



Intelligence and Mental Ability

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Introduction

- Intelligence refers to the abilities involved in learning and adaptive behaviour
- Intelligence tests
 - Designed to measure a person's general mental abilities
- But what exactly what makes up intelligence?

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Definition of Intelligence

Global capacity to think rationally,
act purposefully, and deal
effectively with
the environment

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Theories of Intelligence

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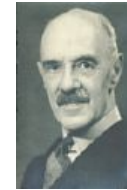
Theories of Intelligence

- Charles Spearman – “g” factor
- Louis Thurstone - Intelligence as a person’s “pattern” of mental abilities
- Raymond Cattell - Clusters of intelligence
- Sternberg - Triarchic theory
- Howard Gardner - Multiple intelligences
- Daniel Goleman - Emotional Intelligence

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Early Theories of Intelligence

- Charles Spearman (1863 – 1945)
 - Believed intelligence is general / global
 - People who are bright in one area are usually bright in other areas as well



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Early Theories of Intelligence

- Louis Thurstone (1887 – 1955)
 - Believed that intelligence is made up of seven distinct, independent abilities
 - Spatial ability, perceptual speed, numerical ability, verbal meaning, memory, word fluency, and reasoning



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Early Theories of Intelligence

- Raymond Cattell (1905 - 1998)
 - Identified two clusters of mental abilities
 - *Crystallized intelligence* includes abilities such as reasoning and verbal skills
 - *Fluid intelligence* includes skills such as spatial and visual imagery, rote memory, and the ability to notice visual details
 - While education can increase crystallized intelligence, it was not thought to have any effect on fluid intelligence

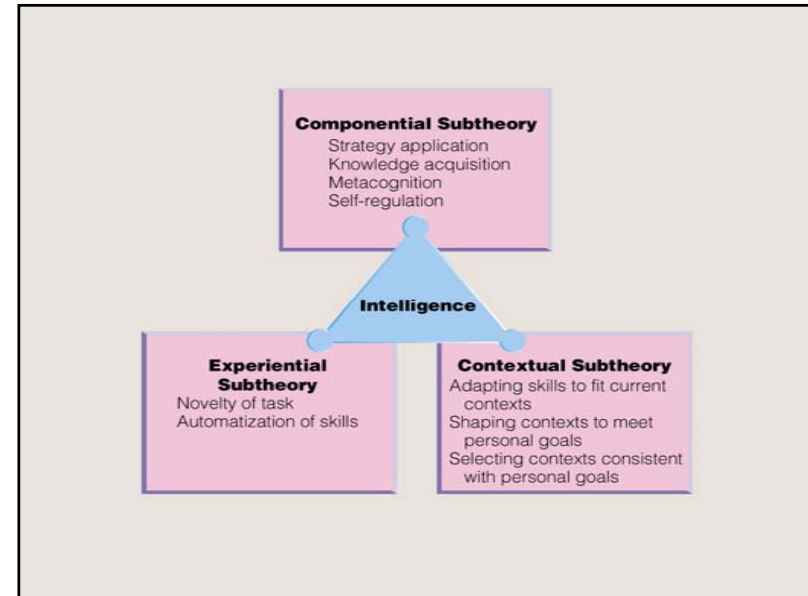


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Contemporary Theories of Intelligence

- Robert Sternberg
 - Triarchic theory of intelligence posits three types of intelligence
 - *Analytical intelligence* includes the ability to learn how to do things, solve problems, and acquire new knowledge
 - *Creative intelligence* includes the ability adjust to new tasks, use new concepts, and respond well in new situations
 - *Practical intelligence* includes the ability to select contexts in which you can excel and solve practical problems

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Contemporary Theories of Intelligence

- Howard Gardner's Theory of Multiple Intelligences (8 so far . . .)
 - Gardner argues that each intelligence has
 - a unique biological basis,
 - a distinct course of development
 - different expert performances
 - Cultural values and learning opportunities
 - Not yet firmly grounded in research.
 - Helpful in efforts to understand and nurture children's special talents.

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Contemporary Theories of Intelligence

- Howard Gardner's theory of multiple intelligences

■ Logical-mathematical	■ Bodily-kinesthetic
■ Linguistic	■ Interpersonal
■ Spatial	■ Intrapersonal
■ Musical	■ Naturalistic

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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, craftsman
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.

Contemporary Theories of Intelligence

- Daniel Goleman
 - Proposed theory of *Emotional Intelligence*
 - Emotional intelligence has five components
 - Knowing one's own emotions
 - Managing one's own emotions
 - Using emotions to motivate oneself
 - Recognizing the emotions of other people
 - Managing relationships
 - http://www.eiconsortium.org/research/what_is_emotional_intelligence.htm

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Defining and measuring intelligence

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Defining and Measuring Intelligence

- Provide an **overall score** for general intelligence or reasoning ability, and an **array of separate scores** measuring specific mental abilities.

