

INTELLIGENCE THEORIES
AND ITS ASSESSMENT

OUTLINE

- Introduction
- Theories
- Tests and assessment
- Criticism
- Conclusion
- References

- The concept of intelligence has presented clinical psychology with one of its greatest dilemmas
- Despite efforts to quantify individual differences in intellectual functioning for over a 100 years, intelligence has remained one of the most difficult and controversial psychological constructs to define and measure

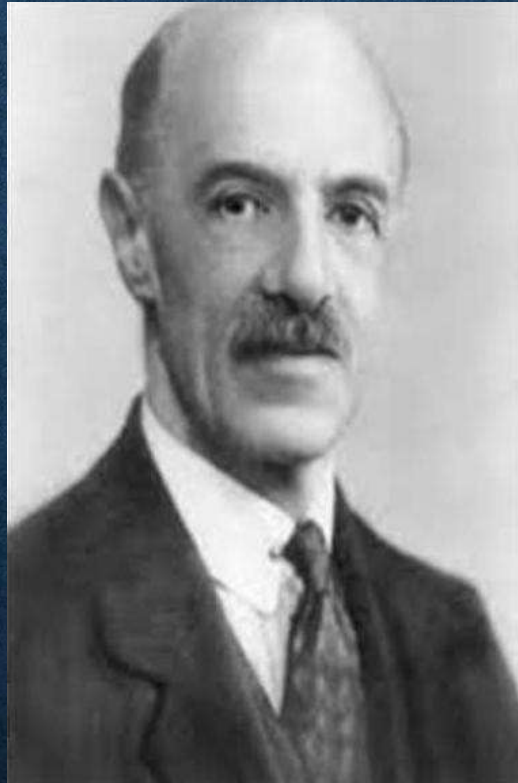
- Capacity for learning and ability to recall, integrate constructively, and apply what one has learned; the capacity to understand and to think rationally. (CTP)
- **Alfred Binet and Theodore Simon (1905)** - ability to judge well, understand well and to reason well.
- **Thorndike (1921)** - power of good responses from the point of view of truth or fact.
- **Thurstone (1921)** - says intelligence is both general ability and a number of specific abilities.

- **Terman** (1916) – intelligence is a general capacity of an individual to adjust his thinking to new requirements; it is a general mental adaptation to new problems. It is ability to learn in terms of abstract ideas.
- **David Wechsler** (1939) – the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with the environment.
- **Howard Gardner** (1986) – the ability or skill to solve problems or to fashion products which are valued within one or more cultural settings.
- **Stern berg** (1985) – Intelligence is the general mental capacity of an individual to adjust his thinking to new requirements. It is general mental adaptability to new problems and conditions of life.

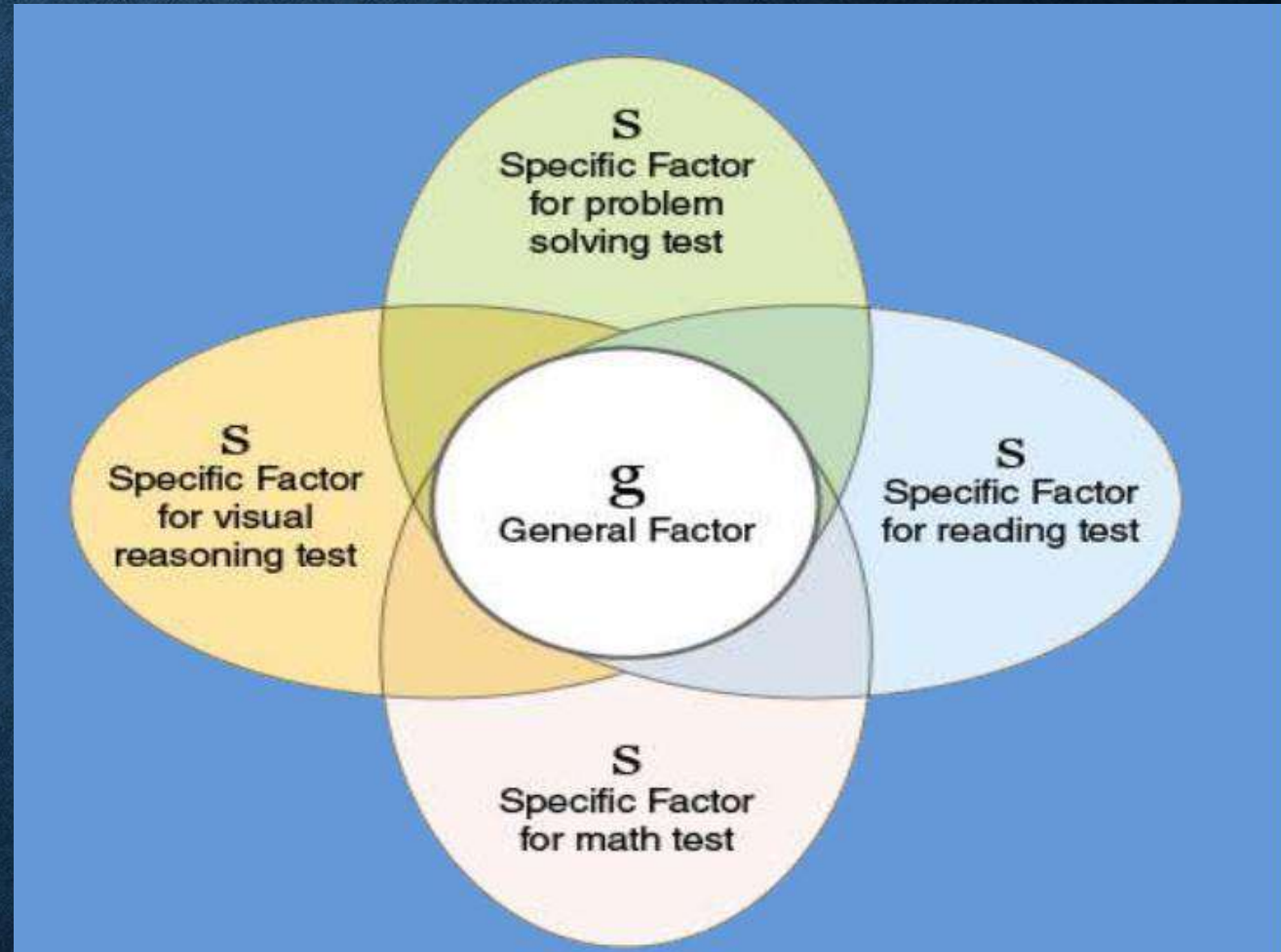
FACULTY THEORY

- Oldest theory
- According to this theory, mind is made up of different faculties like reasoning, memory, discrimination, imagination, etc
- Can be developed by training
- Would not allow uniqueness of an individual

CHARLES SPEERMAN'S TWO-FACTOR
THEORY



- developed a statistical procedure called factor analysis
- performance on any cognitive task depended two factors
 1. One **general ability** or common ability known as ‘*g*’ factor
 2. each task also requires a “**specific**” ability know as ‘*s*’ factor (environmental)
- only the specific factors which eventually evolve in the individual that make the difference

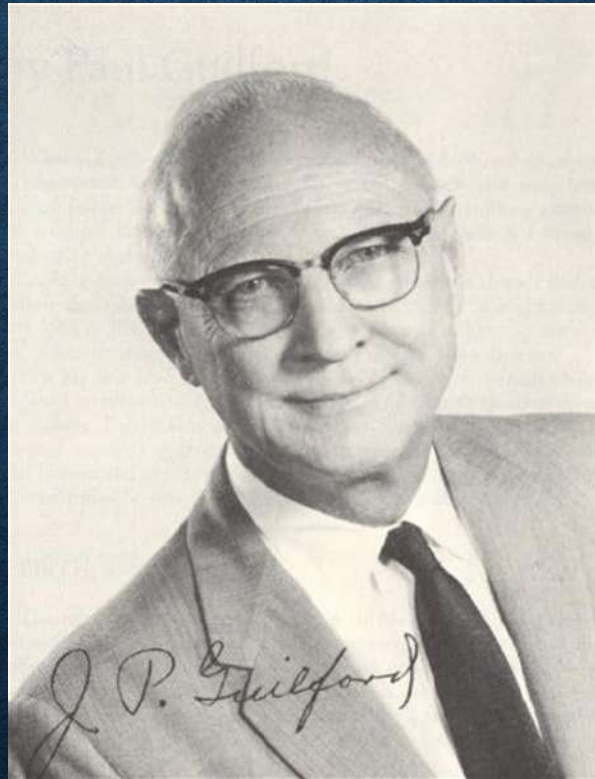


LOUIS THURSTONE GENERAL INTELLIGENCE GROUP FACTOR THEORY

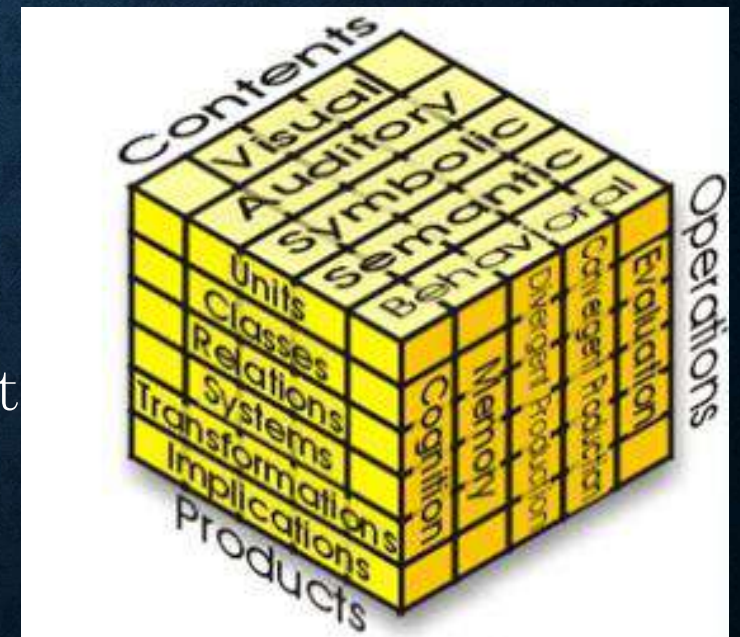
- He contributed that Spearman's g factor consists of seven sub factors (Primary mental abilities)
 1. verbal comprehension
 2. word fluency
 3. numerical ability
 4. spatial Visualization
 5. associative memory
 6. perceptual speed
 7. Inductive reasoning

