



Intelligence testing

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History of Influences in the Development of **INTELLIGENCE THEORY & TESTING**

Student / Asst. of
influenced by

Historical
Foundations
up to 1690

Plato	Thomasius	Aquinas	Itard
Pascal	Augustine	Kant	Hobbes
Aristotle	Smith	Huarle	Esquirol

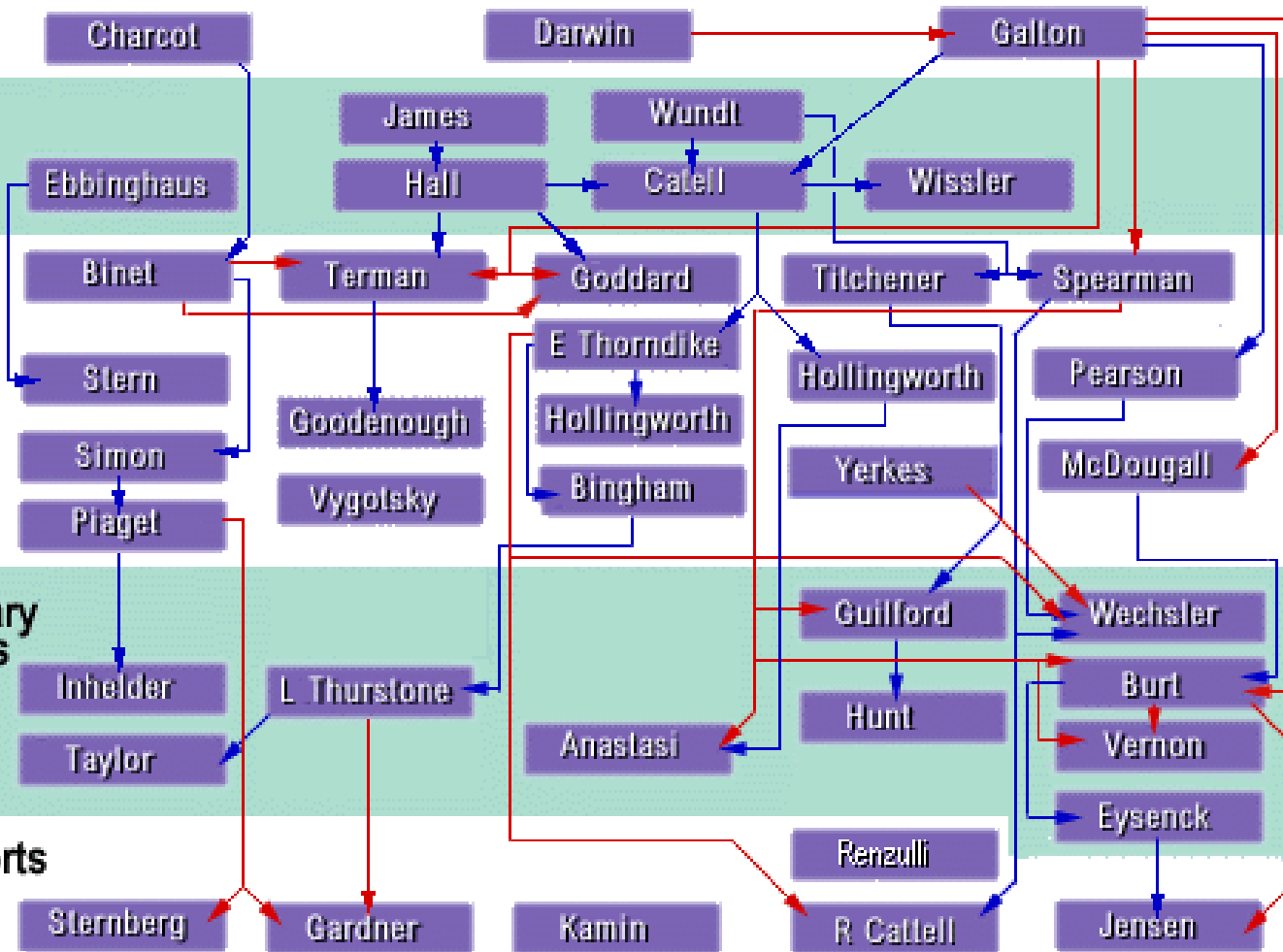
Modern
Foundations
up to 1869

The Great
Schools
up to 1901

The Great
Schools
Influence
up to 1937

Contemporary
Explorations
up to 1969

Current Efforts
up to
present day



Theories we will look at today

- Binet
- Goddard and Terman
- Yerkes
- Wechsler
- Wais and Wisc
- Raven progressive matrices

The birth of the IQ test

France legislates mandatory primary education in 1882.
Government requests a test to identify students who need
“special ed.”

