TOPIC 8: INTELLIGENCE

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General Psychology ↓ focus on general psychological rules, theories that are applicable to all people

Differential Psychology ↓ focus on individual differences

Talking about intelligence means that you are interested in differences between individuals not their intelligence.

INTELLIGENCE (DEFINITION) =
① the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. (Gottfredson, 1997)
② the ability to use knowledge to reason, make decisions, make sense of events, solve problems, understand complex ideas, learn quickly and adapt to environmental challenges. (Gazzaniga 2018)

INTELLIGENCE TESTING

How do we measure intelligence?

test for children → Binet, 1911

① IQ = MA/CA * 100 → indication of the overall capacity of children, increased with age

MA = mental age → corresponds to the age group that solve that particular number of items

CA = Chronological age

IQ = intelligence quotient

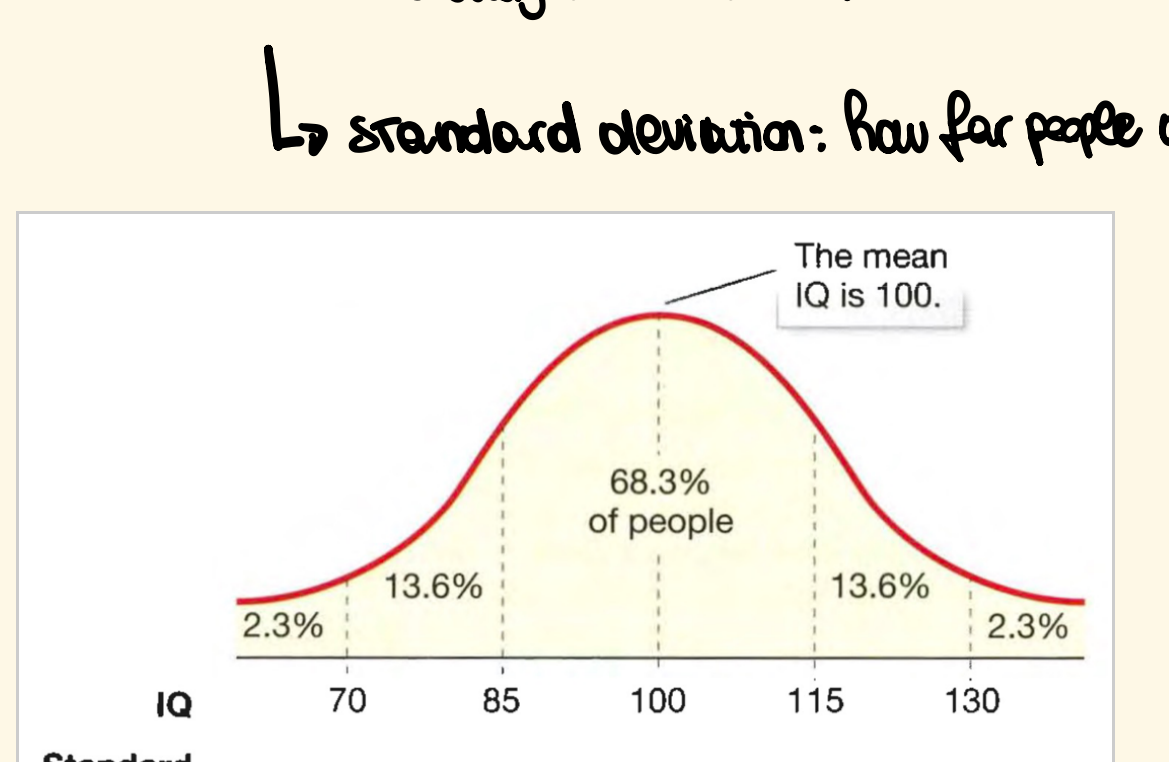
→ this score correlated really with school performance and also with the assessments made by the teachers.

PROBLEM WITH THIS TEST:
After 16 years (chronological age), the mental age does not increase.

IQ in adults → DEVIATION IQ

IQ is a score on a normed test of intelligence.
One person's score is relative to the scores of the large number of people who already took the test.

↳ standard deviation: how far people are from an average.



IQ VS DEVIATION IQ
└ performance compared with an age group
  └ performance compared between individuals

② WECHSLER INTELLIGENCE SCALE FOR CHILDREN (WISC)
↳ children tested in a particular situation

Test for adults

① WECHSLER ADULT INTELLIGENCE SCALE (WAIS, WAIS-R) (revisited)
↳ one individual is tested alone.
Test made of different subtests < verbal test / performance test.

② SCHOLASTIC APTITUDE TEST (SAT)
└ group test

③ RAVEN'S PROGRESSIVE MATRICES TEST
non-verbal test
└ you have to fill in a missing part into a certain pattern.
→ test score non-biased by language

What do we know about reliability and validity of an IQ test?

high reliability + high predictive validity
‖
results are usually consistent and this implies that results can indicate something about performance in a job, for example. → they predict performance in other situation.