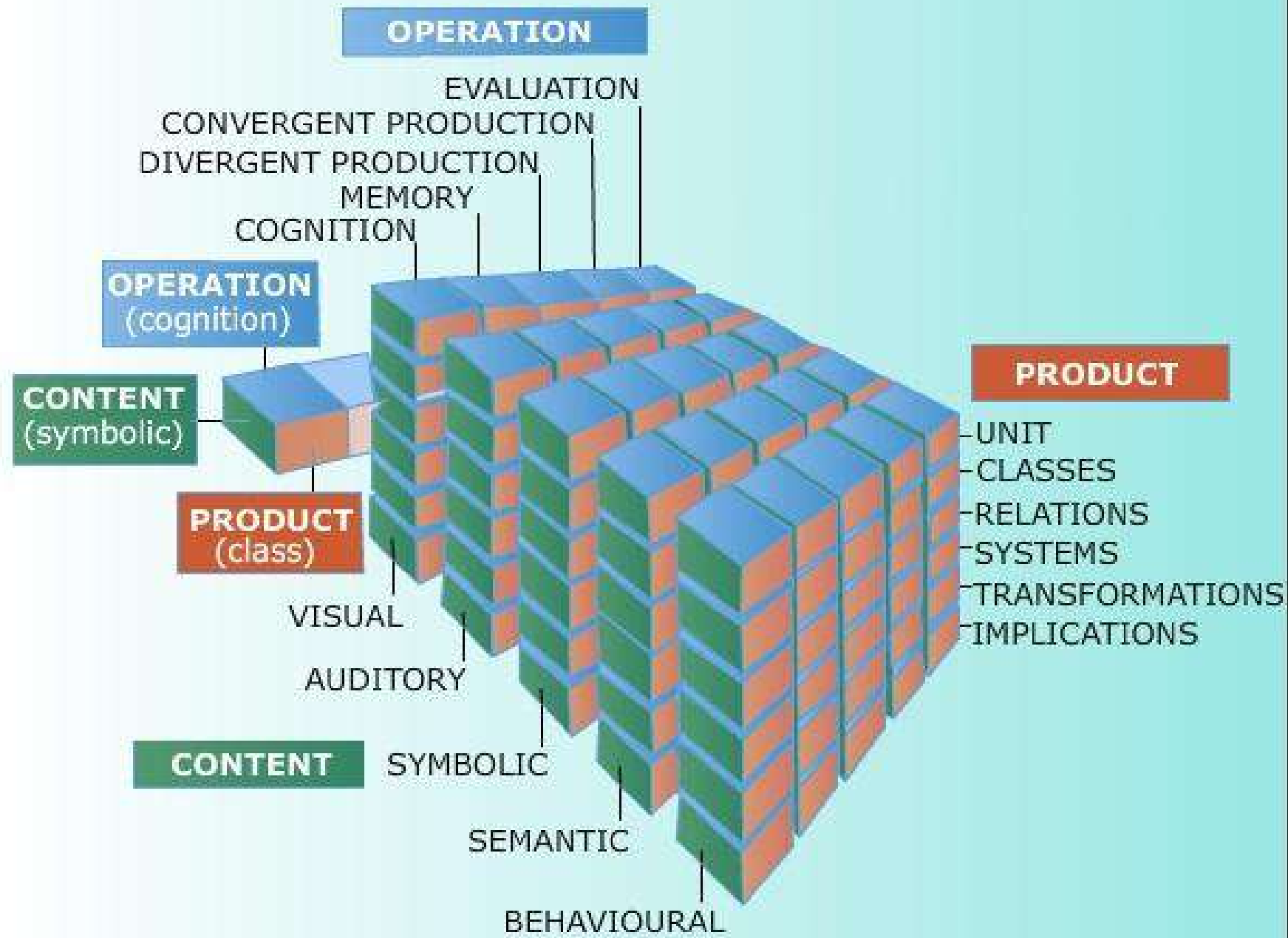


GUILFORD'S TRIDIMENSIONAL THEORY



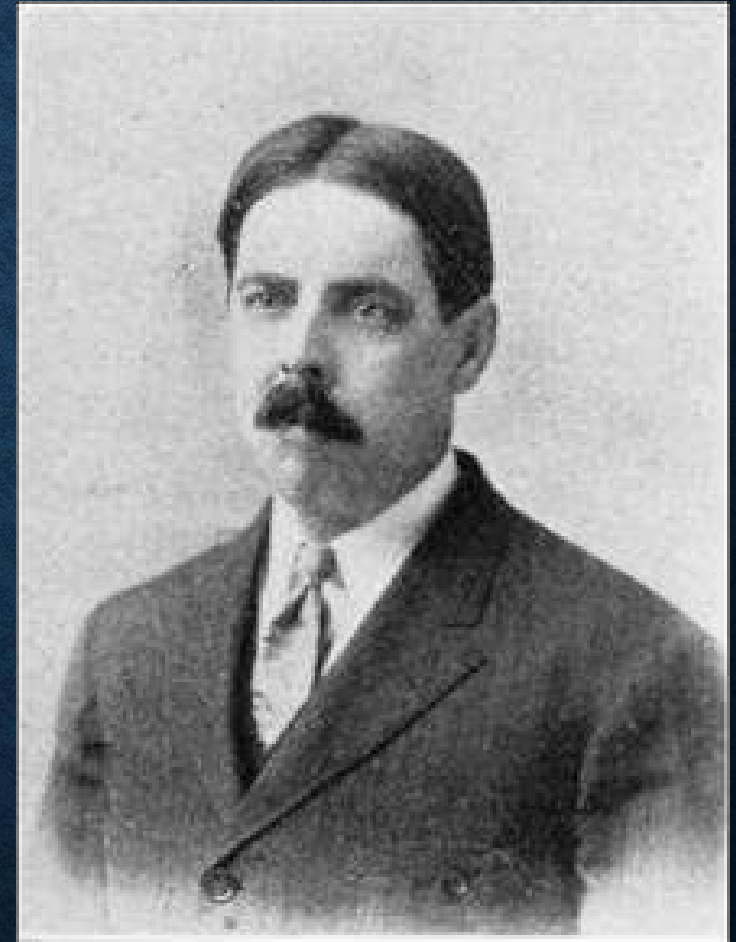
- rejected Spearman's view that intelligence could be characterized in a single numerical parameter
- Guilford's Structure of Intellect (SI)- performance on intelligence tests can be traced back to the underlying mental abilities or factors of intelligence.
- comprises up to 180 different intellectual abilities ($5 \times 6 \times 6 = 180$) organized along three dimensions:
 1. Operations : six operations
 2. Content : five broad areas of information
 3. Products : six products in increasing complexity





THORNDIKE MULTI-FACTOR THEORY

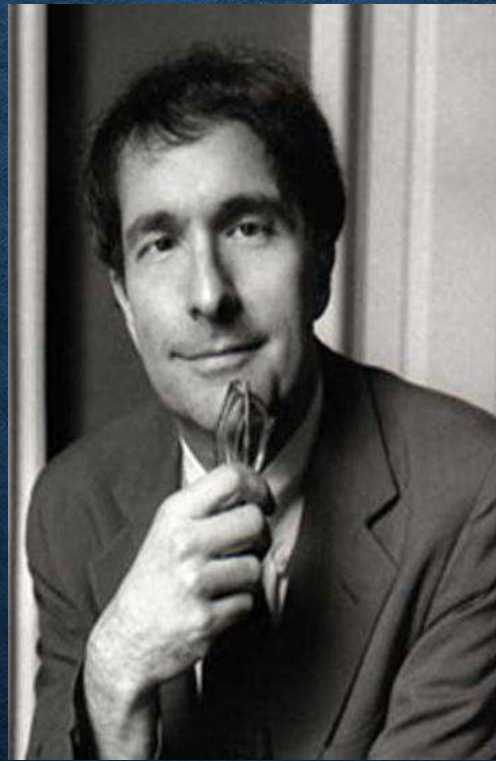
- opposed the theory of General intelligence
- proposed that they are Specific stimuli and Specific response
- intelligence is said to be constituted of multitude of separate factors or elements



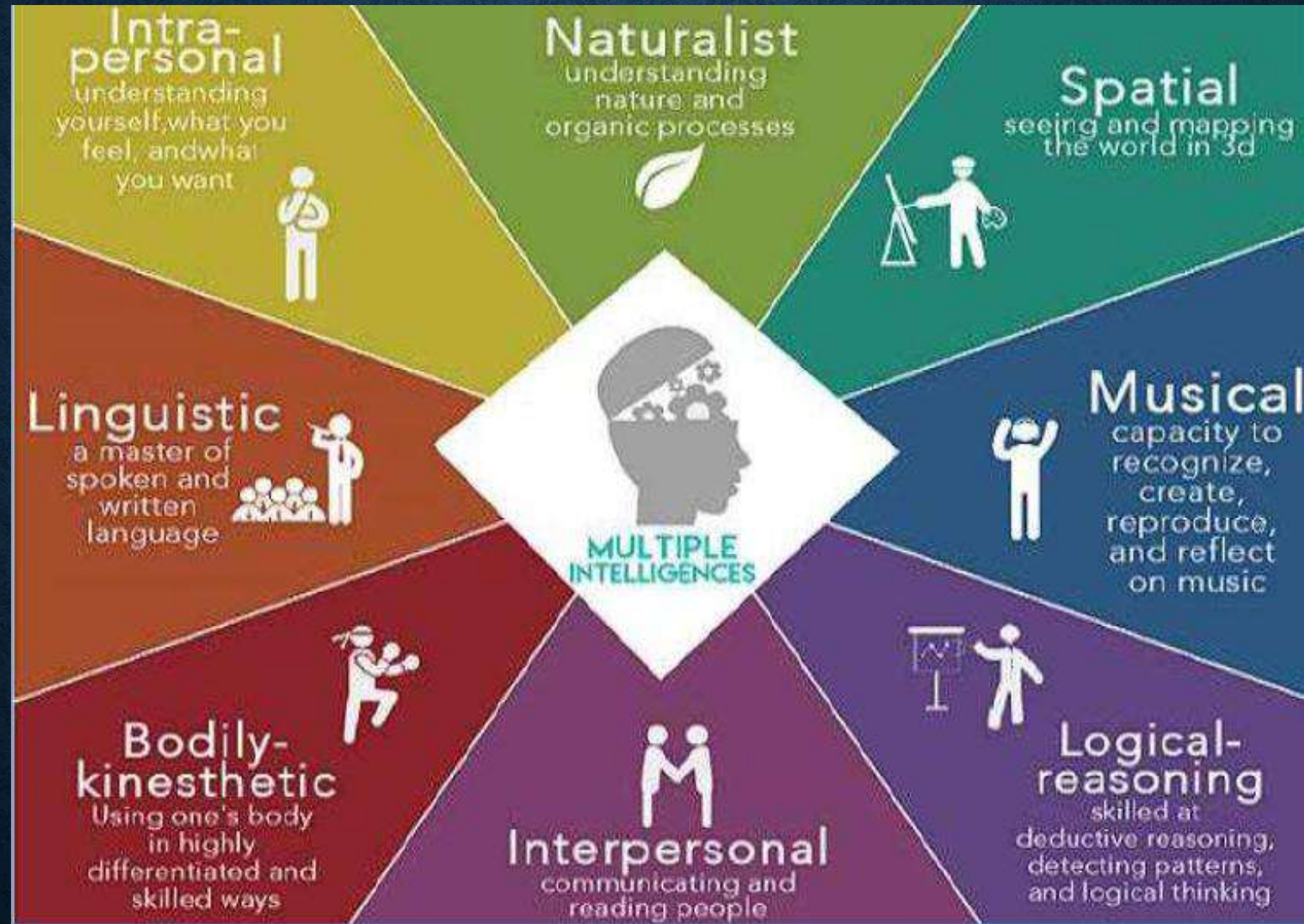
4 CONTRIBUTES OF INTELLIGENCE

1. *Level*—Difficulty of a task
2. *Range*—Number of tasks at any given degree of difficulty that one can solve, Range is determined not only by Level but also by the Breadth of experience and by opportunity to learn
3. *Area*—Total number of situations at each level to which the individual is able to respond, Area is the summation of all the ranges at each level of intelligence
4. *Speed*—Rapidity with which an individual can respond

