

# Testing & Intelligence

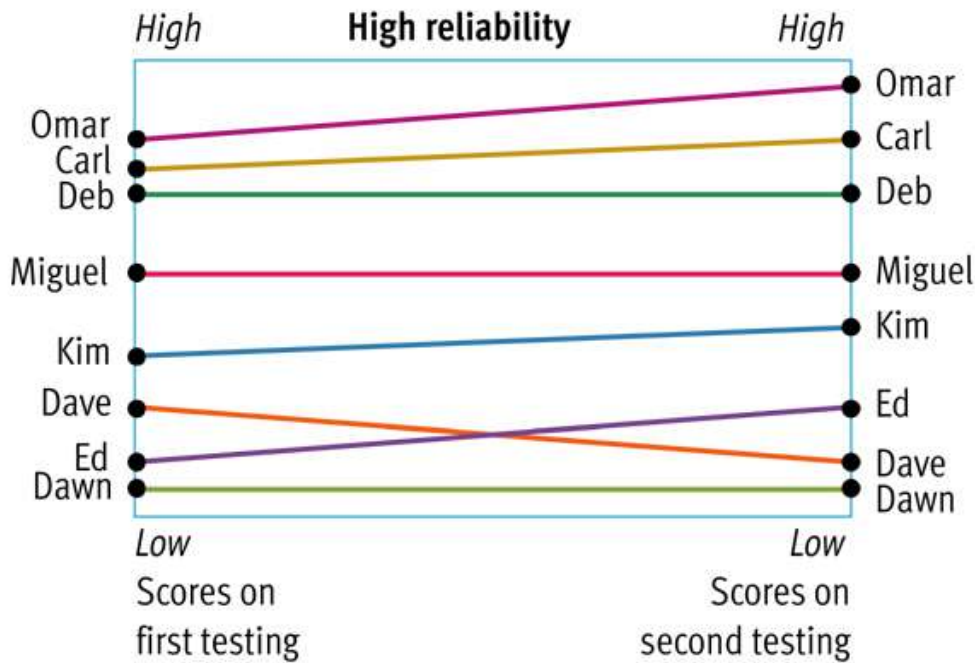


- **Principal Types of Tests**
  - **Personality**
  - **Mental ability**
    - **Intelligence tests** – potential for general mental ability
    - **Aptitude** – potential for specific types of mental abilities (verbal reasoning, numerical ability, abstract reasoning, space relations, etc.)
    - **Achievement** – mastery and knowledge of various subjects

