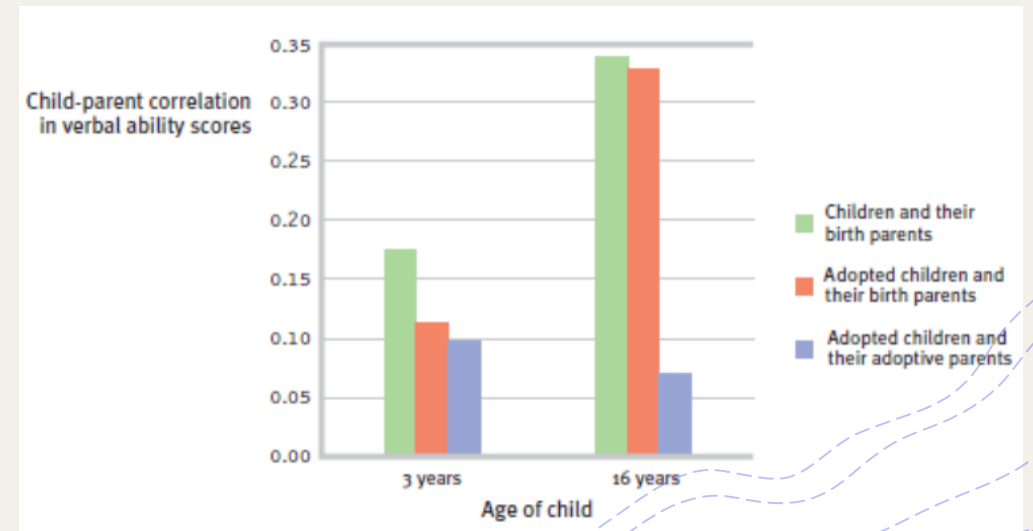
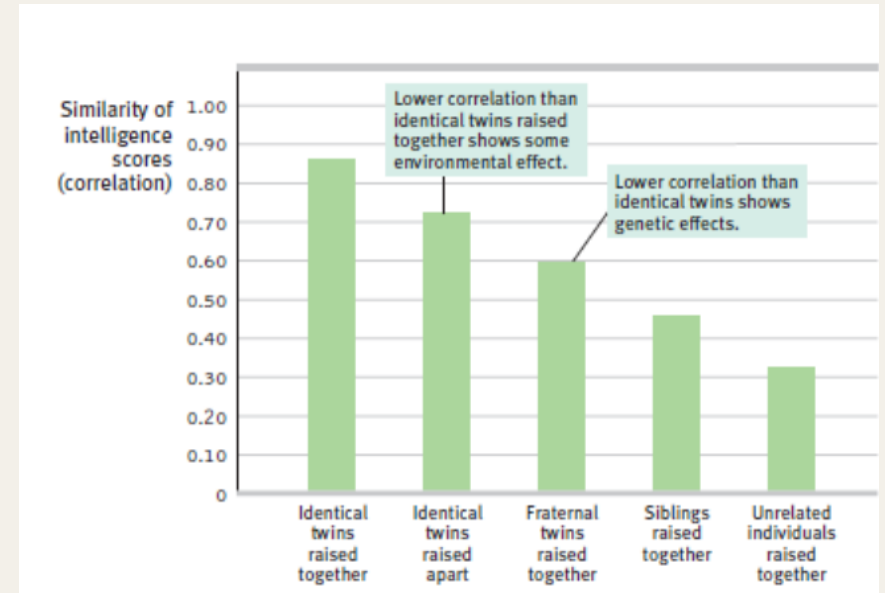
- + Twins raised by the same parents have such similar IQ scores it's as if the same person took the test twice.
- + 50% - 80% of intelligence is thought to be inherited
 - + But intelligence is likely polygenic (single genes don't determine intelligence most of the time).
 - + In some cases, certain genes can cause severe mental disability
 - + We haven't found the genes that account for this 50%-80% heritability of intelligence

Nature vs. Nurture: Environmental Influences

- + When children born into poverty are adopted by middle class families, their IQ scores are significantly improved.
- + If a child is neglected, lack of touch or communication from a very young age, those children are likely to have severely impacted mental abilities
- + Schools which have lower performing teachers are predictive of students performing worse on achievement tests compared to schools with better quality teachers.
- + An interesting component of the environment is that simply believing that someone can improve their intelligence they are likely to work harder and improve their intelligence in a sort of priming type environment.

So, is it nature or nurture?

What do you think?



Nature vs. Nurture

- + Is this debate helpful to science and society?
 - + Likely some of this debate has led to confusion and political issues
 - + But, it has also helped us advance our understanding of intelligence
- + Genetics are not deterministic, instead they are probabilistic
- + The environment matters, but so do genetics!