Alfred Binet publishes (with
Theodore Simon) the first widely-
used standardized IQ test (with 30
subtests) the Simon-Binet Scale
(1905)

How are a fly, an ant, a butterfly, a flea alike?

Digit
repetition

Sentence
completion

Point to an
object in a
picture

Conscious
recognition
of
resemblances

Moral judgment

Recognition of food

- Revised scale published in 1908
- If 75-90% of children in age group pass, it was assigned that age level
- Rejected notion of “IQ”
- Early IQ tests gave estimate of children’s MENTAL age by comparing their performance on various tasks with performance of children at various ages

Henry Herbert Goddard (1866-1957)

- Translated the Binet-Simon intelligence scale into English (1908)
- Distributed 22,000 copies of the translated Binet scale and 88,000 answer blanks across the United States (1908-1915)
- Established the first laboratory for the psychological study of mentally retarded persons (1910)
- Helped to draft the first American law mandating special education (1911)
- Strongly argued the hereditarian position

Stanford-Binet Intelligence Scale

Lewis Terman (1916-72) first U.S. intelligence test

- Interested in gifted children
- translated and modified Binet's scale
- Heavy reliance on vocabulary/language skills
- incorporated old items from the Binet scale, plus some new items

Poorly standardized on 1000 children and 400 adults who were not selected with care

- Developed Intelligence Quotient

$$IQ = (MA/CA) * 100$$

MA = Mental Age; CA = Chronological Age

Vocabulary

- 1. Orange.
- 45. Sportive.
- 80. Exaltation.
- 92. Theosophy

Interpretation



Similarities

- Snake, cow, sparrow
- Book, teacher, newspaper
- Wool, cotton, leather

1916 Stanford-Binet Sample Items for 12 yr olds

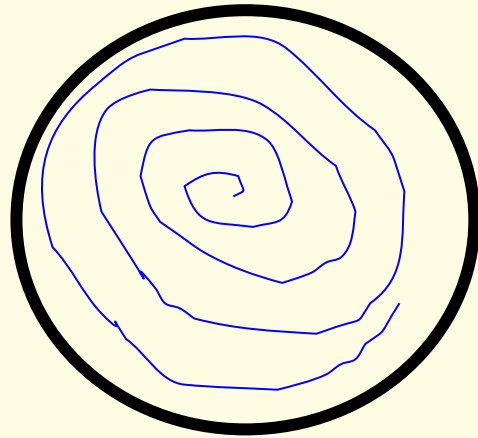
Memory

3-1-8-7-9

6-9-4-8-2

5-2-9-6-1

Practical Problem Solving



Grammar

- FOR THE STARTED AN WE COUNTRY EARLY AT HOUR
- TO ASKED PAPER MY TEACHER CORRECT I MY
- A DEFENDS DOG GOOD HIS BRAVELY MASTER

Stern 1912

- calculated as...
- $$IQ = \frac{\text{Mental Age}}{\text{Chronological age}} \times 100$$

Nowadays NORM referenced..
that is the average
performance of a group is
calculated, then individual
comparison.

Robert Yerkes

Army Alpha/Beta
IQ Test (1917)

designed for
WWI recruits

Assumed to be testing native intelligence

Assumed intelligence and literacy independent

Alpha for literates; Beta for illiterates and non-English speakers

Alpha subtests
Oral Directions;
Arithmetic;
Practical Judgment;
Analogies;
Disarranged
Sentences;
Number Series;
Information

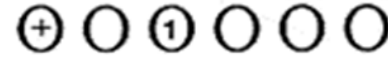
Beta subtests
Memory;
Matching;
Picture Completion;
Geometric
Construction

ARMY ALPHA

Test for Literates

Test 1 Following Oral Directions.

"When I say 'go,' make a cross in the first circle and also a figure 1 in the third circle."



Test 2 Arithmetical Problems

Ex: If it takes 6 men 3 days to dig a 180 - foot drain, how many men are needed to dig it in half a day. Answer: (36)

Test 3 Practical Judgment

If a man made a million dollars, he ought to
[] Pay off the national debt
[x] Contribute to various worthy charities
[] Give it all to some poor man

Test 4 Synonyms - Antonyms

Samples: good - bad same - opposite
 little - small same - opposite

Test 5 Disarranged Sentences

leg flies one have only true - false

Test 6 Number Series Completion

2 3 5 8 12 17 23 30

Test 7 Analogies

gun - shoot :: knife - run cuts hat bird

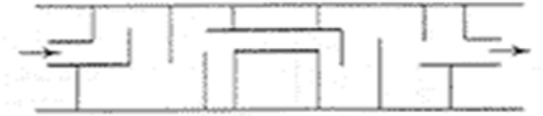
Test 8 Information

The Wyandotte is a kind of:
horse fowl cattle granite

ARMY BETA

Test for illiterates and foreign language speakers.