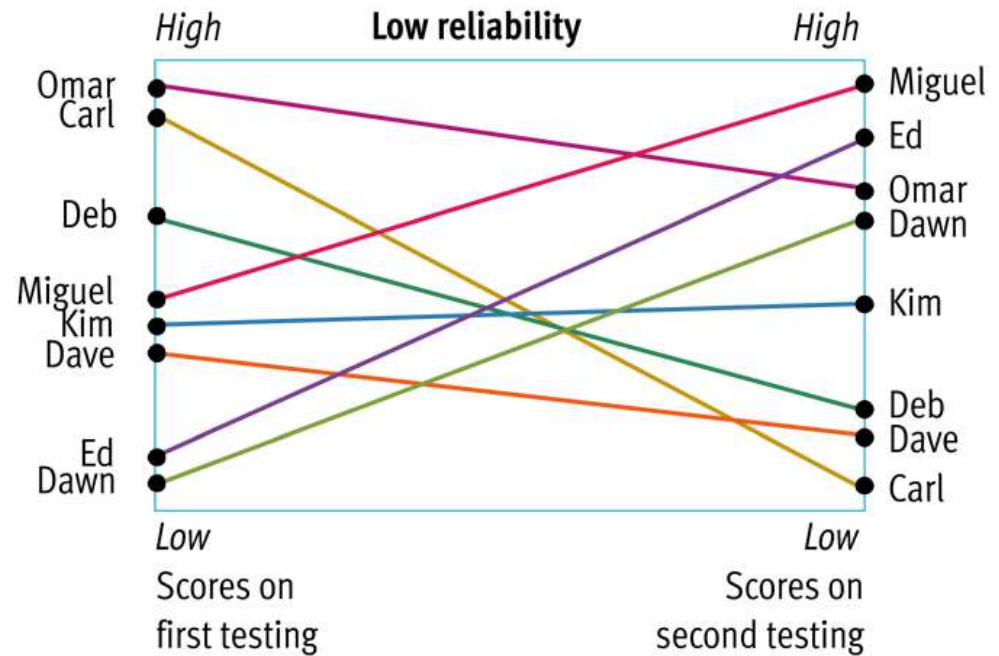
# Testing & Intelligence

- **Standardization & Norms**
  - **Standardization: uniform procedures used in the administration and scoring of a test**
  - **Normalization (Test Norms)**
    - **Information about where a score ranks in relation to other scores on that test**
      - **Percentile scores: the percentage of people who score at or below the score one has obtained**

# Test-retest reliability



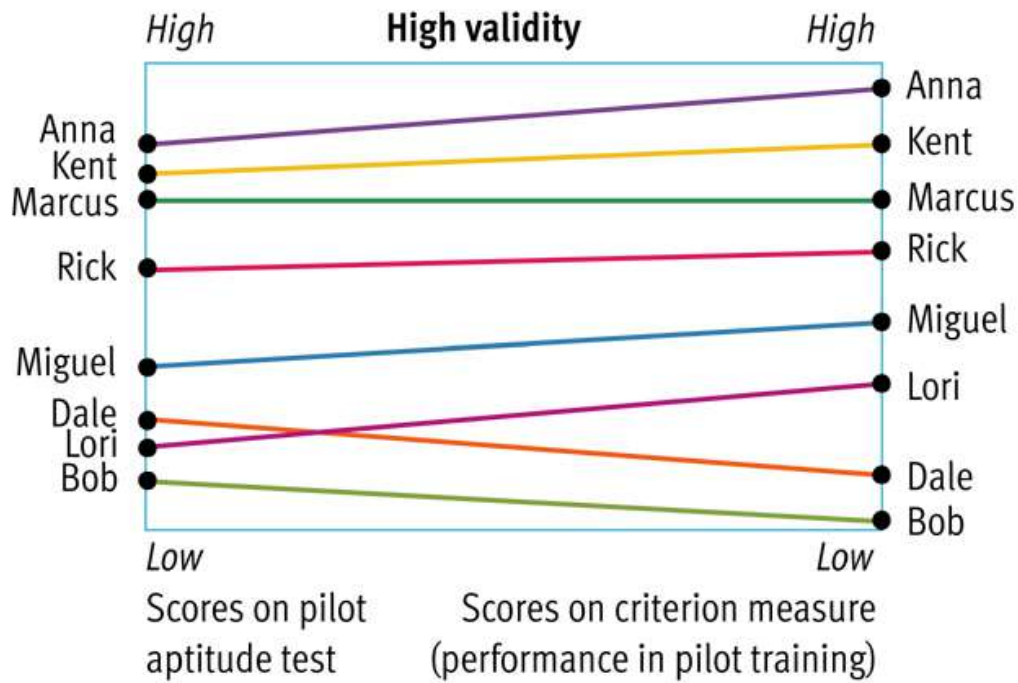
“When can I stop making wild guesses and start making educated guesses?”



