Unit – IV
Lesson - 2

INTELLIGENCE AND CREATIVITY

INTRODUCTION TO THEORES OF INTELLIGENCE

- Intelligence takes various forms and functions in different ways.
- Psychologists have proposed multiple theories based on experimental findings to explain its nature and measurement.
- These theories provide insights into the structure of intelligence and the methods used to assess it.

IS INTELLIGENCE A SINGLE?

- Is intelligence a single, general ability or is it a cluster of different mental abilities?
- Do current IQ tests measure it or should it be more broadly defined?

TWO KINDS OF INTELLIGENCE

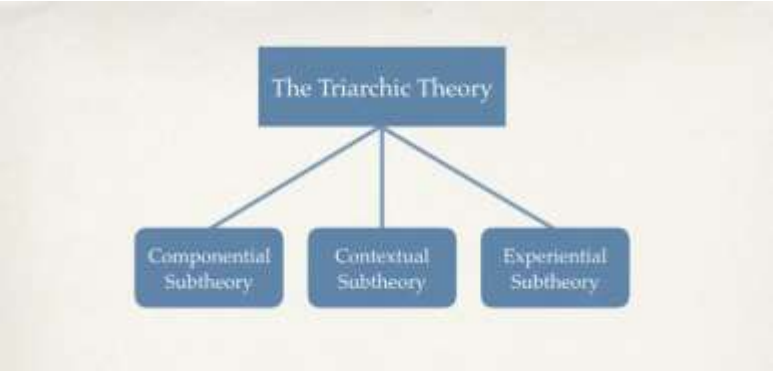
- **Crystallized Intelligence** – learning from past experiences and learning.
  - Situations that require crystallized intelligence include reading comprehension and vocabulary exams.
  - This type of intelligence is based upon facts and rooted in experiences.
  - This type of intelligence becomes stronger as we age and accumulate new knowledge and understanding.

TWO KINDS OF INTELLIGENCE

- **Fluid Intelligence** - the ability to think and reason abstractly and solve problems.
  - This ability is considered independent of learning, experience, and education.
  - Examples: solving puzzles and coming up with problem solving strategies.
  - Both types of intelligence increase throughout childhood and adolescence.
  - Fluid intelligence peaks in adolescence and begins to decline progressively beginning around age 30 or 40.

THEORIES OF INTELLIGENCE - TWO FACTOR THEORY

- **Charles Spearman—"g" factor**
- Louis Thurston—intelligence as a person's "pattern" of mental abilities
- Howard Gardner—multiple intelligences
- Sternberg–Triarchic theory
- Emotional Intelligence - ability to perceive, express, understand, and regulate emotions



SPEARMAN'S GENERAL INTELLIGENCE

SPEARMAN'S DEFINITION OF INTELLIGENCE

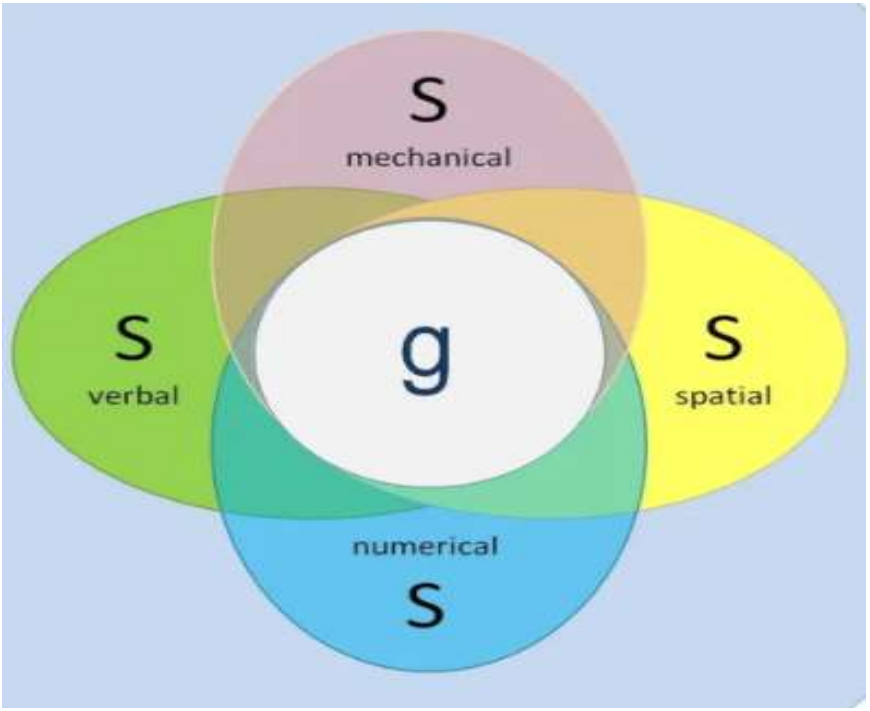
- **Definition**:
  "Intelligence is the capacity of the organism to adjust itself to an increasingly complex environment."
- **Key Idea**:
  Intelligence allows individuals to adapt and respond effectively to changing and more complex surroundings.