Dynamics of intelligence

- + Do you think intelligence is stable across the life-span?
- + Older adults (65+) tend to get more questions wrong on intelligence tests compared to younger adults (18 +)
 - + Why do you think this is?
 - + Remember that intelligence tests are typically designed to measure fluid intelligence (your ability to solve novel problems)
- + While older people tend to perform worse on general intelligence tests (fluid intelligence), they also tend to outperform younger adults on what is called crystallized intelligence
 - + Crystallized intelligence is your knowledge about things and the world. While fluid intelligence is your ability to adaptively solve problems.

Dynamics of intelligence

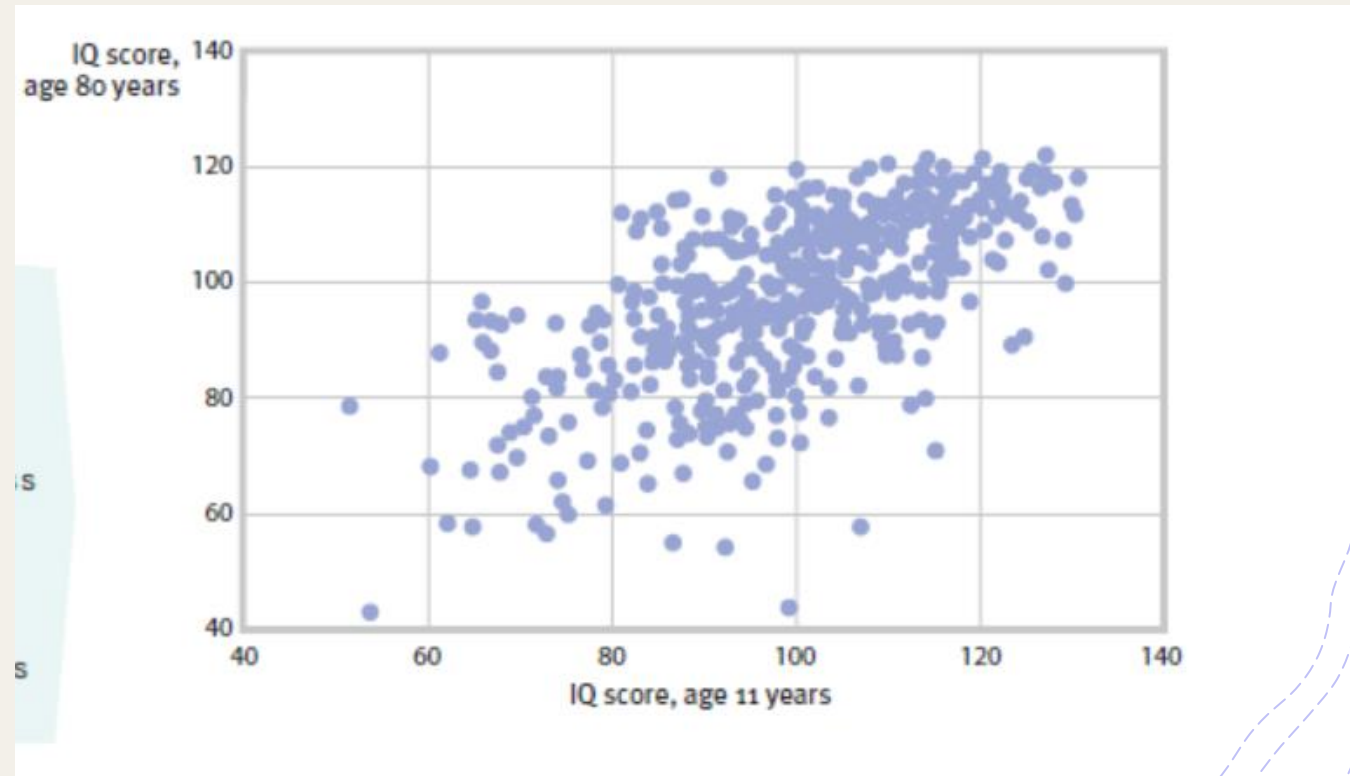
+ What about children?

- + Interestingly, by the age of 4 intelligence tests are relatively stable in their relationship with intelligence scores in adults.

+ This was shown in a study by Dreyer and colleagues

- + children at age 11 performed the same test again at age 80 and they observed strong correlations between their 11-year-old score and 80-year-old scores

+ These studies indicate that IQ is relatively stable over time



Recap

- + What is intelligence?
 - + g
 - + Multiple intelligences
 - + Emotional intelligence
- + How was/is intelligence measured
 - + IQ
 - + Aptitude
 - + Achievement tests
- + Nature vs. Nurture
 - + Genetics and the Environment
 - + Both are important
- + Dynamics of Intelligence