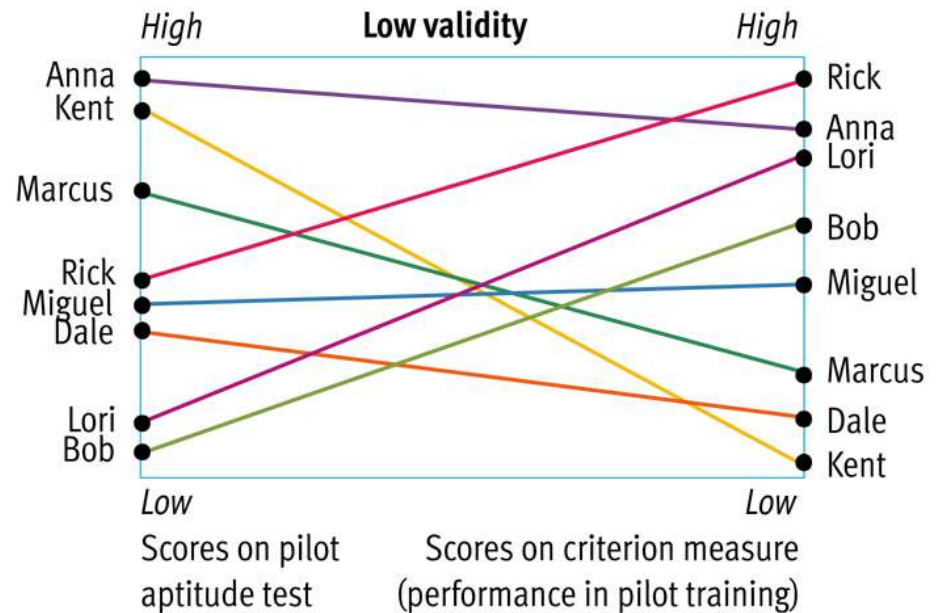
# Content Validity

- Does the content of the test measure how well a student has learned the material presented?