TWO FACTORS OF INTELLIGENCE (SPEARMAN, 1927)

- **General Factor (g)**:
  - Described as "mental energy" that underlies all intellectual activities.
  - Innate and cannot be trained or altered.
  - Varies in degree across individuals and is a key determinant of intelligence test scores.
  - Used to categorize individuals as intelligent or dull.
- **Specific Factors (s)**:
  - Unique to specific abilities or tasks.
  - Work alongside the general intelligence (g) in determining overall intellectual performance.

TWO FACTORS OF INTELLIGENCE (SPEARMAN, 1927)

Figure: 'g' and 's' factors of Spearman's Two Factor Theory



TWO FACTORS OF INTELLIGENCE (SPEARMAN, 1927)

Specific Factors (s) in Intelligence

Example of Specific Factors (s):

- Arithmetic, spatial relationships, verbal fluency, etc.
- Each ability measures a separate **'s' factor**.

Intelligence Score:

- Reflects both the **general intelligence (g)** and the magnitude of specific factors (**s**).
- Example:
  - Performance in a **spatial intelligence test** is influenced by both **general intelligence (g)** and the individual's **spatial ability (s)**.

TWO FACTORS OF INTELLIGENCE (SPEARMAN, 1927)

Spearman's Statistical Analysis of Intelligence

- **Interrelation of Test Scores**:
  - Positive correlation between test scores implies a common factor **'g'** (general intelligence) and specific factors **'s'**.
- **Example**:
  - **M (Mechanical)** & **N (Numerical)**:
    - Common factor = **g**
    - Specific factors = **sM** (mechanical) & **sN** (numerical)
  - **V (Verbal)** & **S (Spatial)**:
    - Common factor = **g**
    - Specific factors = **sV** (verbal) & **sS** (spatial)
- **Objective of Psychological Tests**:
  - Measure individual's **'g'** (general ability) to predict performance across various abilities.
  - Differences in intelligence are based on the **'g'** individuals possess.

TWO FACTORS OF INTELLIGENCE (SPEARMAN, 1927)

The Logic of Intelligence **($g+s_1$, $g+s_2$, $g+s_3$, $g+s_4$,)**

- Different individuals differed both in their 'g' as well as 's' factors. For example, one's performance in Physics = **g**+s_1; Maths = **g**+s_2; English = **g**+s_3.

TWO FACTORS OF INTELLIGENCE (SPEARMAN, 1927)

Characteristics of 'G' Factor

- It is universal inborn ability.
- It is general mental energy.
- It is constant.
- The amount of 'g' differs from individual to individual.
- It is used in every activity of life.
- Greater the 'g' in an individual, greater is his success in life.

Characteristics of 's' Factor

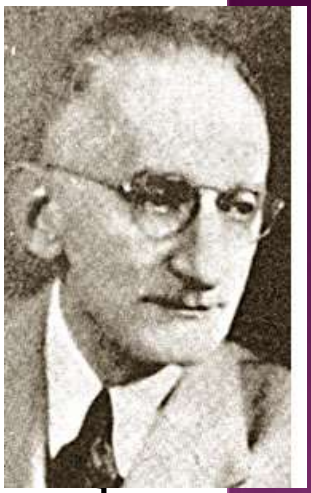
- It is learned and acquired in the environment.
- It varies from activity to activity in the same individual.
- Individuals differ in the amount of 'S' ability.