Test 1 Maze. Credit for correct tracing of mazes.



Test 2 Cube Analysis. Correct count of cubes.



Test 3 X - O Series. The series is to be carried out to the end of the line.

X O X O X O X O X O X O

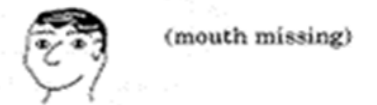
Test 4 Digit Symbol. The appropriate symbol is to be written under each number.

1 2 3 4 5 6 7 8 9
- u - j - L - U - O - A - X - =
3 1 2 1 3 2 1 4 2 3 5 2 9
- j - u - - j - u - - L - u - j - u - =

Test 5 Number Checking. Correct response indicated.

699310 X .. 699310
251004818 251004418

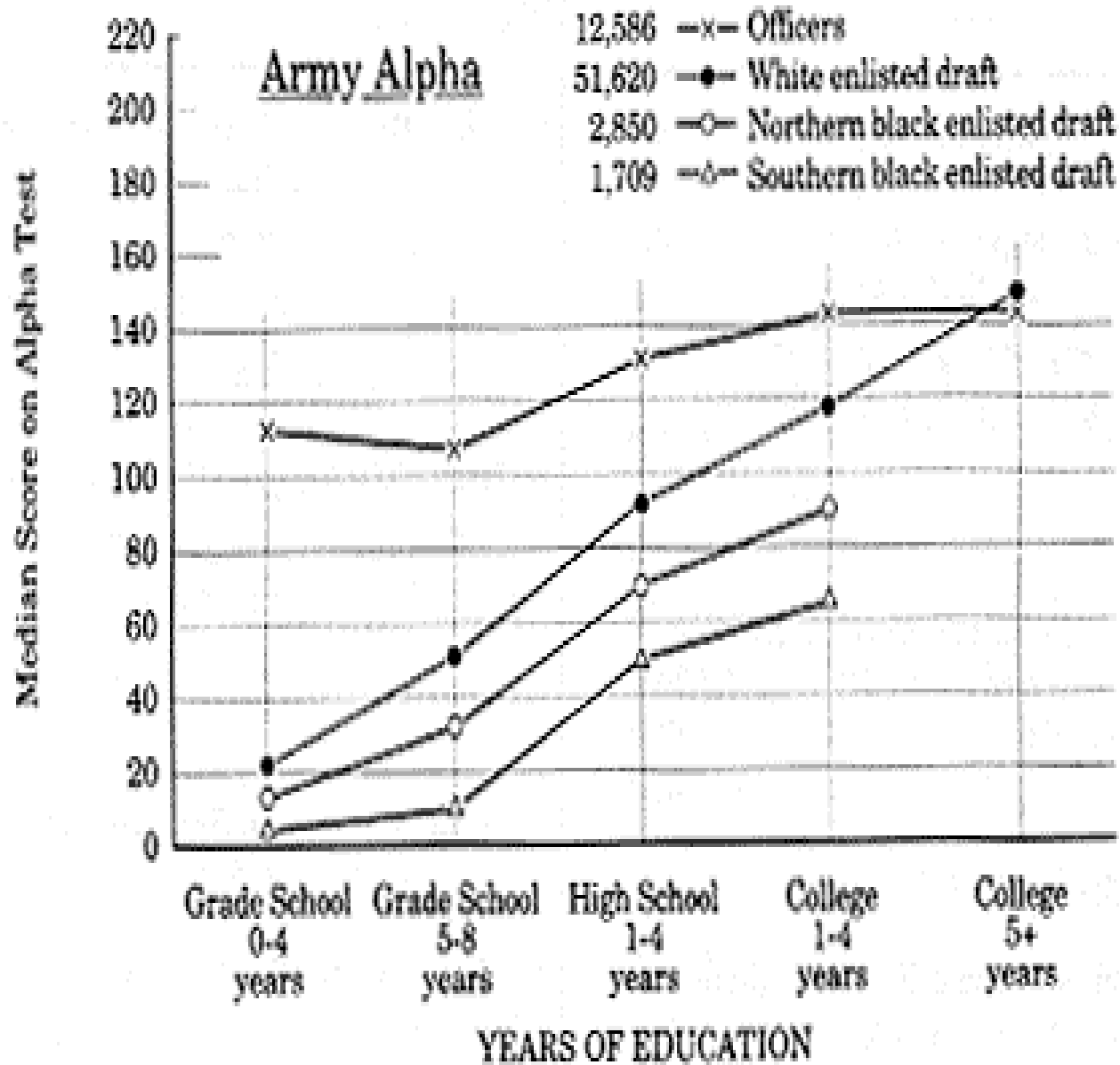
Test 6 Picture Completion. Identify missing parts.