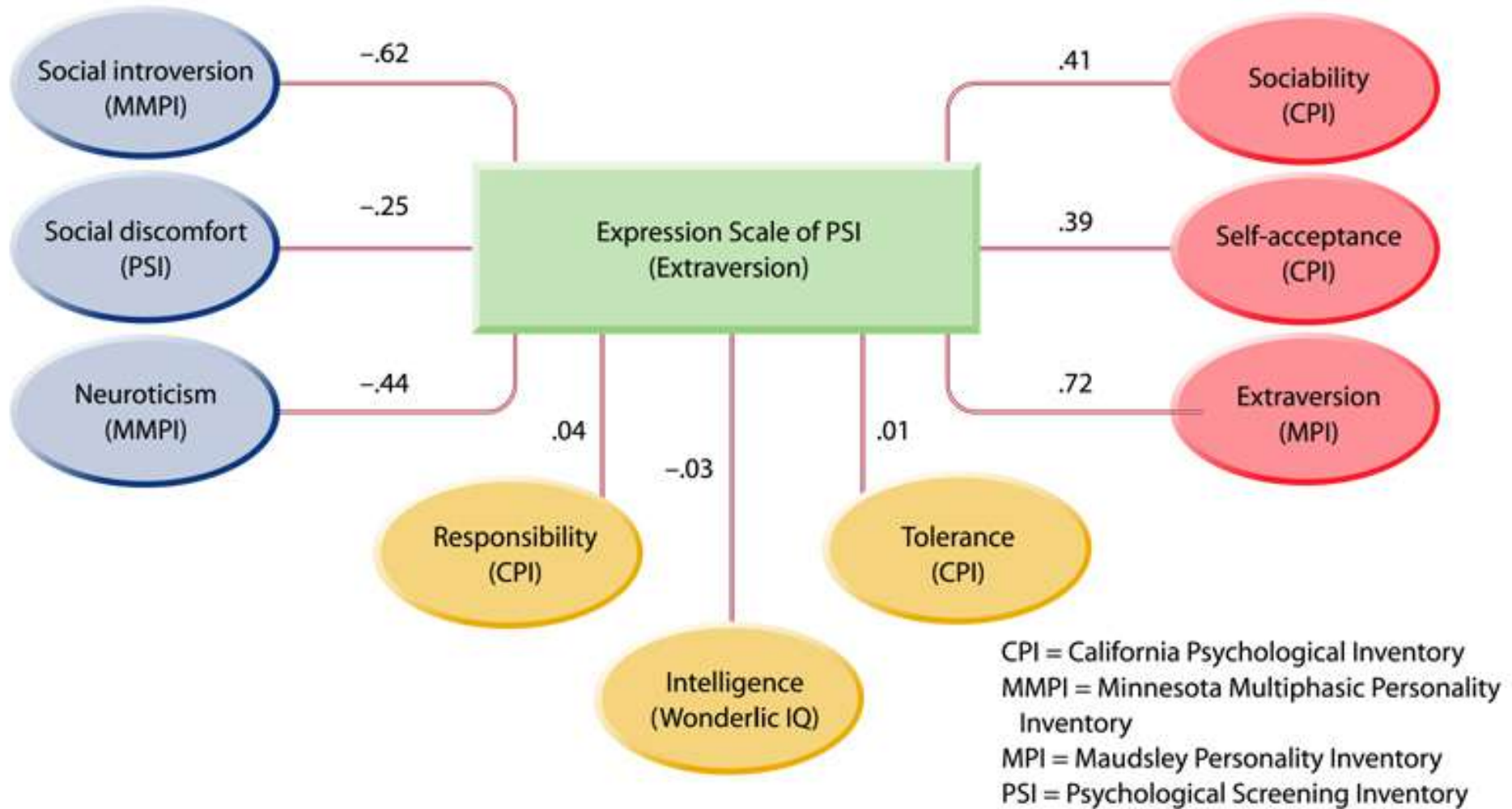




# Criterion validity



# Construct Validity



# History: defining & measuring intelligence



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- Sir Francis Galton (1822-1911)
  - genes & family lines
  - intelligence = biological capacity
  - Eugenics
  - reaction times & sensory acuity
    - later research contradicted these measures

# History: defining & measuring intelligence



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## ■ Alfred Binet (1857-1911)

- Binet-Simon Test France, 1905
- Looking to identify students in need of extra help, but not always applied that way
- intelligence = collection of higher-order mental abilities loosely related to one another
- intelligence is nurtured
- mental age





# Lewis Terman (1916)

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- The Stanford-Binet Scale
  - modification of the original Binet-Simon, after original came to US
  - intelligence quotient (IQ) = child's mental age divided by child's chronological age
  - used widely in the US, not as much as previously

$$\text{IQ} = \frac{\text{MA}}{\text{CA}} \times 100$$

(Intelligence quotient)      (Mental age)      (Chronological age)

Formula for calculating IQ score

**Based on the Stanford-Binet Intelligence Scale\***

**\* No longer used!**



# Modern intelligence tests

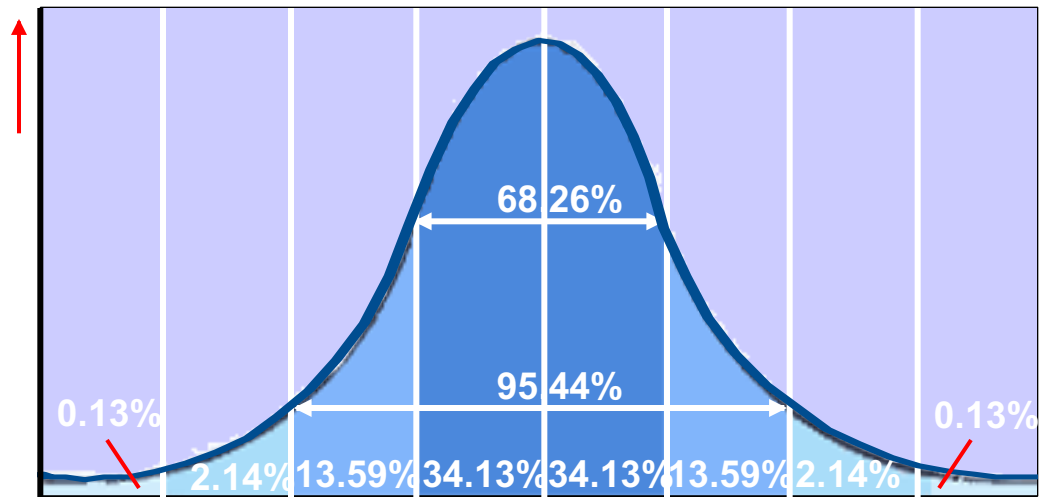
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## The Wechsler tests