TWO FACTORS OF INTELLIGENCE (SPEARMAN, 1927)

Criticisms of Spearman's Two-Factor Intelligence Theory

- **Focus on Psychometric Approach**:
  - Spearman emphasized **factor analysis** but neglected **cognitive processes** related to intelligence.
- **Limited Scope of "g"**:
  - The **'g' factor** does not account for other important abilities like **perception**, **emotional**, and **motor skills**.
  - Spearman viewed mental abilities as **unitary**, not independent.
- **Criticism by Louis Thurstone (1935)**:
  - Thurstone objected to the dominance of **general intelligence** and proposed intelligence consists of **multiple primary abilities**, discovered through factor analysis.
- **Legacy**:
  - Despite criticisms, Spearman's **two-factor theory** introduced the valuable tool of **factor analysis** to psychology.

GROUP FACTOR THEORY OF LOUIS L. THURSTONE



Introduction

- Intelligence is a cluster of abilities.
- Believed that there were different "primary mental abilities" each independent from the other.
- Examples: Verbal Comprehension, numerical ability, reasoning & perceptual speed
- The *g* factor was just an overall average score of these independent abilities.
- Looked for a pattern of mental abilities like Wechsler.

GROUP FACTOR THEORY OF LOUIS L. THURSTONE

Thurston's Theory of Primary Mental Abilities (1938)

- **Overview**:
  - Proposed by **Louis Thurstone** in 1938.
  - Forms the basis for contemporary intelligence theories, including those by **Gardner (1983)** and **Carroll (1993)**.
  - Influenced the development of modern **group intelligence tests**.
- **Key Findings**:
  - Analyzed data from **56 mental ability tests**.
  - Concluded that the general intelligence factor (**g**) is **unimportant** and possibly **epiphenomenal**.
- **Seven Primary Mental Abilities**:
  - Thurston identified **seven distinct primary abilities** that make up intelligence.

GROUP FACTOR THEORY OF LOUIS L. THURSTONE

Thurston's Theory of Primary Mental Abilities (1938)

1. The Numerical Factor

- It involves the ability of an individual to do quick and accurate numerical computations. It can be measured by checking the accuracy and speed of the person in solving various arithmetic problems.

2. The Verbal Factor

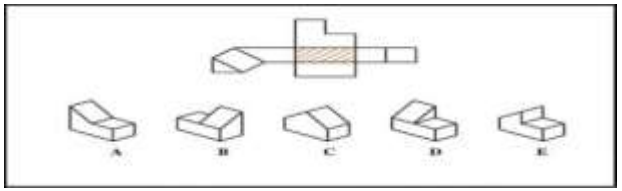
- It refers to the ability of the person to understand and use various words, sentences, language, or other verbal content pieces. This ability can be assessed through vocabulary tests, jumble word tests and verbal or reading comprehension tests.

GROUP FACTOR THEORY OF LOUIS L. THURSTONE

Thurston's Theory of Primary Mental Abilities (1938)

3. The Space Factor (Spatial Visualization)

- **Definition**:
  - Refers to the ability to **visualize and manipulate objects** in space, both real and imaginary.
- **Key Tasks**:
  - Solving **puzzles** involving spatial reasoning.
  - Understanding **geometric figures** and their relationships.
  - Identifying the **mirror image** or **rotated images** of objects.
- **Measurement**:
  - Tests measuring spatial ability focus on tasks involving the visualization of objects from different angles or positions.



GROUP FACTOR THEORY OF LOUIS L. THURSTONE

Thurston's Theory of Primary Mental Abilities (1938)

5. Verbal Fluency / Word Fluency Factor

- **Definition**:
  - The ability to **rapidly generate words** or sentences, reflecting **communication skills**.
- **Key Tasks**:
  - Tests may involve tasks like quickly thinking of words that **start or end** with a specific letter.
- **Importance**:
  - Individuals with high verbal fluency excel in tasks requiring quick verbal expression, while those with lower fluency may struggle.
  - Crucial for **effective communication** in everyday and professional contexts.