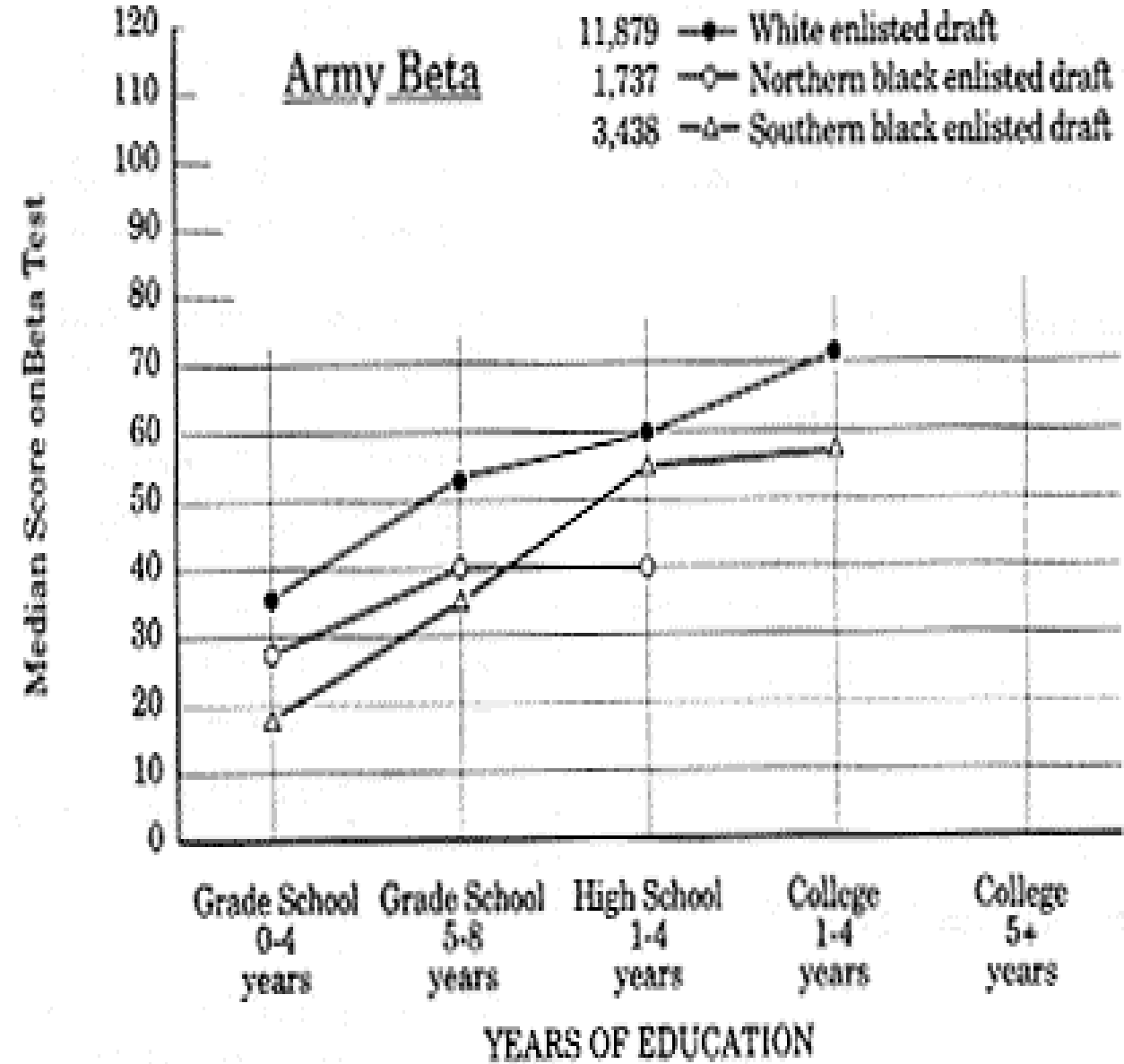
Test 7 Geometrical Construction. Construct a square (on right) out of figures on left.