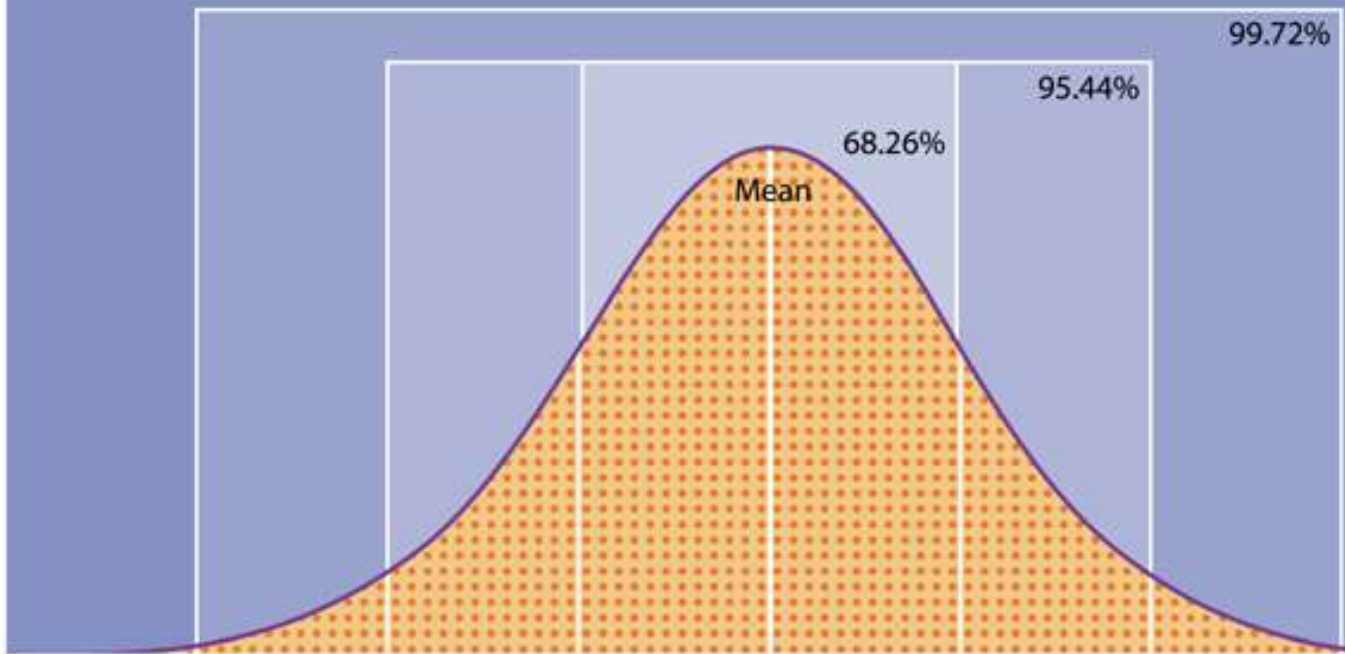
- used more widely now than Stanford-Binet
- Less reliance on verbal abilities
- modeled after Binet's, also made adult test
  - WISC-III for children
  - WAIS-III for adults

# Standardized scoring of Wechsler tests

All raw scores  
converted to  
standardized  
scores  
Normal distribution  
Mean of 100  
Standard deviation  
of 15



Number of cases



-3      -2      -1      0      +1      +2      +3

Standard deviations from the mean

0.1      2.1      13.6      34.1      34.1      13.6      2.1      0.1

Cases in interval (%)