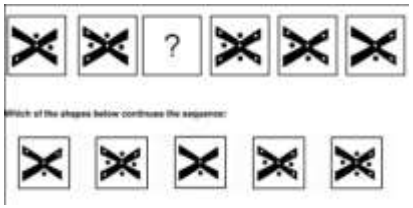
GROUP FACTOR THEORY OF LOUIS L. THURSTONE

Thurston's Theory of Primary Mental Abilities (1938)

6. Reasoning Factor

a) The Inductive

- This reasoning involves the ability to deduce a general principle from a specific concept.
- This ability is measured through various tests like number series, word series and classification of words or numbers.
- The inductive reasoning tests may involve selecting an appropriate number or image according to the sequential order of the given numbers or images series.



b) Deductive Reasoning Factor

It involves the ability to accurately understand a specific phenomenon or concept from the generalized principle. Various aptitude tests are available to test the deductive reasoning of the person that includes the various set of statements and the person has to choose the best possible logical solution according to the given statements.

GROUP FACTOR THEORY OF LOUIS L. THURSTONE

Thurston's Theory of Primary Mental Abilities (1938)

7.Perceptual Speed Factor

- **Definition**:
  - The ability to **rapidly recognize and compare** images, numbers, or letters, and accurately **proofread content**.
- **Key Tasks**:
  - Tests may involve tasks like **picture recognition**, **finding specific letters or numbers** in sequences, or identifying **particular words** in paragraphs.
- **Importance**:
  - Essential for tasks that require **quick visual processing** and attention to detail, such as proofreading or pattern recognition.

HOWARD GARDNER'S MULTIPLE INTELLIGENCES

HOWARD GARDNER (1943-)

- Author of a contemporary theory of multiple intelligences consisting of eight separate kinds of intelligence
- Multiple Intelligences – several independent mental abilities that allow a person to solve problems, create products that are valued within one's culture.
- Intelligence defined within the context of culture

GARDNER'S TYPES OF INTELLIGENCE

Intelligence	Examples
 Verbal-Linguistic	Reading comprehension Writing

GARDNER'S TYPES OF INTELLIGENCE

Intelligence	Examples
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GARDNER'S TYPES OF INTELLIGENCE

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 Visual-Spatial	Judging distance Map reading Geometry

GARDNER'S TYPES OF INTELLIGENCE

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 Intrapersonal	Knowledge of self

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 Interpersonal	Listening Cooperation Sensitivity to others
 Intrapersonal	Knowledge of self
 Naturalistic	Appreciate nature Ability to work with plants and animals

Howard Gardner's Multiple

Linguistic intelligence	Adept use of language: poet, writer, public speaker, native storyteller
Logical-mathematical intelligence	Logical, mathematical, and scientific ability: scientist, mathematician, navigator, surveyor
Musical intelligence	Ability to create, synthesize, or perform music: Musician, composer, singer
Spatial intelligence	Ability to mentally visualize the relationships of objects or movements: sculptor, painter, expert chess player, architect
Bodily-kinesthetic intelligence	Control of bodily motions and capacity to handle objects skillfully: athlete, dancer, craftsperson
Interpersonal intelligence	Understanding of other people's emotions, motives, intentions: politician, salesperson, clinical psychologist
Intrapersonal intelligence	Understanding of one's own emotions, motives, and intentions: essayist, philosopher
Naturalist intelligence	Ability to discern patterns in nature: ecologist, zoologist, botanist.