HOWARD GARDNER'S
THEORY OF MULTIPLE INTELLIGENCES



- Gardner supports Thurstone's idea that intelligence comes in multiple forms
- there are **eight** distinct kinds of intelligence that are independent of one another, each operating as a separate system
 - (1) linguistic
 - (2) musical
 - (3) logical-mathematical
 - (4) spatial
 - (5) bodily-kinesthetic
 - (6) naturalist
 - (7) and (8) interpersonal self and others
- speculates about a 9th - "existential intelligence" = ability to think about the question of life, death and existence
- noted that brain damage may diminish one type of ability but not others e.g. savants



GARDNER'S EIGHT INTELLIGENCES

Aptitude	Exemplar
1. Linguistic	T. S. Eliot, poet
2. Logical-mathematical	Albert Einstein, scientist
3. Musical	Igor Stravinsky, composer
4. Spatial	Pablo Picasso, artist
5. Bodily-kinesthetic	Martha Graham, dancer
6. Intrapersonal (self)	Sigmund Freud, psychiatrist
7. Interpersonal (other people)	Mahatma Gandhi, leader
8. Naturalist	Charles Darwin, naturalist

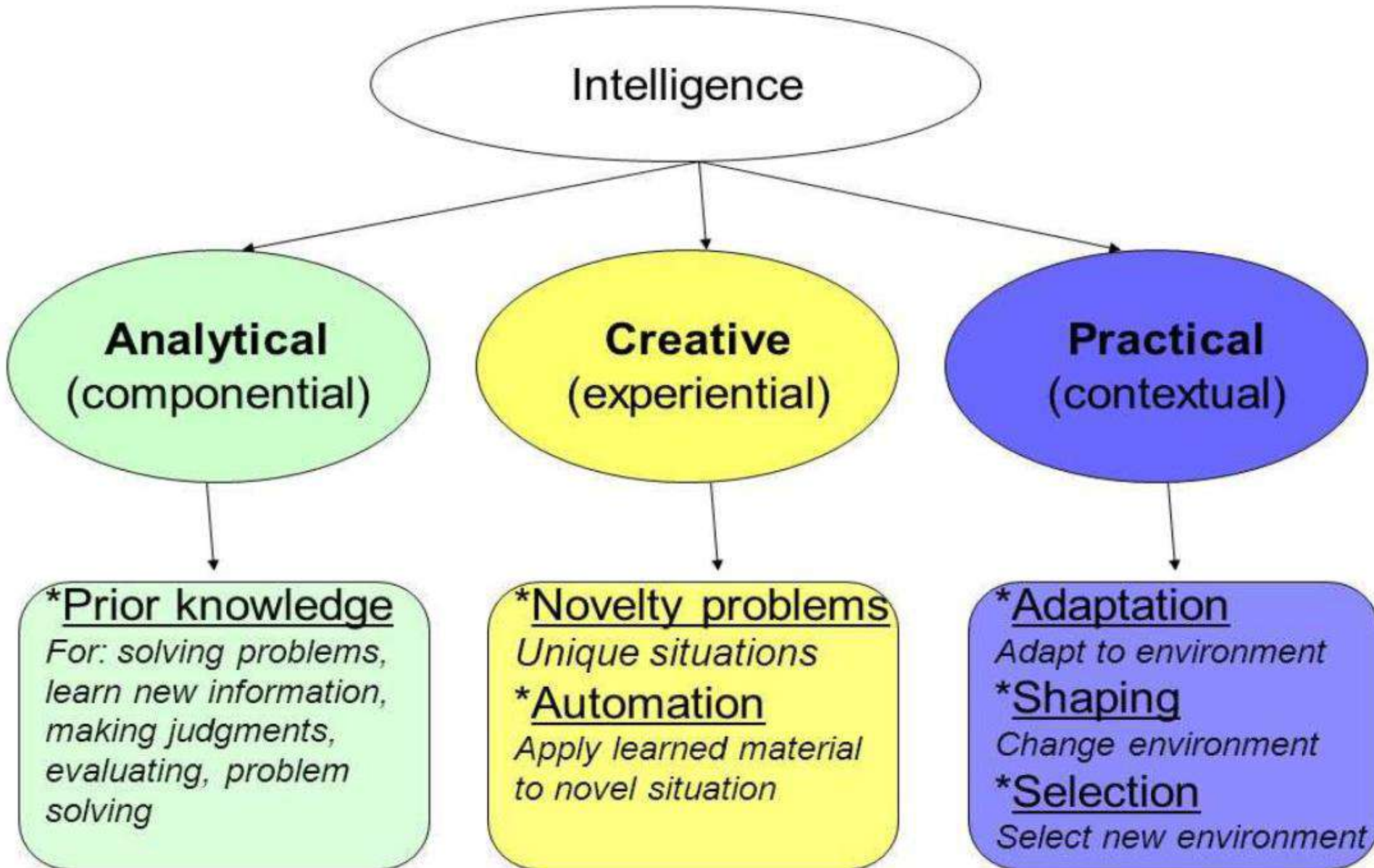
STERNBERG'S TRIARCHIC
THEORY



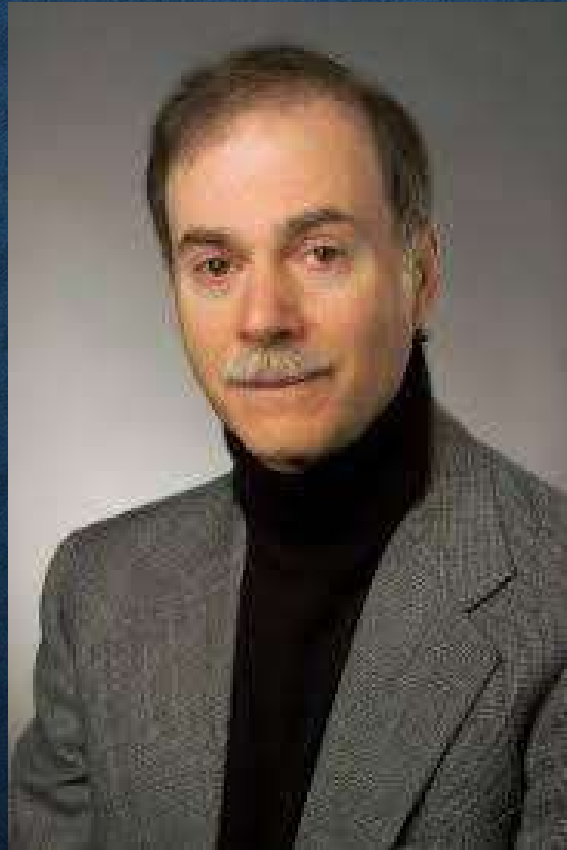
- Sternberg also agrees with Gardner, but suggests *three* intelligences rather than eight

1. **Analytical intelligence:** Basic information processing skills , assessed by academic tests, Persons high on this dimension usually excel on standard tests of academic potential and make excellent students
2. **Creative intelligence:** Ability to deal with novel versus routine problems, Persons high on this dimension excel zeroing in on what information is crucial in a given situation, and combining seemingly unrelated facts, shown by many scientific geniuses and inventors
3. **Practical intelligence:** Ability to adapt to different contexts, and to select and shape contexts, Persons high on this dimension are intelligent in a practical, adaptive sense (street smarts)

STERNBERG'S TRIARCHIC THEORY OF INTELLIGENCE



COE & BIOLOGICAL
THEORY



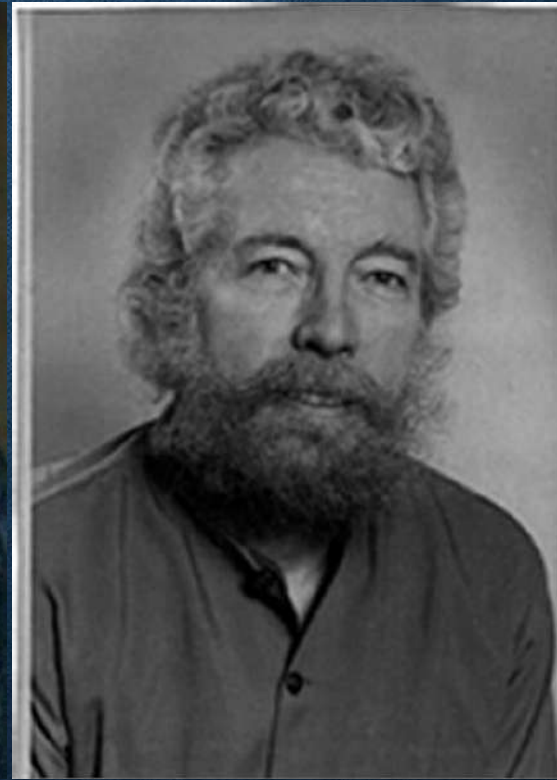
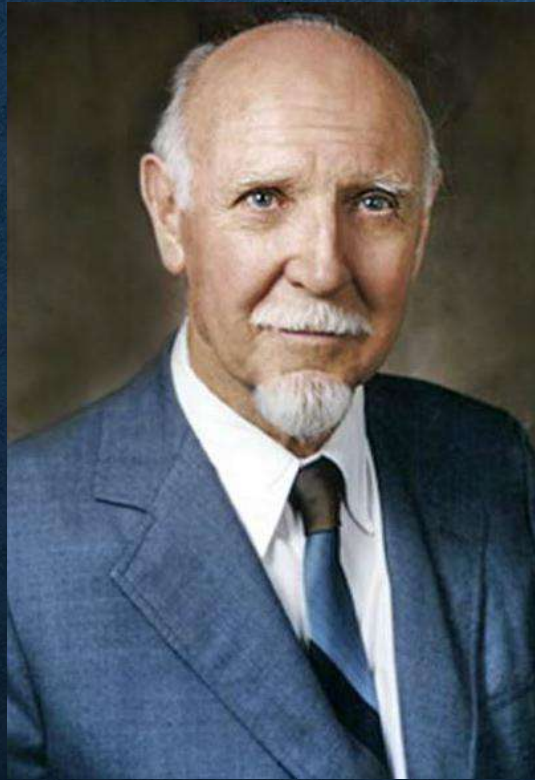
- There are multiple cognitive potentials rather than a single underlying general intelligence or *g*
- biologically based and controls mental process
- Cognitive potentials are closely linked to challenges and opportunities in individual environment
- Knowledge, personality, motivation, education(contextual factors) are essential for demonstration of cognitive abilities