Army Alpha Results by Years of Education



Army Beta Results by Years of Education



S J Gould - A Nation of Morons

YERKES said that:

- These tests measure
- **NATIVE INTELLECTUAL ABILITY**

in other words
intelligence which was
unaffected by culture
or educational
opportunities

The BETA test still
required men to
use pencils and
paper - and many
had never been
educated at all

Gould reports many
problems in the
administration of the
tests

Illiterate men were
allocated to the Alpha

The queues for the Beta
became so long that
some men were
reallocated to the Alpha

Many who failed the
Alpha were never
recalled

However the results were used by the army and had great impact - mental testing became.....'scientifically established'

By 1921 commercial and educational establishments were using the tests

Wechsler Intelligence Scale (David Weschler, 1939-81) - designed to show subtest scores

Less reliant on
language/vocabulary
skills

Contains Verbal and
Performance subtests

Performance
compared to same
age peers – raw score
has different
interpretation
depending on age

Designed widely used
test for adults (WAIS),
children (WISC), and
preschoolers (WPPSI)

WAIS-R Testing kit

Testing Booklet

Puzzle Pieces

Story Cards

Block Design



TABLE 1.1 Frequency of use with adults of various intelligence, achievement, adaptive behavior, personality, and vocational interest tests (N=300)

Test	Number Who Commonly Use Test	Test	Number Who Commonly Use Test
Intelligence		Personality	
WAIS-R or WAIS	290	MMPI	200
Stanford-Binet (1972)	75	Rorschach	196
PPVT-R or PPVT	52	TAT	168
Bender-Gestalt	35	Sentence Completion	108
Shipley-Hartford	27	Draw-A-Person	77
Raven's Progressive Matrices	25	Bender-Gestalt	66
WISC-R	24	House-Tree-Person	54
Slosson	18	16 PF	19
Leiter	13	Millon Clinical Multiaxial Inventory	18
Quick Test	10	Self concept Inventories	13
Achievement		CPI	11
WRAT-R or WRAT	175	Beck Depression Inventory	10
PIAT	59	Vocational Interest	
Woodcock-Johnson	29	Strong-Campbell	111
Adaptive Behavior		Kuder General Interest Survey	28
Vineland Adaptive Behavior Scales (Vineland Revision) or Vineland Social Maturity Scale	101	Career Assessment Inventory	12
AAMD Adaptive Behavior Scale	41	Kuder Occupational Interest Survey	11
		Minnesota Vocational Interest Inventory	10
		Holland Self-Directed Search	9

NOTE: Tests are included in this table only if they were listed as commonly used by at least nine respondents (3% of sample).

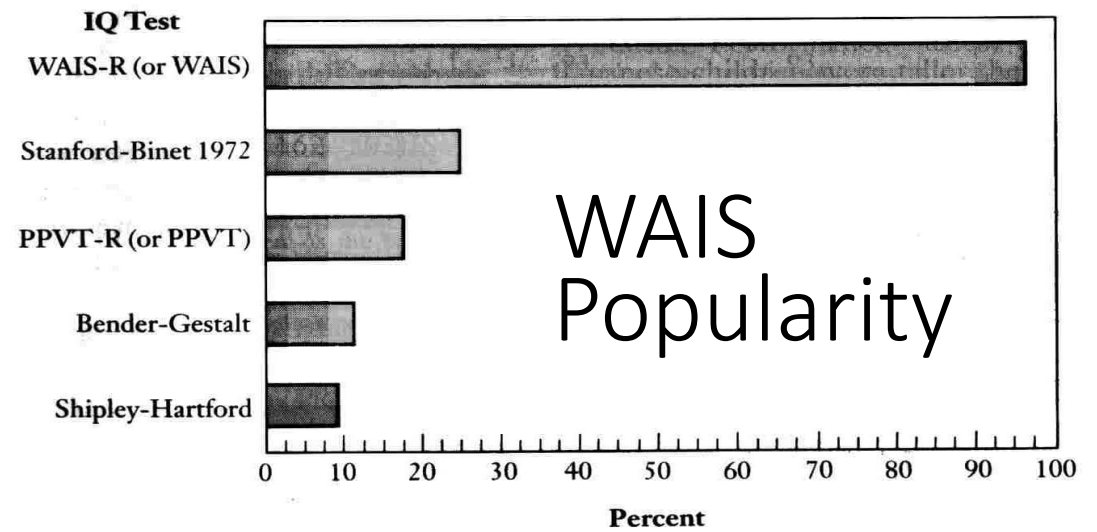


FIGURE 1.3

Prevalence of use of the five most popular intelligence tests for adults (data from Harrison et al., 1988).

Wecshelr - calculated as...

- Deviation IQ = $\frac{\text{actual test score}}{\text{expected score for that age}} \times 100$

The Standard Progressive Matrices (SPM)

Non-verbally assesses intelligence in children and adults through abstract reasoning tasks.