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Alfred Binet (1857–1911)

- Intelligence—collection of higher-order mental abilities loosely related to one another
- Did not rank “normal” students according to the scores
- Binet-Simon Test developed in France, 1905
- Intelligence is nurtured



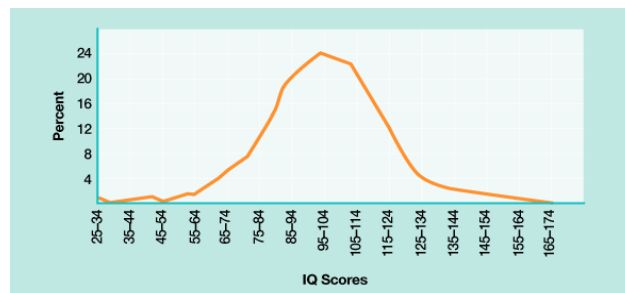
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Intelligence Tests

- Binet-Simon scale
 - First test of intelligence, developed to identify children who might have difficulty in school
 - Binet developed the concept of *mental age* in children
- Stanford-Binet scale
 - L. M. Terman's adaptation of the Binet-Simon scale
 - Terman introduced the I.Q. score
 - A score of 100 is considered average

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Approximate Distribution of IQ Scores in the Population



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Modern Intelligence Tests

The Stanford-Binet Scale

- Modification of the original Binet-Simon, after original came to US
- Intelligence Quotient (IQ) - mental age divided by chronological age
- Used widely in the US, not as much as previously

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Intelligence Tests

- Stanford-Binet measures four kinds of mental abilities
 - Verbal reasoning
 - Abstract/visual reasoning
 - Quantitative reasoning
 - Short-term memory

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Modern Intelligence Tests

- Types of tests:
 - Achievement test—designed to measure level of knowledge, skill, or accomplishment in a particular area
 - Aptitude test—designed to measure capability to benefit from education or training
 - Interest test—measures self-reported vocational interests and skills

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Modern Intelligence Tests

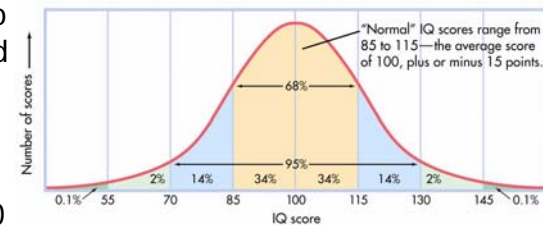
■ The Wechsler tests

- Used more widely now than Stanford-Binet
- Modeled after Binet's, also made adult test
 - WISC-IV for children
 - WAIS-III for adults

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Standardized Scoring of Wechsler Tests

- All raw scores converted to standardized scores
- Normal distribution
- Mean of 100
- S.d. of 15



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Wechsler Intelligence Scale for Children-IV

- The aggregate or global ability of the individual to think rationally, act purposefully and deal effectively with the environment.
- Ages 6- through 16-year-olds.
- Verbal IQ
- Performance IQ
- Full Scale IQ
- Mean = 100; SD 15
- Average 85-115

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Intelligence Tests

- Group Tests
 - Intelligence tests that can be given to large groups
 - Advantages
 - Quick scoring
 - No examiner bias
 - Easier to establish norms
 - Disadvantages
 - Less likely to detect someone who is ill or confused
 - Might make people nervous
 - Learning disabled children often perform worse

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Intelligence Tests

- Performance tests
 - Tests that minimize the use of language
 - Used to test very young children or people with LD
 - Also can be used to test those unfamiliar with English
- Culture-fair tests
 - Tests designed to reduce cultural bias
 - Minimize skills and values that vary from one culture to another

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Qualities of Good Tests

- Standardized
 - Administered to large groups of people under uniform conditions to establish norms
- Reliable
 - Ability to produce consistent results when administered on repeated occasions under similar conditions
- Valid
 - Ability to measure what the test is intended to measure

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What Makes a Good Test?

- Reliability
 - Ability of a test to provide consistent and stable scores
 - Can measure reliability in two ways
 - Test-retest reliability – give the same test twice and compare scores
 - Split-half reliability – divide one test into two parts and compare the scores on each part

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What Makes a Good Test?