ANDERSON'S THEORY OF INTELLIGENCE AND COGNITIVE DEVELOPMENT

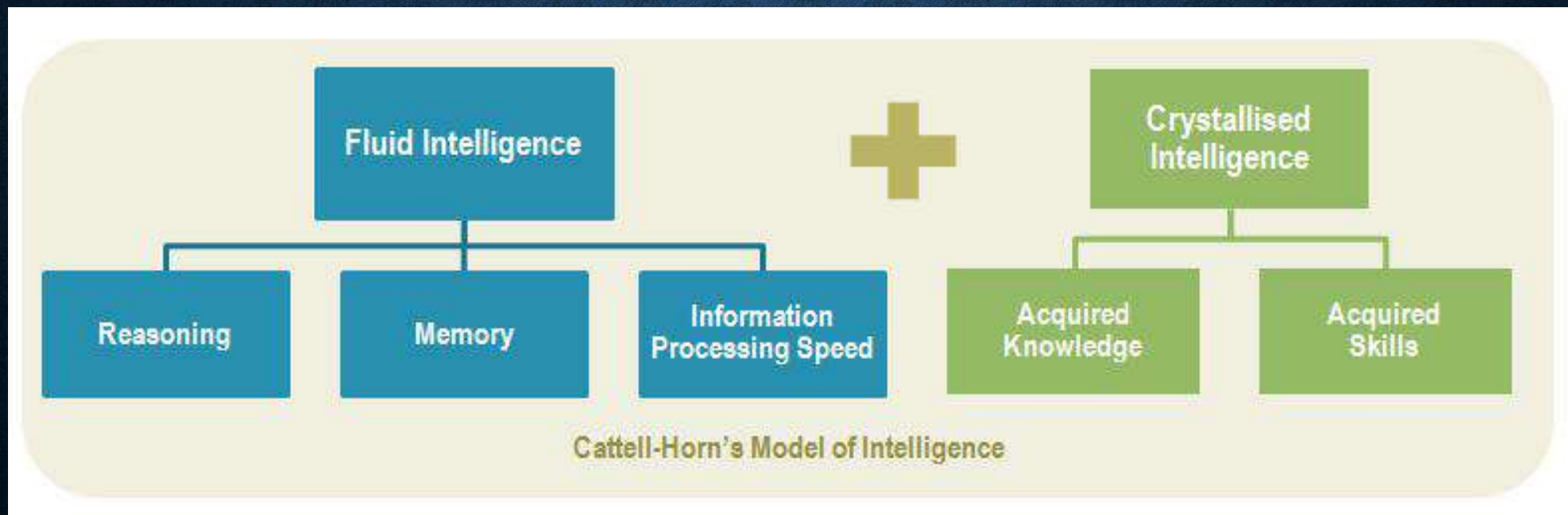


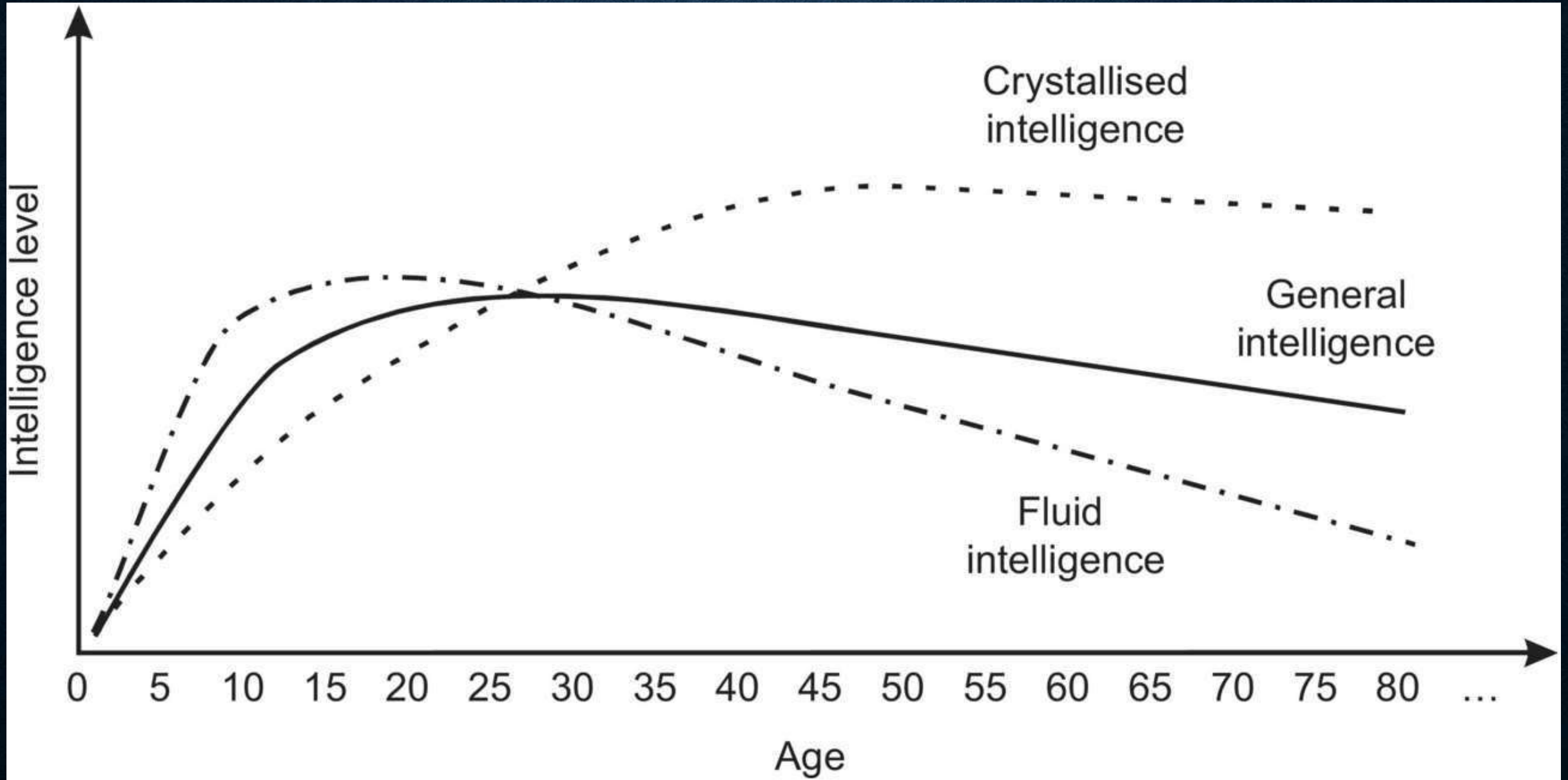
- points out Gardner's multiple intelligences are ill-defined - they are 'sometimes a behaviour, sometimes a cognitive process, and sometimes a structure in the brain'
- sought to develop a theory based on the idea of general intelligence proposed by Thurstone
- suggests two different 'routes' to knowledge
 1. **Basic processing mechanism:** which operates through the specific processors, to acquire knowledge (A person with a slower basic processing mechanism is likely to have more difficulty acquiring knowledge than a person with a faster processing mechanism)
 2. **Modules:** used to acquire knowledge, Module based knowledge, such as perception of three-dimensional space, comes automatically if the module has matured sufficiently, and this accounts for the development of intelligence

SPITZ AND HORNE'S FLUID AND CRYSTALLIZED
INTELLIGENCE



- **fluid** and **crystallized intelligence** (respectively abbreviated **Gf** and **Gc**) are factors of general intelligence, originally identified by Raymond Cattell
- **Fluid Intelligence**: characterized by Biological factors such as processing capabilities, reasoning, capacity to learn new ways of solving problems and performing activities – Decreases with age
- **Crystallized Intelligence**: characterized by environment, accumulated knowledge of the world we have acquired throughout our lives – Increases with age