↳ example:
Correlation between intelligence and job performance (but only refers to complexity)
+ income
+ lifetime expectancy
+ health
+ chance that you will die in a car accident

Is it better to perceive intelligence as one general ability (overall capacity) or different subtypes of abilities?

answer ‖
PSYCHOMETRIC APPROACH = attempt to understand the nature of intelligence by studying the pattern of results obtained on intelligence tests.

subtests:
- comprehension
- information
- arithmetic
- vocabulary

→ between 0 and 1
correlation matrix (example: for WAIS)
(not redundant, left-to-right diagonal empty 'cause it's for self-correlation of subtests)

Correlations can be high, but they are not equal to 1.
This suggests the existence of a general capacity and the existence of some specific intelligences.

⊕ SPEARMAN (1904) = general intelligence + specific abilities

⊕ CATTEL (1971) = fluid vs crystallized intelligence
- fluid: ability to deal with a new and unusual problem
- crystallized: acquired knowledge, background knowledge and cognitive skills. ability to solve known issues
they are really highly correlated

Standard intelligence tests typically fail to capture "other types" of intelligence

non-academic intelligence
• Sternberg (1999) < analytic / creative / practical intelligence } no strong evidence for their existence. they appear to be strongly correlated and it is not a justification for the fact that they are really separate.

• Salovey and Mayer (1990): Emotional Intelligence
the ability your own emotions and those of other people
⊕ control of emotions
→ it is not fully correct to see it a separate entity as it is correlated with an IQ test.

• Gardner (1983): multiple intelligences
└ linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, etc...
specific brain regions can lead to very specific deficiencies → different types of intelligence situated in different areas of the brain.
people may not be very intelligent but they may have one specific capability they are very good at.

What make people intelligent?

Different measures correlate with g (general intelligence):

1) intelligence ⟷ efficiency
the speed with which the brain transmit signals. → weak correlation between IQ and simple reaction time
= same for choice reaction time

Correlation between general intelligence and speed of mental processing

Simple vs choice
- simple: you have to perform a task as quickly as possible as you receive a stimulus
- choice: you have to choose between two answers

2) Correlation −0.5 with Discrimination Task Performance → 2 stimuli, 1 mask stimulus.
How long do participants take to discriminate the two stimuli.
the smaller the reaction time the larger our IQ is.

3) Working memory capacity
└ measured by reading out a list of items or complex sentences and participants are asked afterwards to repeat the last word of the sequence.
→ measures the number of items that can be repeated and these number reflects the number of items kept in working memory simultaneously.
- simple word span task (remember only words)
- Secondary processing required (remember words + something else, like number or equations)

4) Executive control
└ ability to switch from one goal to another one (from left to right, or viceversa)

All our cognitive functions seem to be related to how intelligent we are.

THE ROOTS OF INTELLIGENCE

Score on an intelligence test is affected by both genes and the environment. (genes × environment)

Genetic influences → IQ correlates between parents and children
→ this is higher than the one between same parents and other children
they do not only share genes but also environment

TWIN STUDIES
└ identical vs fraternal twins
they differ in the way they share their genes, identical twins share 100% of their genes, while fraternal twins share 50% of their genes.

identical: correlation IQ = 86
fraternal: correlation IQ = 60

influence of genes LARGER than influence of environment
‖
ADOPTION STUDIES.

Environmental Influence

– impoverished environment: negative correlation with IQ
BUT measurement in impoverished environments exhibit greater influence of the environment than the ones in enriched environments.

• impoverished environment — larger environment effect
• enriched environment — larger genes effect

the expression of genes related to intelligence appears to be altered by the environment.
↓ it requires
the presence of a minimal environment, not present in impoverished environment.

– Environmental factors <
- prenatal and postnatal factors
- SES, social economic status (income)
- education
- overall change in environment
} they may lead to changes in IQ

– FLYNN EFFECT:
the IQ scores have risen dramatically during the last century of intelligence testing.
↳ As genes cannot have changed much during this period, the increase must be due to environmental factors or epigenetic effects.
→ COGNITIVE ABILITIES escalate within the span of one generation.

HERITABILITY(H) = indication of the extent to which the variance in a trait within a certain population in a certain environment is determined by genetic variance.

$H = \frac{\text{Genetic Variance}}{\text{Phenotypic Variance}}$ → $0 \leq H \leq 1$ < only genetic influence = 1; only environmental influence = 0

to perform it there must be a variation in the population.

↳ for intelligence it is $0.4 \leq H \leq 0.7$

poor environments → lower IQs → smaller variations among individuals
vs
rich environment → higher IQs → larger variations among individuals.

→ our genes give us the possibility to develop a certain level of intelligence → poor environment → brain cannot optimally develop. → the potential you were genetically born with cannot express itself.

Group differences:

– men vs women: is the gender difference relevant for the difference in IQ?
– blacks and whites (white are in more favourable conditions)