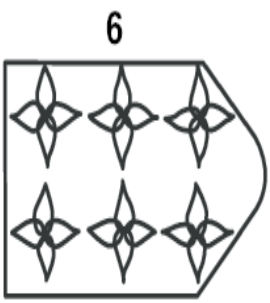
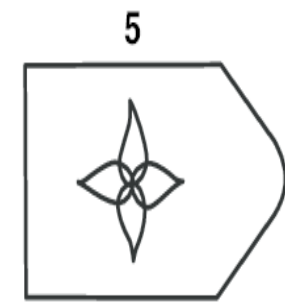
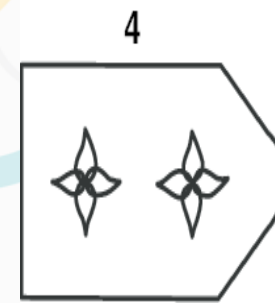
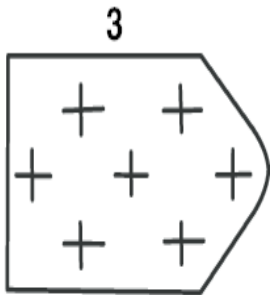
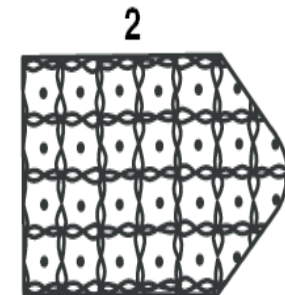
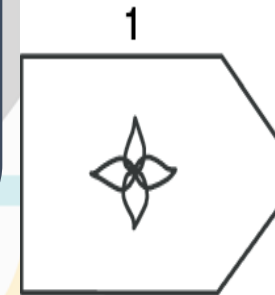
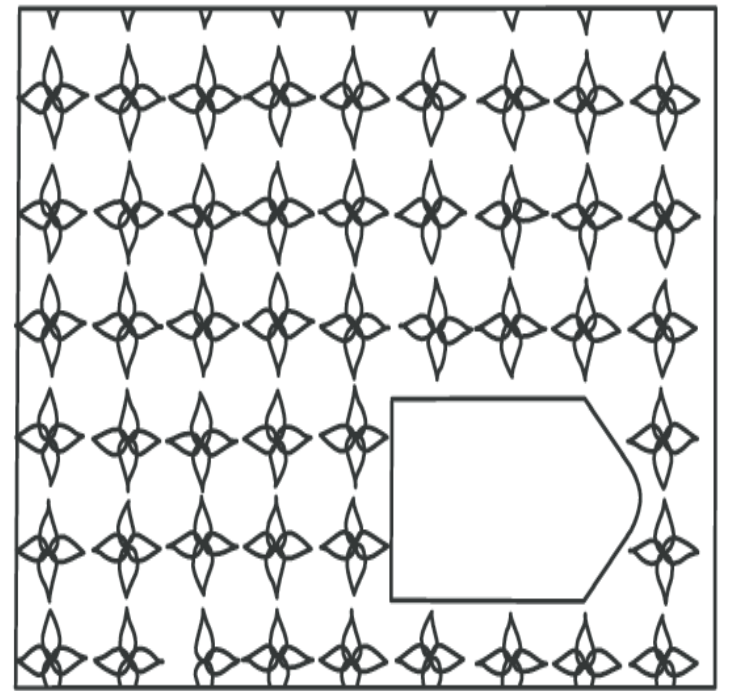
Advanced Progressive Matrices (APM)

Patterns are arranged in order of increasing difficulty.

Sometimes called Raven's, although the SPM is only one of three tests that together comprise Raven's Progressive Matrices.

Appropriate for ages 8-65, the SPM consists of 60 problems (five sets of 12), all of which involve completing a pattern or figure with a part missing by choosing the correct missing piece from among six alternatives.

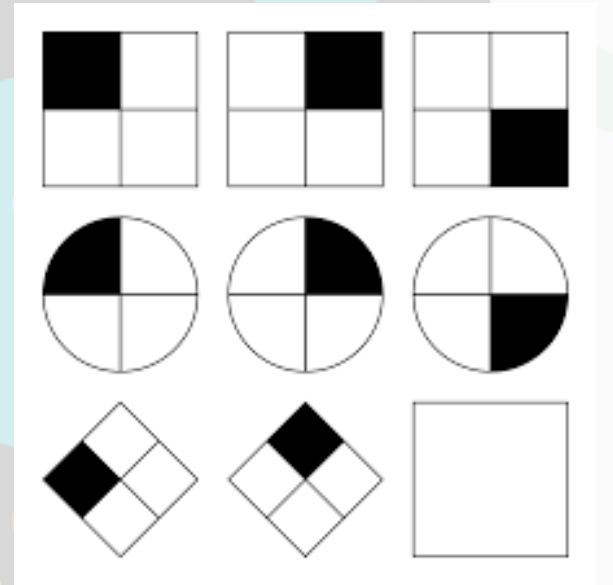
The Coloured Progressive Matrices (CPM)



Reliability

Internal reliability

A number of items that correlate positively with one another; this suggests they are measuring the same construct