PETER SELIGER AND EMOTIONAL
INTELLIGENCE

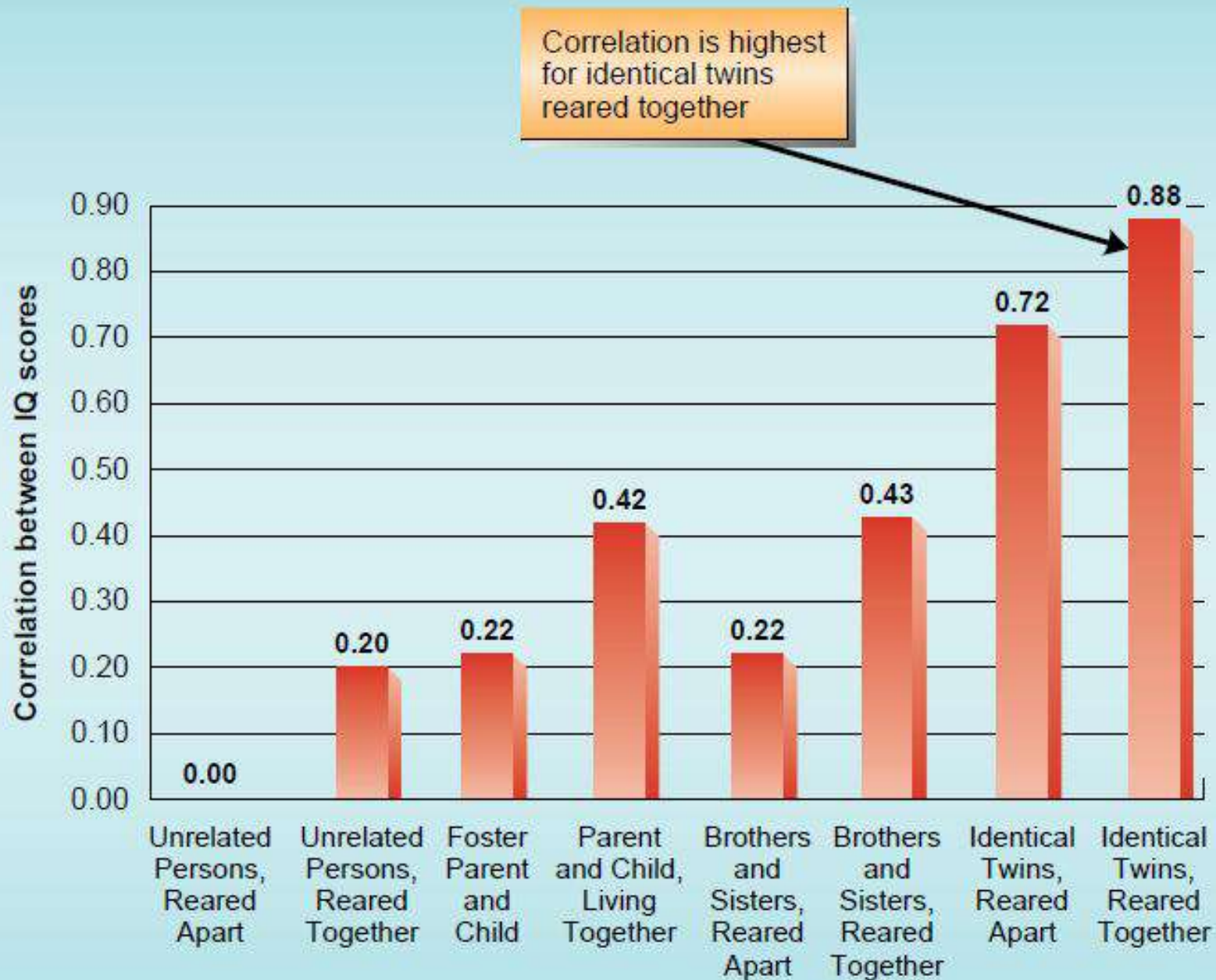


- Daniel Goldman popularized the term, Based on Mayer and Salovey, who suggest that there are 4 components to emotional intelligence
 1. Accurate perception and expression
 2. Ability to access and generate emotions
 3. Understanding emotions and emotional meanings
 4. Emotional regulation
- There is increasing evidence that emotional intelligence is important for success and wellbeing.

PIAGET'S THEORY STAGE THEORY OF COGNITIVE DEVELOPMENT

- Intelligence is an adaptive process
- **Schemas** – are categories of knowledge that help us to interpret and understand the world
- **Assimilation** – The process of taking in new information into our already existing schemas is known as assimilation.
- **Accommodation** – Accommodation involves modifying existing schemas, or ideas, as a result of new information or new experiences
- As children progress through the stages of cognitive development, it is important to
- maintain a balance between applying previous knowledge (assimilation) and changing behaviour to account for new knowledge (accommodation)

ROLE OF HEREDITY



TESTS OF INTELLIGENCE

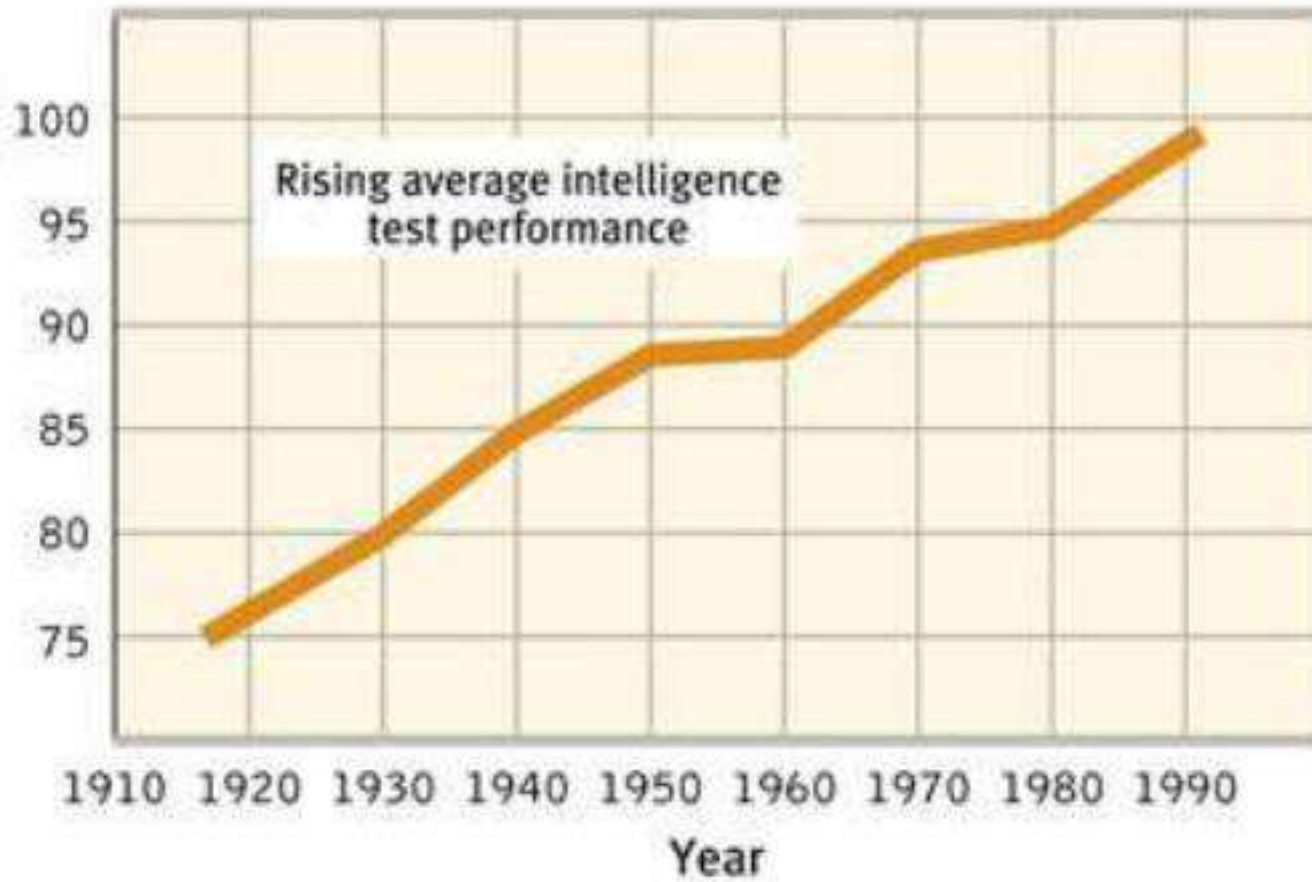
PRINCIPLES OF TEST CONSTRUCTION

- For a psychological test to be acceptable it must full fill the following three criteria:
 1. Standardization
 2. Reliability
 3. Validity

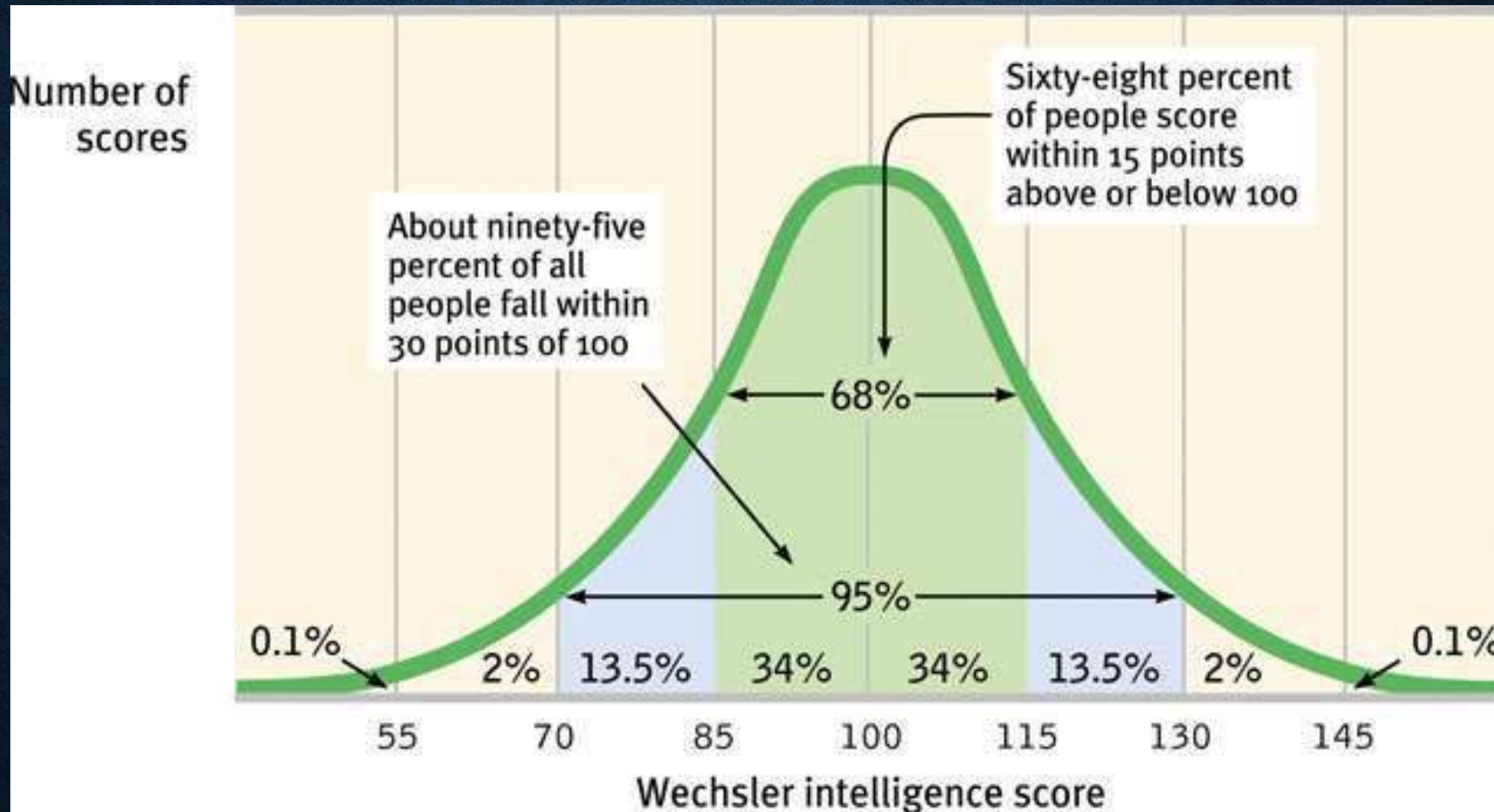
STANDARDIZATION

- The standardization of a test involves *giving it to a large number of people at different ages and computing the average score on the test at each age level*
- intelligence tests need to be standardized on a regular basis
- *FLYNN EFFECT* – In the past 60 years, intelligence scores have risen steadily by an average of 27 points.