HOWARD GARDNER'S EIGHT INTELLIGENCES

Aptitude	Example
1. Linguistic ("word smart")	Toni Morrison, writer
2. Logical-mathematical ("number smart")	Albert Einstein, scientist
3. Musical ("music smart")	Wynton Marsalis, musician
4. Spatial ("art smart")	Frida Kahlo, artist
5. Bodily-kinesthetic ("body smart)	Tiger Woods, athlete
6. Intrapersonal ("self smart")	Anna Freud, psychoanalyst
7. Interpersonal ("people smart")	Mahatma Gandhi, leader
8. Naturalist ("nature smart")	John Audubon, naturalist

ROBERT STERNBERG'S TRIARCHIC THEORY OF INTELLIGENCE

ROBERT STERNBERG (1949-)

- Author of a Triarchic theory of multiple intelligences consisting of of 3 mental *abilities*
- Disagrees with Gardner in calling these *intelligences*. Instead believes these are talents or abilities. Said Intelligence is a general quality
- Stresses both the universal aspects of intelligent behavior and the importance of adapting to a certain social and cultural climate.
- Also called Successful Intelligence

ROBERT STERNBERG

- Analytic intelligence—mental processes used in learning how to solve problems
- Creative intelligence—ability to deal with novel situations by drawing on existing skills and knowledge
- Practical intelligence—ability to adapt to the environment (street smarts)

STERNBERG'S TYPES OF INTELLIGENCE

Intelligence	Examples
Analytic 	Analyzing Comparing Evaluating

STERNBERG'S TYPES OF INTELLIGENCE

Intelligence	Examples
 Analytic	Analyzing Comparing Evaluating
 Practical	Applying Using

STERNBERG'S TYPES OF INTELLIGENCE

Intelligence	Examples
 Analytic	Analyzing Comparing Evaluating
 Practical	Applying Using
 Creative	Inventing Designing

EMOTIONAL INTELLIGENCE

EMOTIONAL INTELLIGENCE

- The ability to perceive, express, understand, and regulate emotions
- People high in emotional intelligence are more in touch with their feelings and the feelings of others.

IQ Tests do a good job measuring:

- Abstract thinking
- Problem solving
- Capacity to acquire knowledge

IQ Tests however do not measure:

- Creativity
- Achievement motivation
- Goal-oriented behavior
- Ability to adapt to one's environment

THE WECHSLER SCALES

Verbal Subtests

- Information
- Vocabulary
- Arithmetic
- Similarities
- Comprehension
- Digit Span

Performance Subtests

Picture Completion

Picture Arrangement

Block Design

Object Assembly

Digit Symbol

VERBAL SUBTESTS

- **Information**: culturally acquired info
- **Vocabulary**: general verbal intell.
- **Arithmetic**: numerical reasoning
- **Similarities**: abstract reasoning
- **Comprehension**: social norms
- **Digit Span**: short term memory

PERFORMANCE SUBTESTS

- **Picture Completion**: visual concentration and nonverbal general information
- **Picture Arrangement**: ability to plan, interpret and anticipate in social context
- **Block Design**: perceptual organization, spatial visualization and abstract concentration
- **Object Assembly**: visual motor organ., synthesis
- **Digit Symbol:** visual memory

COMPREHENSION

1. Why should we obey traffic laws and speed limits?
2. Why are antitrust laws necessary?
3. Why should we lock the doors and take the keys to our car when leaving the car parked?
4. What does this saying mean: "Kill two birds with one stone."

INFORMATION

1. Who wrote Huckleberry Finn?
2. Where is Finland?
3. At what temperature does paper burn?
4. What is entomology?

ARITHMETIC

1. How many 15¢ stamps can you buy for a dollar?
2. How many hours will it take a cyclist to travel 60 miles if he is going 12 miles an hour?
3. A man bought a used stereo system for 3/4 of what it cost new. He paid $225 for it. How much did it cost new?
4. Six men can finish a job in ten days. How many men will be needed to finish the job in two and a half days?

A. Verbal tests

SIMILARITIES

- In what way are an orange and a banana alike?