Test-retest reliability

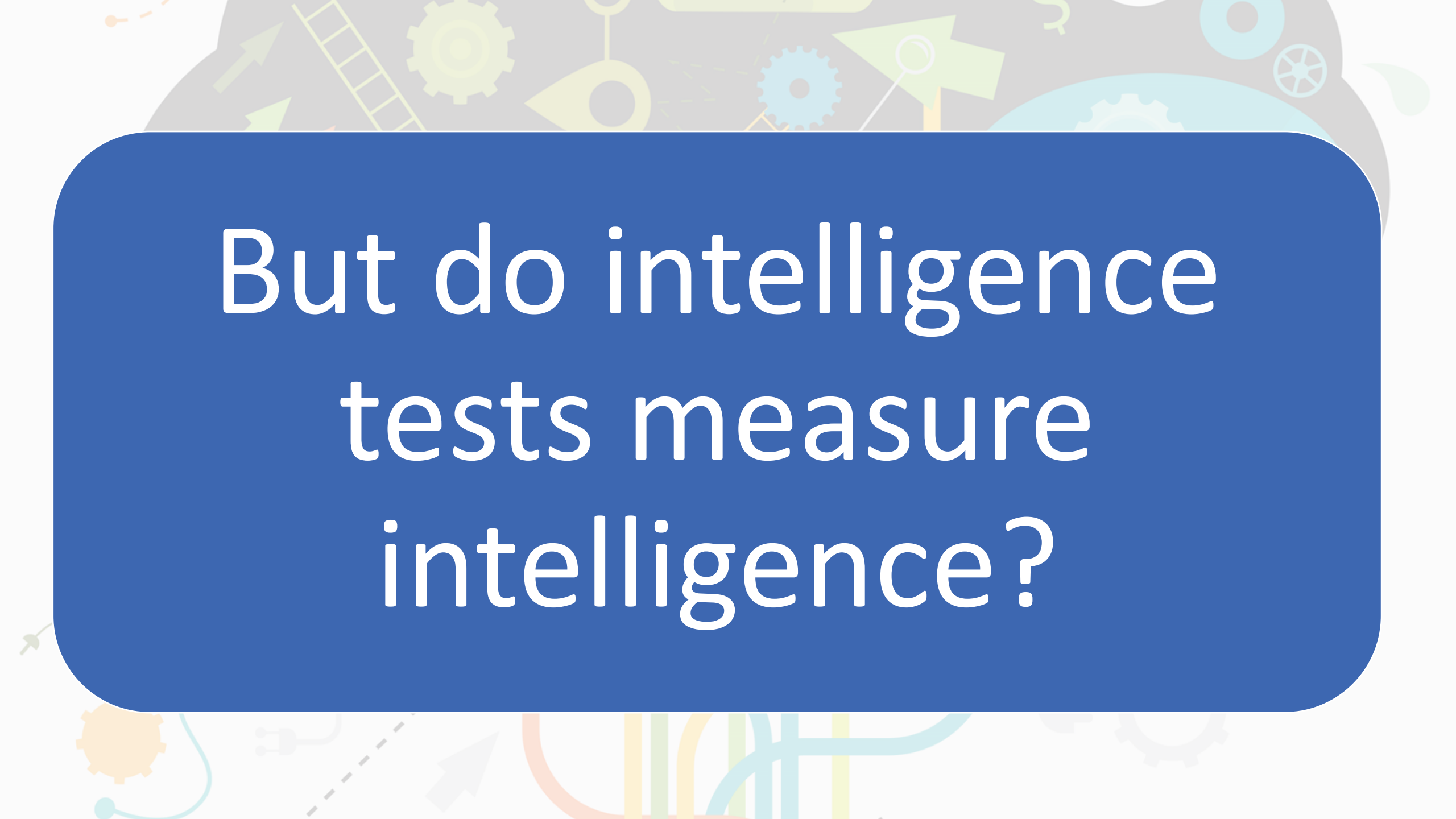
Reliability of the test over time

Validity Issues: Intelligence Tests

Face validity - whether the test appears (at face value) to measure what it claims to.