Intelligence test scores, based on 1996 standards



NORMAL CURVE



- Standardized tests establish a normal distribution of scores on a tested population in a bell-shaped pattern

RELIABILITY

- A test is *reliable* when it yields consistent results.
- assesses the degree to which a test is measuring something
- To establish reliability researchers establish different procedures
 1. Split-half Reliability: Dividing the test into two equal halves and assessing how consistent the scores are.
 2. Test-Retest Reliability: Using the same test on two occasions to measure consistency
 3. Alternative form reliability: two forms of the same test yield equivalent scores
 4. Internal Reliability: Different parts of the same test produce similar results
 5. Interrater or Interjudge: Two or more raters or judges who administer and

VALIDITY

- Validity of a test refers to what the test is supposed to measure or predict
- actually measure intelligence rather than something else
- Content Validity: indicates the degree to which a group of test items actually covers the various aspects of the variable under study
- Criterion (empirical) validity: test can be assessed by correlating the test score with some external criterion known to be valid – This correlation is called a validity coefficient
- construct validity: scores on the test correlate with outcomes that the theory says it should predict

HISTORY OF INTELLIGENCE TESTING

- Two important historical developments in the latter half of the nineteenth century greatly influenced the ultimate introduction of measures of intelligence:
 1. compulsory education in countries
 2. Psychologist's belief that mental abilities could be measured
- Interest in individual differences (such as levels of intelligence) was taken by institutions such as schools, industries, military forces, and government

- Head Circumference and Reaction time (Francis Galton 1880) - first attempts to measure intelligence
- Binet-Simon (Alfred Binet 1909) - first “intelligence test”
 - commissioned by French gov to separate children into vocational vs academic schooling
 - 30 items of increasing difficulty - 1905
 - Revision 1908 - age specific versions
 - developed to identify children who needed ‘special’ education
 - Created the concept of mental age (MA)

- Lewis Terman (1916–72) –
 - first U.S. intelligence test
 - Heavy reliance on vocabulary/language skills
 - translated and modified Binet's scale
 - Developed Intelligence Quotient
 - $$\text{IQ} = \frac{\text{Mental Age} \times 100}{\text{Chronological Age}}$$

STANFORD BINET INTELLIGENCE SCALE

- Currently in its 5th edition
- Assesses intelligence and cognitive abilities in children and adults aged 2-89yrs
- Based on Cattell-Horn-Carroll (CHC) theory of intellectual abilities
- Number of items: 129
- Total testing time 45-90 minutes
- Content of assessment: Fluid Reasoning, Knowledge, Quantitative Reasoning, Visual-Spatial Processing, and Working Memory
- Process of assessment: Verbal and nonverbal
- Indian adaptation: Binet-Kamat Test

Hierarchical Structure of SB5

Fluid Reasoning (FR)	Nonverbal	Matrices Tasks
	Verbal	Analogies
Knowledge (KN)	Nonverbal	Recognize Absurdities in Pictures
	Verbal	Vocabulary
Quantitative Reasoning (QR)	Nonverbal	Quantitative Reasoning
	Verbal	Verbal Quantitative Reasoning
Visual/Spatial Reasoning (VS)	Nonverbal	Form Board
	Verbal	Positions and Directions
Working Memory (WM)	Nonverbal	Block Pattern Memory
	Verbal	Sentence Memory

KAMATH BINET TEST OF INTELLIGENCE KBI

- Kamath undertook a revision of the Stanford Binet Scales to suit Indian conditions
- The tests has subtests from Age III to XXII.
- Begins with the tests of the year of the child
- Work upwards till the child fails on all items
- Then work below the child' s chronological age until all items are passed
- For each item passed the child earns a credit of 2 months, 4 months or 6 months depending on the corresponding age
- $IQ = \frac{\text{Mental Age} \times 100}{\text{Chronological Age}}$

Chronological Age

WECHSLER INTELLIGENCE SCALE

- (David Wechsler, 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 aged 16–90yrs (WAIS), children (WISC–V); Wechsler, 2014 and pre schoolers (WPPSI)
- Mean score of 100; SD of 10 (15 in WISC and WPPSI)
- Indian adaptation WAPIS – Prabha

- Four factors measured by 10 core subtests and 5 supplemental subtests

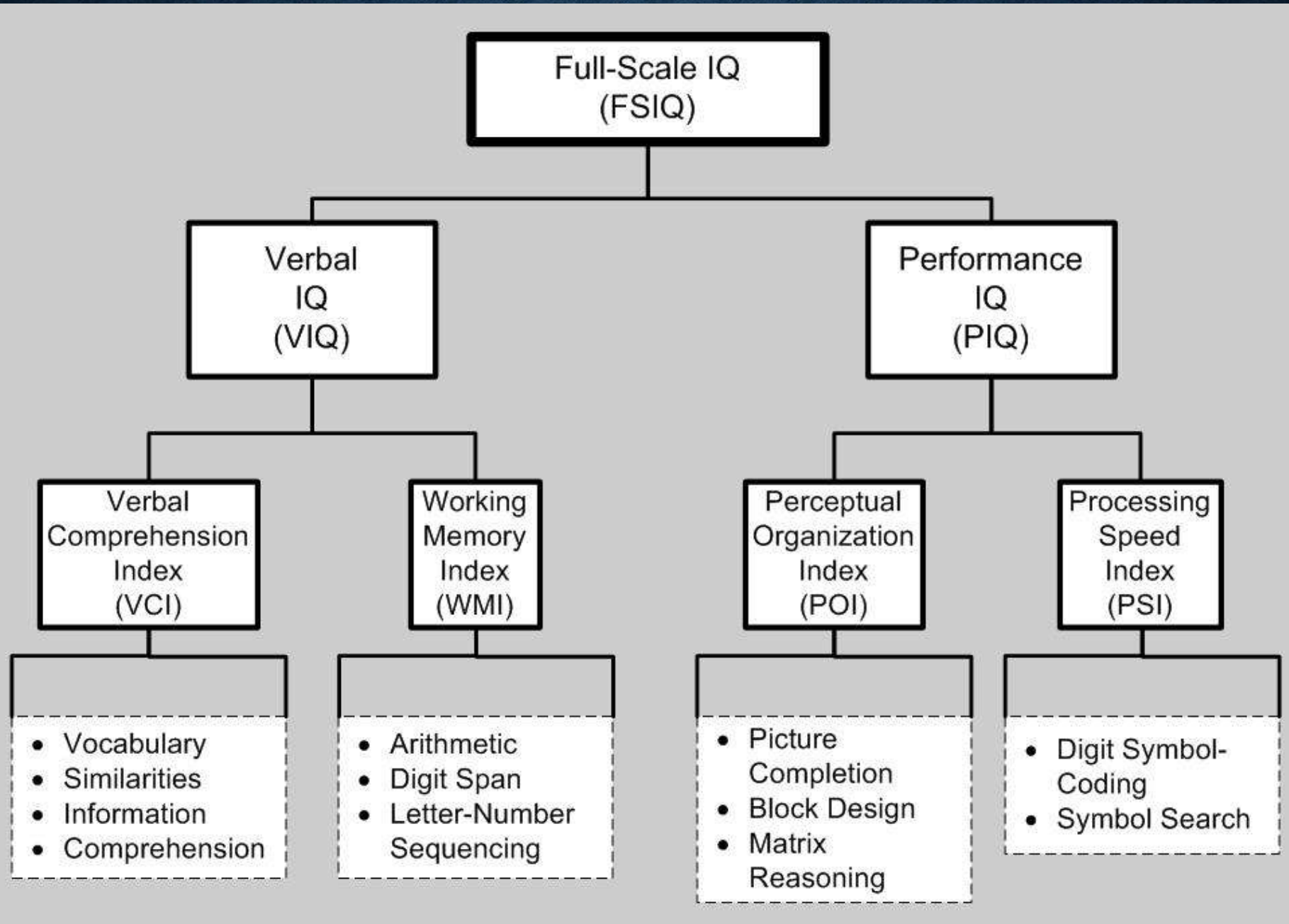
1. Verbal Comprehension

2. Perceptual Reasoning

3. Working Memory

4. Processing Speed

- **General Ability Index (GAI)**: Combined score on the six core subtests that comprise the VCI and PRI
- **Full Scale IQ (FSIQ)**: Total combined performance of the VCI, PRI, WMI, and PSI (Mean = 100, SD = 15)



VERBAL

General Information

What day of the year is Independence Day?

Similarities

In what way are wool and cotton alike?

Arithmetic Reasoning

If eggs cost 60 cents a dozen, what does 1 egg cost?

Vocabulary

Tell me the meaning of corrupt.

Comprehension

Why do people buy fire insurance?

Digit Span

Listen carefully, and when I am through, say the numbers right after me.

7 3 4 1 8 6

Now I am going to say some more numbers, but I want you to say them backward.

3 8 4 1 6

PERFORMANCE

Picture Completion

I am going to show you a picture with an important part missing. Tell me what is missing.

'85

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

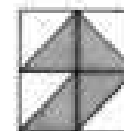
Picture Arrangement

The pictures below tell a story. Put them in the right order to tell the story.



Block Design

Using the four blocks, make one just like this.



Object Assembly

If these pieces are put together correctly, they will make something. Go ahead and put them together as quickly as you can.



Digit-Symbol Substitution

Code

△	○	◇	×	◇
1	2	3	4	5

Test

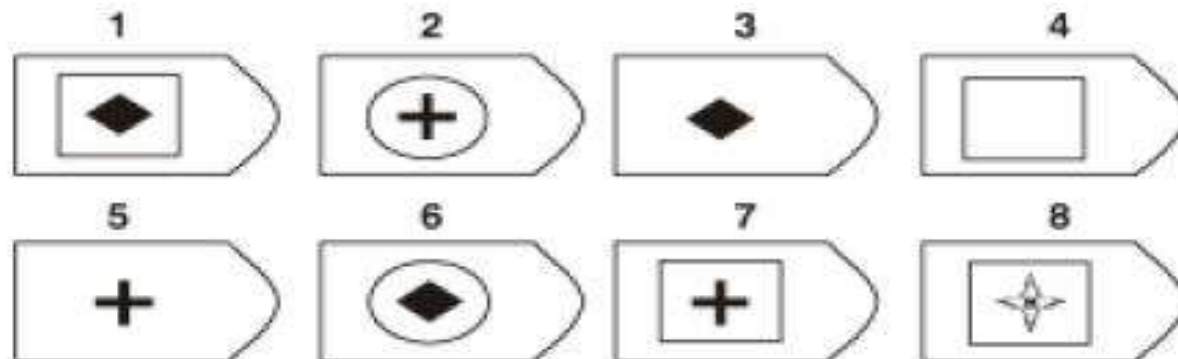
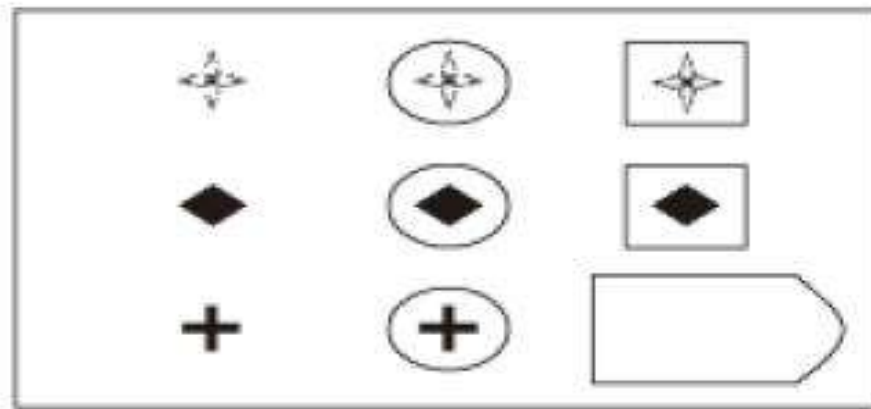
1	5	4	2	1	3	5	4	1	5