- Validity
 - Ability of a test to measure what it was designed to measure
 - Content validity
 - The extent to which test items represent the knowledge or skills being measured
 - Ecological validity
 - Relationship between scores on a test and an independent measure of what the test is supposed to measure

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Criticisms of IQ Tests

- Test content and scores
 - Critics argue that IQ test measure a narrow set of skills
 - Some feel that the tests merely measure test taking ability
 - Tests may discriminate against minorities
- Use of intelligence tests
 - Could result in permanent labeling
- IQ and success
 - Relationship does exist, but may be the result of a self-fulfilling prophecy

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Individual differences

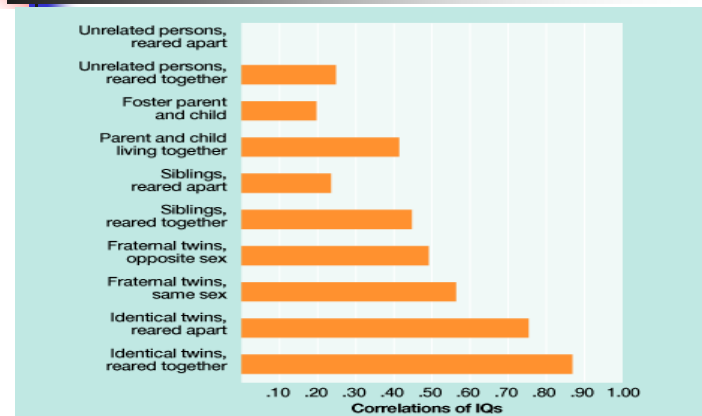
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What Determines Intelligence?

- Heredity
 - To what extent is intelligence inherited from parents?
 - Evidence from twin and adoption studies points to a genetic component for intelligence

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Correlation of IQ Scores of Family Members



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Twin studies

- Adoption research
 - Estimates are that 50% of differences among children in IQ can be traced to their genetics
 - Poverty severely depresses the intelligence of large numbers of ethnic minority children.
 - Unique cultural values and practices do not prepare these children for intelligence tests.



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What Determines Intelligence?

- Environment
 - The environment in which one is raised can strongly effect intelligence
 - This can include proper nutrition and access to quality education as well as an enriching environment

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Nature - Nurture

- There is general agreement that both heredity and environment affect IQ scores
- Debate centers around the relative contribution of nature (heredity) and nurture (environment) to the development of intelligence

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Mental Abilities & Human Diversity

- Gender
 - Overall, men and women do not differ significantly in general intelligence
 - Women may show slight advantage in mathematical computation skills
 - Men show an advantage in spatial ability
 - Men are more likely to fall in the extremes of intelligence range

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Cultural Influences

- Unique cultural values and practices do not prepare ethnic minority children for intelligence tests.
 - Language Customs
 - Familiarity with Test Content
 - People-oriented versus books, TV, video games

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Explaining Individual and Group Differences in IQ (US Studies)

- American black children score, on the average, 15 IQ points below American white children, although this difference is shrinking.
- Hispanic children fall midway between black and white children
- The gap between middle-SES and low-SES children is about 9 points.
- There is considerable variation within each ethnic and SES group.

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Extremes of Intelligence

- Learning Disabilities
 - Refers to a wide variety of mental deficits
 - Defined as significantly sub-average general intelligence functioning that is accompanied by significant limitations in adaptive functioning
 - Some people with LD show *savant performance* on particular skills

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Learning Disabilities

Level of Disability	IQ Range
Mild	Low 50s-70s
Moderate	Mid 30s-low 50s
Severe	Low 20s-mid 30s
Profound	Below 20 or 25

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Extremes of Intelligence

- Giftedness
 - Refers to superior IQ combined with ability in academics, creativity, and leadership
 - Giftedness is often in specific areas
 - “Globally” gifted people are rare

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Gifted Children

- Gifted children display exceptional intellectual strengths, including high IQ, keen memory, and an exceptional capacity to solve challenging problems rapidly and accurately.
 - High creativity
 - Divergent thinking
 - Convergent thinking
 - Talent.
 - Extreme giftedness often results in social isolation.
 - Many talented youths become experts in their fields, yet few become highly creative.

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Educating the Gifted

- The extent to which programs for the gifted foster creativity and talent depends on opportunities to acquire relevant skills.
- Gardner's theory of multiple intelligences has inspired several model programs that include all pupils.
- Evidence is still needed on how effectively these programs nurture children's talents.
- These programs may be useful in identifying talented, low-SES minority children, who are underrepresented in school programs for the gifted.

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Creativity

- Creativity can be defined as the ability to produce novel and socially valued ideas or objects
- Creativity and intelligence
 - Intelligence and creativity are related, but only up to a certain threshold
 - Above about 110 IQ they are virtually unrelated
 - Creative people are often perceived as intelligent

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Creativity

- Creativity tests
 - Open-ended questions are used
 - Scoring is based upon the number and originality of a person's answers

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Creativity

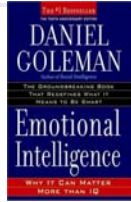
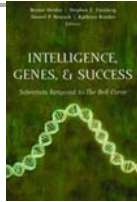
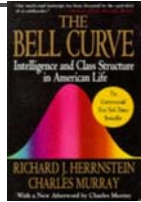
To enhance creativity:

- Creativity as a goal
- Reinforce creative behaviour
- Engage in problem finding
- Acquire relevant knowledge
- Try different approaches
- Exert effort and expect setbacks



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