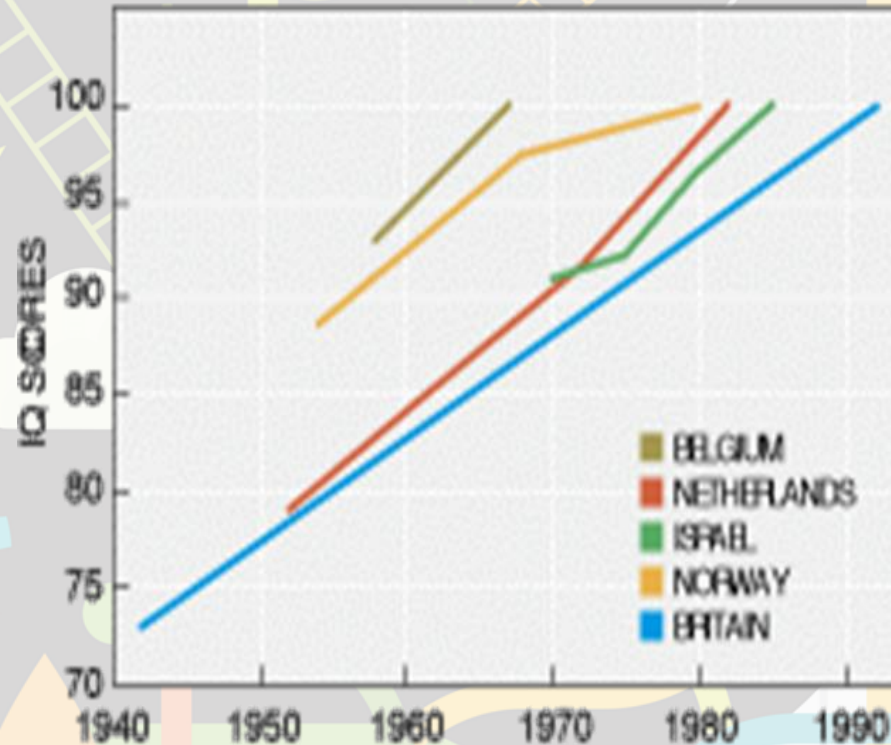
Concurrent validity
- Individuals perform equally as well or poorly on different intelligence tests

Predictive validity - Can predict real-world measures of intelligence or achievement and job performance



But do intelligence
tests measure
intelligence?

The Flynn Effect (1995)



IQ scores tend to rise 3 points every 10 years

Explanations for the Flynn effect

Length of schooling - Children attend school for more years than their parents and their grandparents did.

Test-taking sophistication - Is there a culture, or knowledge of taking IQ tests in modern life, that wasn't around when intelligence tests were first introduced? Also, teaching today is geared around achievement tests.

Child-rearing practices and Head Start - Sesame street – educational TV. Today parents are more interested in their child's dev and abilities - doing more to develop it (toys, TV etc.) Head-start –give poorest families a head start to break the cycle of poverty and narrow the gap.

The cultural and technological age - Exposure to visual media. Children are now learning from this – not just in a traditional classroom setting (improvements in fluid intelligence - to think logically and solve problems in novel situations, independent of acquired knowledge.)

Nutrition improvements – increase in height (1.2cm per decade) and brain size – consumption of dairy, fruit, veg and fish products

The nature versus nurture debate

- Galton (1865) suggested that children inherit their intelligence from their parents
- Plomin (2000) – genetic heritability = h^2
- Plomin (2004) - assessing the influence of shared genes
 - Family studies
 - Twin studies
 - Adoption studies

<https://www.youtube.com/watch?v=lyT2AlzzzQs>

Historical and current understanding

Heritability debate has a long, controversial history

- In the 1960's Arthur Jensen fueled debate with heritability estimate of .8
- The Bell Curve (1994) by Herrnstein and Murray

Contemporary consensus

- Evidence does exist for high heritability, but
- Environmental factors are also important
 - Studies show heritability = .4 to .8 (best estimate probably .7)
 - High heritability does not discount environmental influence. Consider vocabulary
- So are psychological factors (e.g., Carol Dweck's work)

Assumptions

1. IQ is polygenetic (Gottesman's model postulates 5 genes)
2. IQ is normally distributed
3. Very low IQ is produced by genetic abnormalities

Evidence

1. Average IQ correlation of identical twins is .86
2. Identical twins, fraternal twins, siblings, and parent-child IQ correlations - all higher than that of unrelated persons
3. Parent-child correlations are higher for biological vs adopted parents
4. When siblings are reared together, IQ correlations are higher for biological siblings than for adopted siblings
5. The high correlation in #1 resists change over time
6. Many genetic abnormalities have been proven to cause lower IQ
 - a. Turner's syndrome
 - b. Fragile X syndrome
 - c. PKU

The environmentalist position

A. Assumptions

1. Genetics alone cannot account for the normal range of IQ
2. IQ is not necessarily normally distributed (tests are designed to yield a normal distribution)

B. Evidence

1. IQ correlations of identical and fraternal twins raised together are higher than for those raised apart.
2. Fraternal twins IQ correlations are higher than siblings's IQ correlations
- 3.. Adoptive parent-child correlations are higher than unrelated adults and children

- 
- A close-up photograph of a person's hand holding a lit cigarette. The hand is positioned on the left side of the frame, with the index and middle fingers gripping the cigarette. A small amount of white smoke is rising from the tip of the cigarette. The background is a blurred, light blue-grey color, suggesting an indoor setting with a window or a plain wall.



References

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