RAVEN'S PROGRESSIVE MATRICES & RDM

- Developed by J. C. Raven in 1936
- nonverbal group test
- It consists of 5 sets of 12 items each , usually 60-item test used in measuring abstract reasoning and regarded as a nonverbal estimate of fluid intelligence
- Each item contains a figure with a missing piece
- Measures ability to form perceptual relations, reason by analogy independent of language and formal schooling (culture fair)

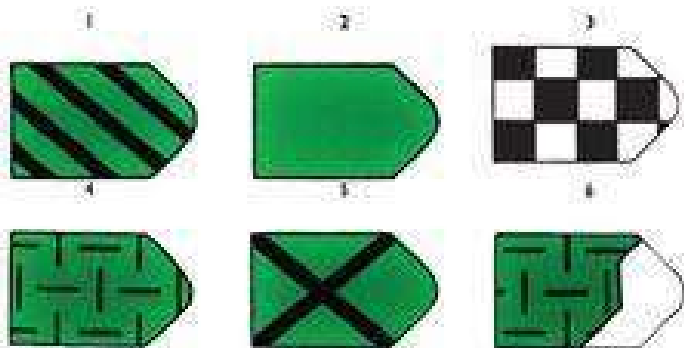
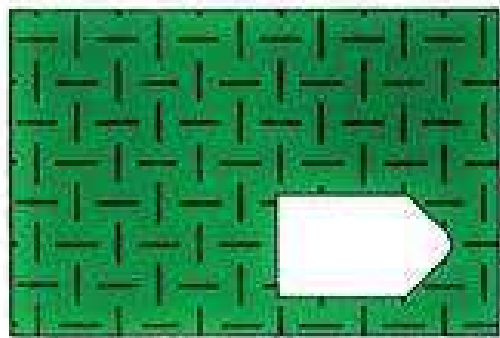
Name of version	Age group	Total items	Time required
Standard progressive matrices	12 yrs & above	60 items in 5 sets of 12	60 min
Colored progressive matrices	Below 11 yrs.	36 items in 3 sets of 12	15-30 min
Advanced progressive matrices	High intelligence	12 practice items 36 test items	40-60 min

Raven's Progressive Matrices



— A —

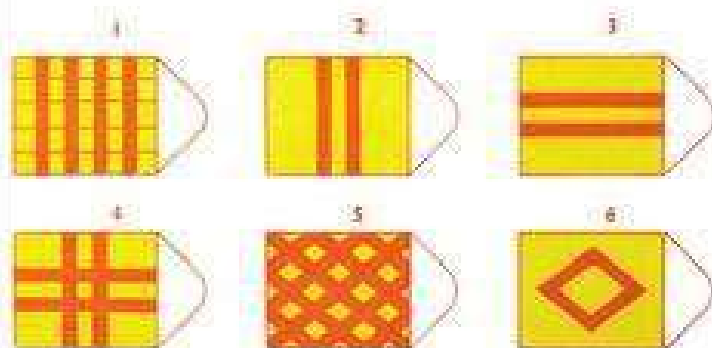
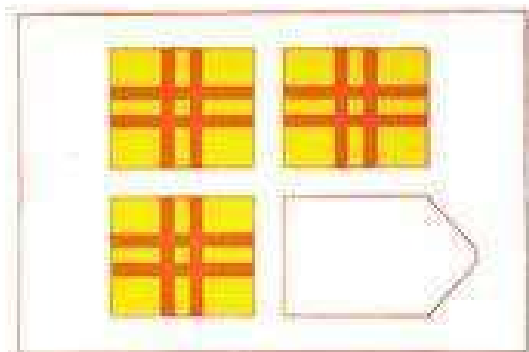
A1



(A)

— A_B —

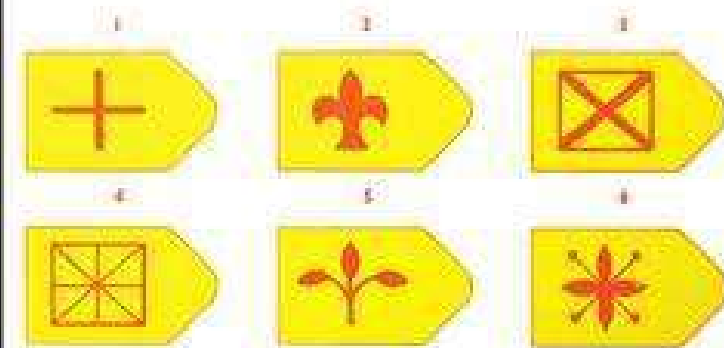
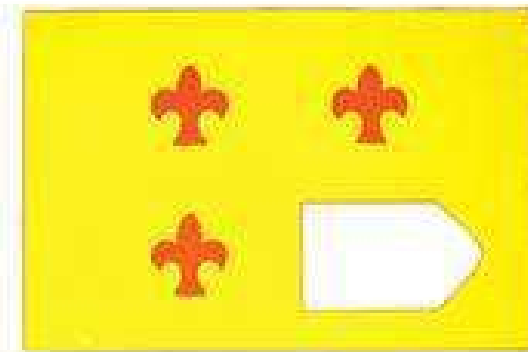
A₂1



(AB)

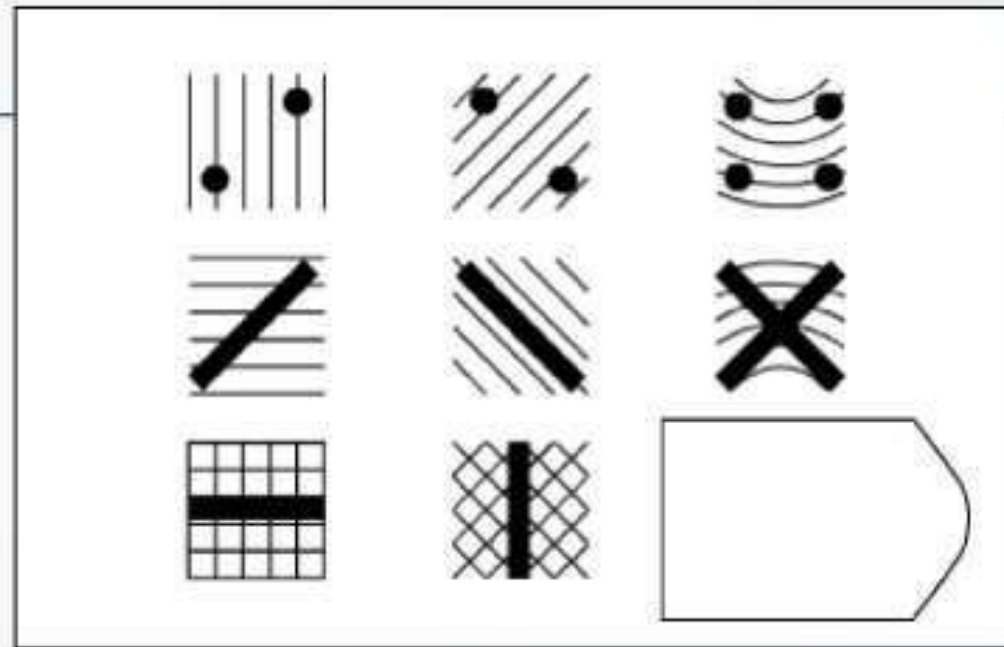
— B —

B1



(B)

APM: Practice Item 3



- 1 2 3 4
- 5 6 7 8
-
- Eight numbered options, each in a white box with a pointed right edge. Option 1: A 4x4 grid with a thick cross in the center. Option 2: Four curved lines with a thick 'X' shape and four black dots at the intersections. Option 3: Four curved lines with a thick cross in the center. Option 4: A 4x4 grid with a thick cross in the center. Option 5: Four curved lines with a thick cross in the center and four black dots at the intersections. Option 6: Four curved lines with a thick 'X' shape. Option 7: A 4x4 grid with a thick cross in the center. Option 8: A 4x4 grid with a thick cross in the center.

SEGUN FORM BOARD

- individual has to insert geometrical shaped blocks into corresponding recesses as quickly as possible
- available from 3years to 11years
- Used particularly for young children and supplemented with other tests
- Advantages:
 1. Spontaneous arousal in children.
 2. Amenable & brief.



BHATIA BATTERY OF INTELLIGENCE TESTING

- C. M. Bhatia Constructed this test for Indian population in 1955
- 5 subtests:
 1. Koh' s block design
 2. Alexander pass a long
 3. Pattern drawing test
 4. Immediate memory
 5. Picture construction
- Total max score = 95

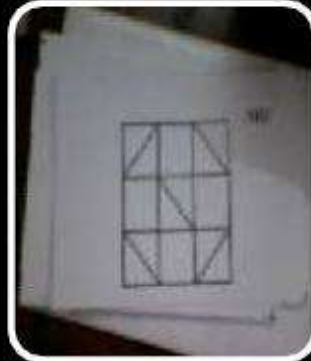
Subtests of Bhatia battery



Includes the 10 designs from original 17 designs of Koh's test



All designs from original Alexander pass a long test



NEW.
Each of 8 cards has a pattern.
Draw w/o lifting.

Digit
Span

Digit span
forward
&
backward



Parts of
pictures
have to be
meaningful
ly
combined.