VOCABULARY

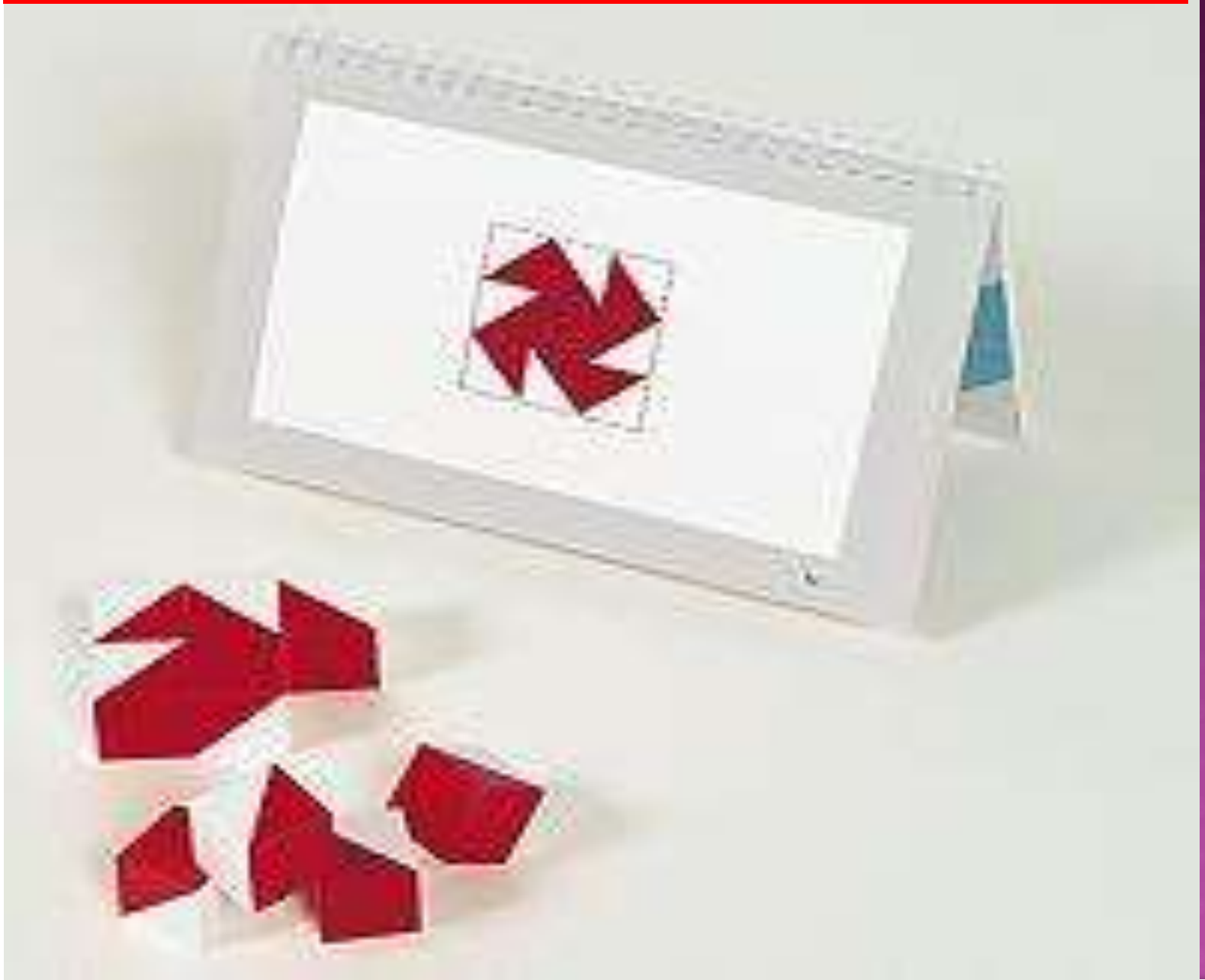
- Bed
- Ship
- Penny

DIGIT SPAN

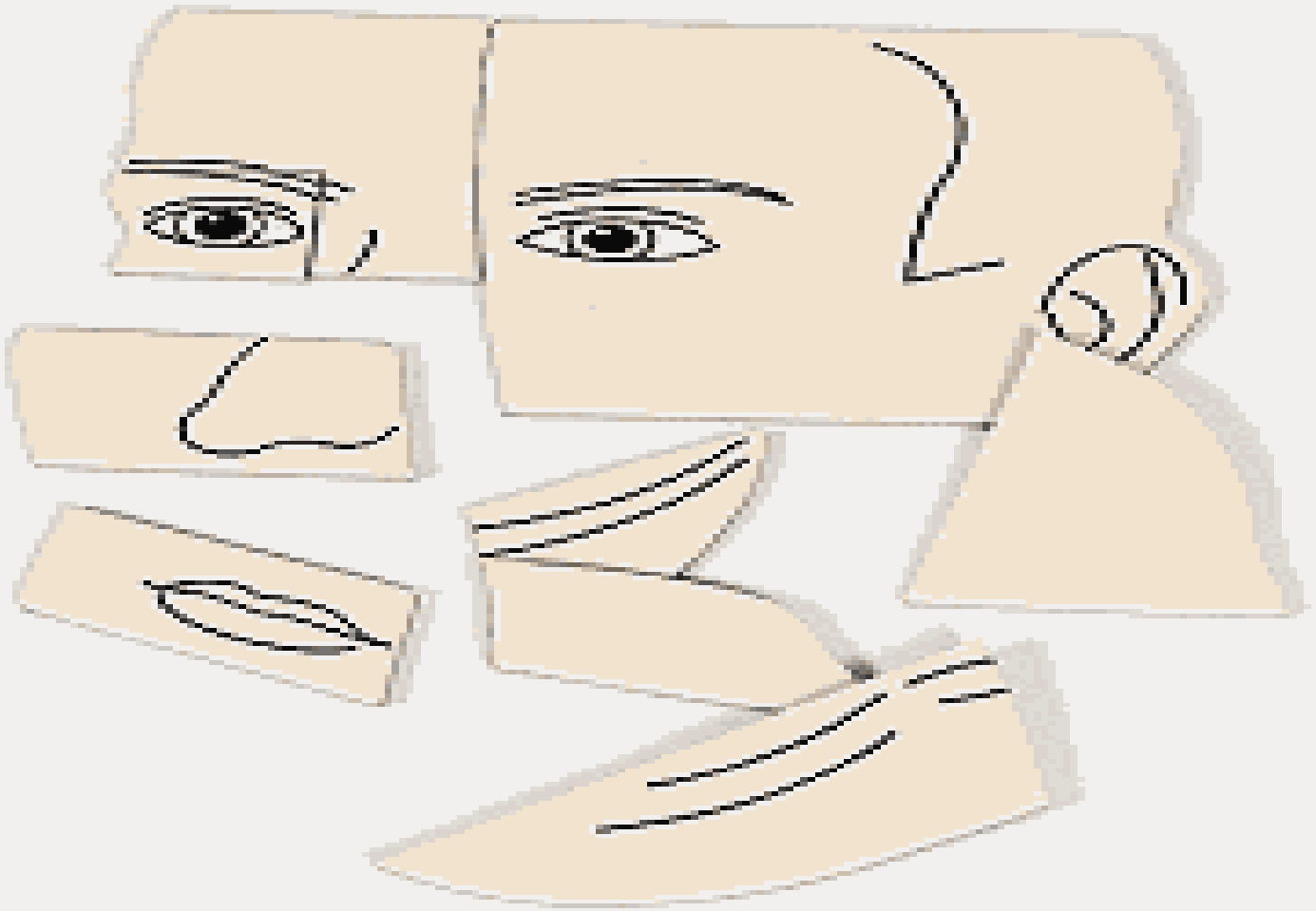
- Demonstrate

Picture Completion

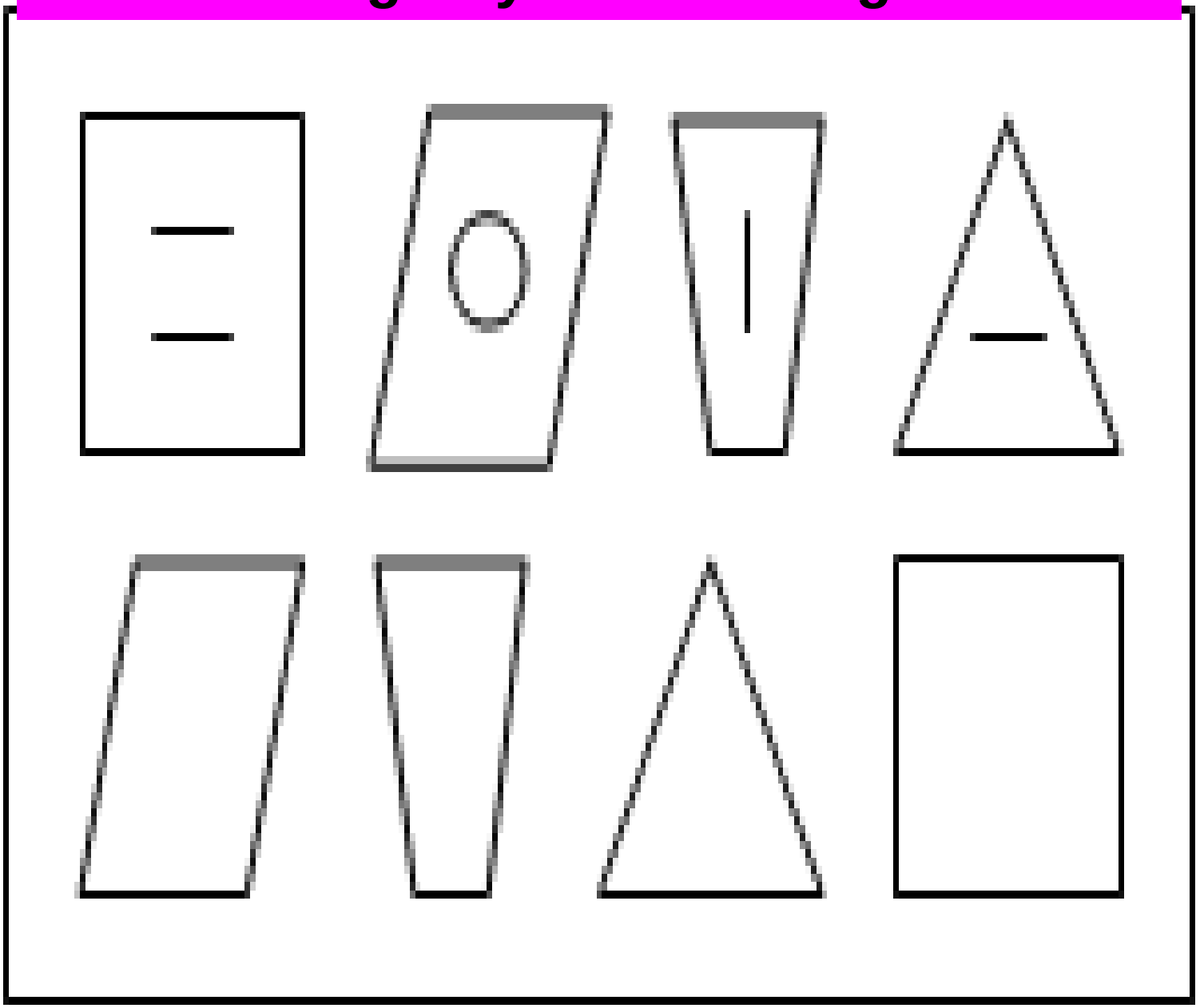
Block Design



Object Assembly



Digit Symbol Coding



Picture Arrangement

WECHSLER SCALES: CLINICAL USE

- Estimation of general intelligence (correlates with academic success and occupational status)
- Examine the discrepancy in performance between verbal and performance subtests
- Examine the variability among subtests

CONTROVERSIES: RACE AND IQ

Average IQ score differ for various racial and ethnic groups

- Asian Americans
- Whites
- Latina
- African Americans

GENETICS

Genetics

- Heritability estimates for IQ is about .50 in a population

Environment

- Like other traits, IQ is changeable (height for example).
- Educational experiences affect IQ
- IQ scores have increased over the years (nutritional factors, increasing access to information)