Intelligence

Lecture 24
“Psychology’s Most Telling Contribution To Date”  
Herrnstein (1973, p. 62)

- Francis Galton
  - *Hereditary Genius* (1869)
  - Anthropometrics
    - Correlation Coefficient
  - Eugenics Movement

- Alfred Binet
  - Binet-Simon Test (1905)
    - Theodule Simon
The Binet-Simon
“Scale for Measuring Intelligence”
Matarazzo (1972), after Binet & Simon (1905)

- Following a Moving Object With the Eyes
- Finding and Eating a Square of Chocolate Wrapped in Paper
- Comparing Two Lines of Unequal Length
- Repeating a Sentence of 15 Words
- Telling How Two Common Objects are Different

- Telling How Two Common Objects are Similar
- Making Rhymes
- Repeating Spoken Digits
- Sentence Completion
- Using Three Nouns in a Single Sentence
- Paper Folding and Cutting
- Defining Abstract Terms
Mental Age and the Intelligence Quotient
Binet & Simon (1908); Stern (1912)

• Mental Age
  – Items Arranged in Increasing Order of Difficulty
  – Items Grouped into Clusters by Age Level
    • Ages 3-13
    • Passed by a Majority of Children at That Level

• IQ = (MA/CA) x 100
  – Mental Age
  – Chronological Age
The American Scene

• Louis Terman (1916)
  – Stanford-Binet Intelligence Scale
  – Study of “Gifted” Children

• Robert Yerkes (1921)
  – Army “Alpha” and “Beta” Tests
    • Armed Forces Qualification Test

• David Wechsler (1936)
  – Wechsler Adult Intelligence Scale
    • Wechsler Intelligence Scale for Children
The Wechsler Adult Intelligence Scale
Wechsler (1939)

**Verbal Scales**
- Information
- Comprehension
- Memory span
  - 8 Digits Forward
  - 6 Digits Backward
- Arithmetical Reasoning
- Similarities
- Vocabulary

**Performance Scales**
- Picture Arrangement
- Picture Completion
- Block Design
- Object Assembly
- Digit Symbol
Calculating the Deviation IQ

• Norms for Age Groups
  – Age 16-75

• Z-Score: Standard Deviations from Mean
  – Produces “Normal” (Gaussian) Distribution
Assume $M = 40$, $SD = 12$
Transform to $M = 100$, $SD = 15$

<table>
<thead>
<tr>
<th>Test Score</th>
<th>Deviation IQ</th>
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<tbody>
<tr>
<td>40</td>
<td>100</td>
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<tr>
<td>28</td>
<td>85</td>
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<tr>
<td>52</td>
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<td>16</td>
<td>70</td>
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<tr>
<td>64</td>
<td>130</td>
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Frequency Distribution of IQ
after Wechsler (1939)
“The Bell Curve” of IQ
AFQT administered to National Longitudinal Study of Youth, 1980
Fischer et al. (1996), after Herrnstein & Murray (1994)
The “Forced Curve”

• “Grading on the Curve”
  – $M = C$; As and Bs = Ds and Fs

• WAIS, WISC, Stanford-Binet
  – $M = 100$, $SD = 15$

• SAT, GRE, GMAT
  – $M = 500$, $SD = 100$

• LSAT
  – $M = 150$, $SD = 10$
Properties of Psychometric Tests

- Standardization
- Norms
- Reliability
  - Inter-rater
  - Test-Retest
- Validity
  - External Criterion
- Utility
  - Cost-Benefit Ratio
The Structure of Intelligence

• Spearman (1904): General Intelligence
  – Two-factor Theory
    • General Intelligence \((g)\)
    • Specific Factors \((s_n)\)

• Thurstone (1941): Primary Mental Abilities
  – Factor Analysis
    • Number
    • Word Fluency
    • Verbal Meaning
    • Memory
    • Reasoning
    • Space
    • Perceptual Speed
The Structure of Intellect
Guilford (1967), as revised

Products
- Units
- Classes
- Relations
- Systems
- Transformations
- Implications

Contents
- Figural
- Symbolic
- Semantic
- Behavioral

Operations
- Evaluation
- Convergent production
- Divergent production
- Memory
- Cognition
Crystallized and Fluid Intelligence
Cattell (1942)

• Fluid Intelligence (Gf)
  – General Ability to Perceive Relationships
  – Neurological Connections
  – Assessed by “Culture Fair” Tests

• Crystallized Intelligence (Gc)
  – Product of Experience
    • Education, Environment
  – Assessed by Standard Intelligence Tests

• Components of Performance
  – Fluid Intelligence + Education + Motivation
Raven’s Progressive Matrices
Raven (1938)

Sample Item
The Theory of Multiple Intelligences
Gardner (1983, 1999)

Multiple Intelligences
• Linguistic
• Logical-Mathematical
• Spatial
• Musical
• Bodily-Kinesthetic
• Intrapersonal
• Interpersonal

Evidence
• Isolation by Brain Damage
• Exceptional Cases
• Identifiable Core Operations
• Psychometric Tests
• Experimental Tasks
Triarchic Theory of Intelligence
Sternberg (1985)

- Analytical Intelligence
  - Meta-Components
  - Performance Components
  - Knowledge Acquisition Components

- Creative Intelligence
  - Novelty Skills
  - Automatization Skills

- Practical Intelligence
  - Adaptation, Shaping, Selection
Intelligence Beyond Cognition

• Social Intelligence (Thorndike, 1920)
  “The ability to understand and manage men and women, boys and girls – to act wisely in human relations” (p. 228)

• Emotional Intelligence (Salovey & Mayer, 1990)
  “The ability to monitor one’s own and others’ feelings, to discriminate among them, and to use this information to guide one’s thinking and action” (p. 189)
The “Flynn Effect”

United States

Stanford-Binet and WAIS

1932-Referenced IQ

% Scoring > 24/40

Raven Progressive Matrices

Netherlands