CRITICISM

- During the 1920s, group intelligence tests were administered to millions of persons wishing to immigrate to the United States
- Such testing was required by legislation designed to prevent “mentally defective” persons from entering the country - racial and ethnic prejudice reflected in such testing
- The California State Board of Education in 1975 imposed a moratorium on the use of intelligence tests to assess disabilities in African Americans
- IQ testing is prejudicial to African American children and tends to diagnose them as mentally retarded
- intelligence tests may suffer from subtle forms of cultural bias

CLASSIFICATION:

ICD 10

LEVEL	IQ	ICD 10 code
Mild (Educable)	50 - 70	F70
Moderate (Trainable)	35 - 49	F71
Severe (Dependent)	20 - 34	F72
Profound	< 20	F73
Severity unspecified	Untestable by standard tests	F78

IQ Classifications in Educational Use

Wechsler, David. *Wechsler Adult Intelligence Scale-Third edition*
Psychological Corporation, 1997

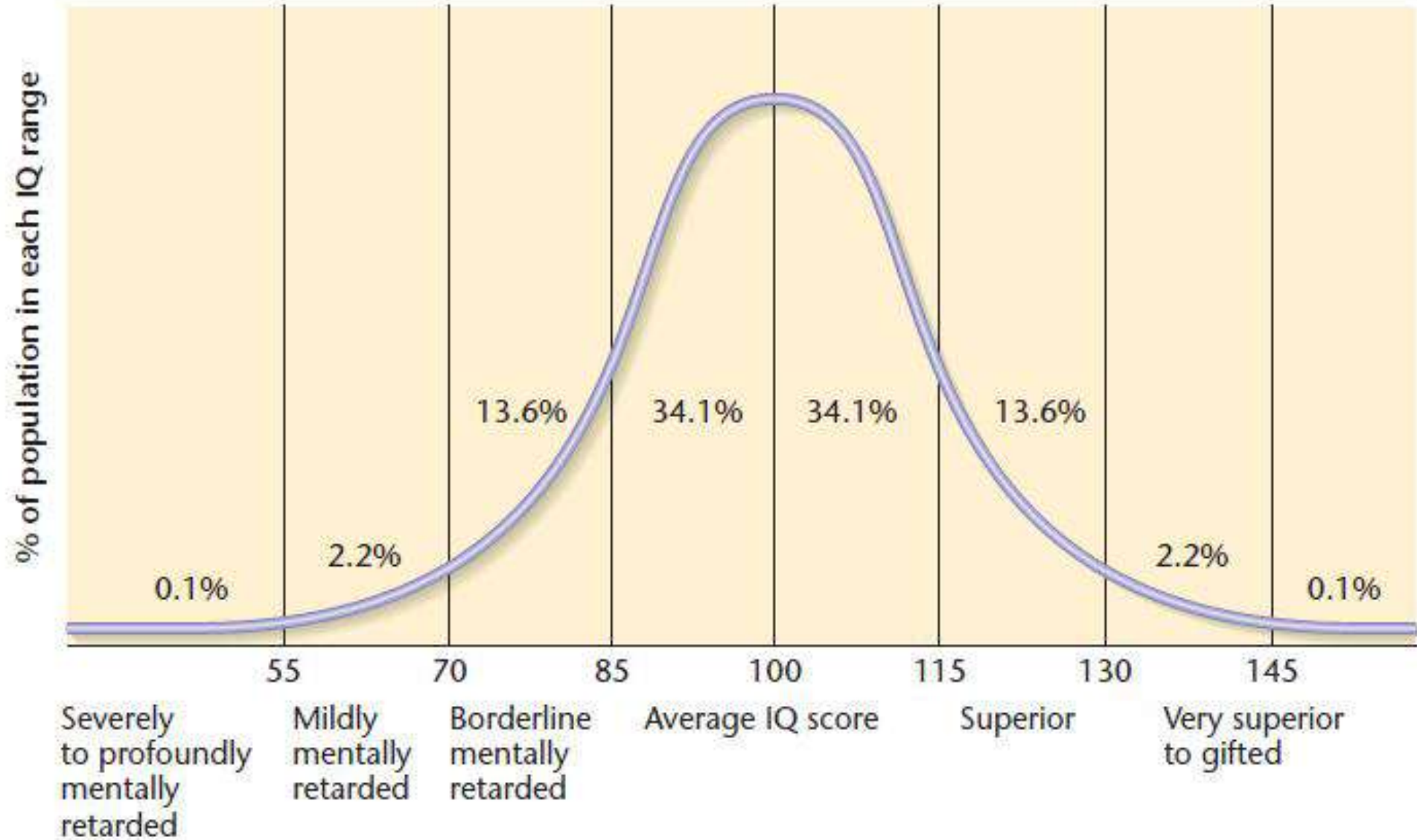
Classification	IQ Score	Percent Included	
		Theoretical Normal Curve	Actual Sample
Very Superior	130 and above	2.2	2.1
Superior	120-129	6.7	8.3
High Average*	110-119	16.1	16.1
Average	90-109	50.0	50.3
Low Average*	80-89	16.1	14.8
Borderline	70-79	6.7	6.5
Extremely Low* **	69 and below	2.2	1.9

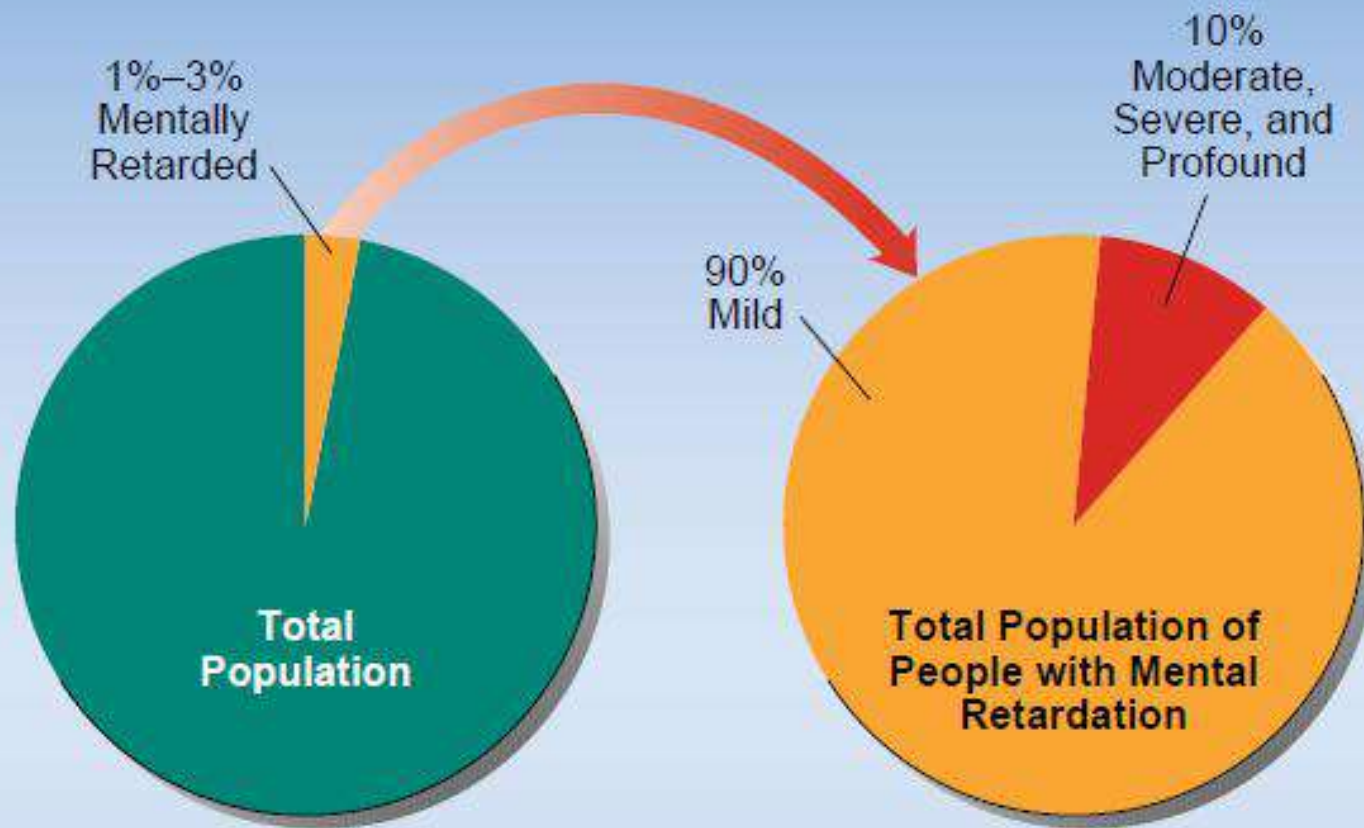
*The terms *High Average*, *Low Average* and *Extremely Low* correspond to the terms *Bright Normal*, *Dull Normal* and *Mental Defective*, respectively, used in the 1955 WAIS manual.

**The term *Extremely Low* is used in place of the terms *Mentally Retarded*, used in the WAIS-R, and *Intellectually Deficient*, used in the WISC-III to avoid the implication that a very low IQ score is sufficient evidence by itself for the classification of "mental retardation" or "intellectually deficient."

IQ Classifications in Psychiatric Use

Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)
American Psychiatric Association, 1994





Classification	Stanford-Binet IQ Score	Wechsler IQ Score	Percentage of the Mentally Retarded	Educational Level Possible
Mild	52-68	55-69	90	Sixth grade
Moderate	36-51	40-54	6	Second to fourth grade
Severe	20-35	25-39	3	Limited speech
Profound	Below 20	Below 25	1	Unresponsive to training

- ICD-11: this term have been replaced by the term "*disorders of intellectual development*" (codes 6A00 - 6A04 diagnosis code).
- The term "*intellectual disability (intellectual developmental disorder)*" is used in DSM-5 (2013)

- In the case of students with an IQ of <85 it is preferable that a revised curriculum is followed with the help of a resource person
- In the case of students with 90 and above IQ points and still showing a discrepancy between capability and achievement scores further investigations need to be done
- Possible reasons for poor school performance:
 1. Specific Learning Disability
 2. ADHD/ ADD issues
 3. Emotional Disturbance

CONCLUSIONS

- IQ tests are used as screening measures to understand the capability of the individual.
- Test development, administration, and interpretation requires great sensitivity.
- In order to get authentic results it is advisable that the test must be conducted by a trained psychologist.
- Principal, teachers, parents and the student need to understand the purpose of undergoing an evaluation.

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- Benjamin J. Sadock, Virginia A., Dr Pedro Ruiz MD Kaplan and Sadock's Comprehensive Textbook of Psychiatry (2 Volume Set) Tenth, 2 Volume Set Edition
- Clifford Morgan, Richard King, John Weisz, John Schopler Introduction to Psychology
- Susan Nolen-Hoeksema, Rita L. Atkinson, Barbara Fredrickson, Ernest Ropiequet Hilgard, Geoffrey Loftus, Willem Wagenaar Atkinson & Hilgard's Introduction to Psychology, 15th edition
- Wikipedia
- Google images

A black and white portrait of Albert Einstein, looking thoughtfully at the camera with his hand resting on his chin. The background is dark and out of focus.

Thank you

Everybody is a genius.
But if you judge a **fish** by its ability
to **climb** a tree, it will live its
whole life **believing** that it is stupid.

- Albert Einstein