55      70      85      100      115      130      145

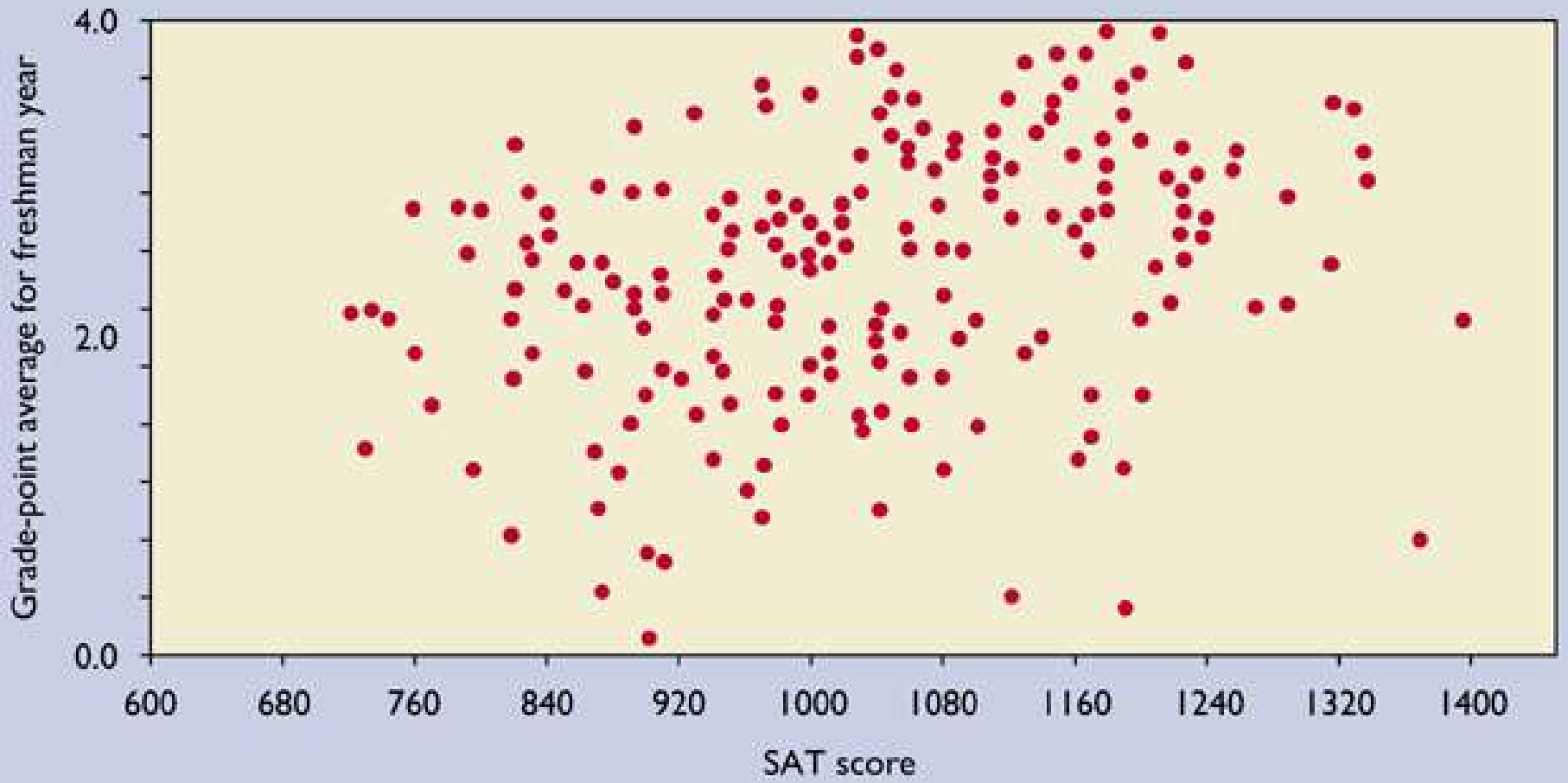
Deviation IQ score

0.01th      2nd      16th      50th      84th      98th      99.9th

Percentile

Retarded      Borderline      Low average      Average      High average      Superior      Gifted

Mental classification



# History: defining & measuring intelligence

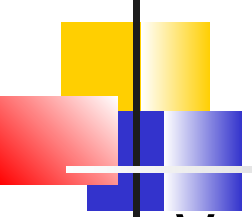


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## Charles Spearman (1863-1945)

- liked Binet's methods of testing
- liked Galton's idea that intelligence was a single entity
- developed "factor analysis"
- two factors
  - "g" = general intelligence
  - "s" = specific ability
- score on any given test depends on a combination of these 2 factors
  - g accounts for the similarity in test results
  - s accounts for the differences in test results

# How valid are IQ tests?

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- Validity = test measures what it's intended to measure
  - Does test correlate with other measures of same construct?
  - School achievement
    - IQ tests (I.e., S-B and the Wechsler) correlate moderately
    - but they were designed to test stuff that you learn in school
  - Prestigious positions (lower correlation)
  - On-the-job performance & other work-related variables (not a strong correlation)

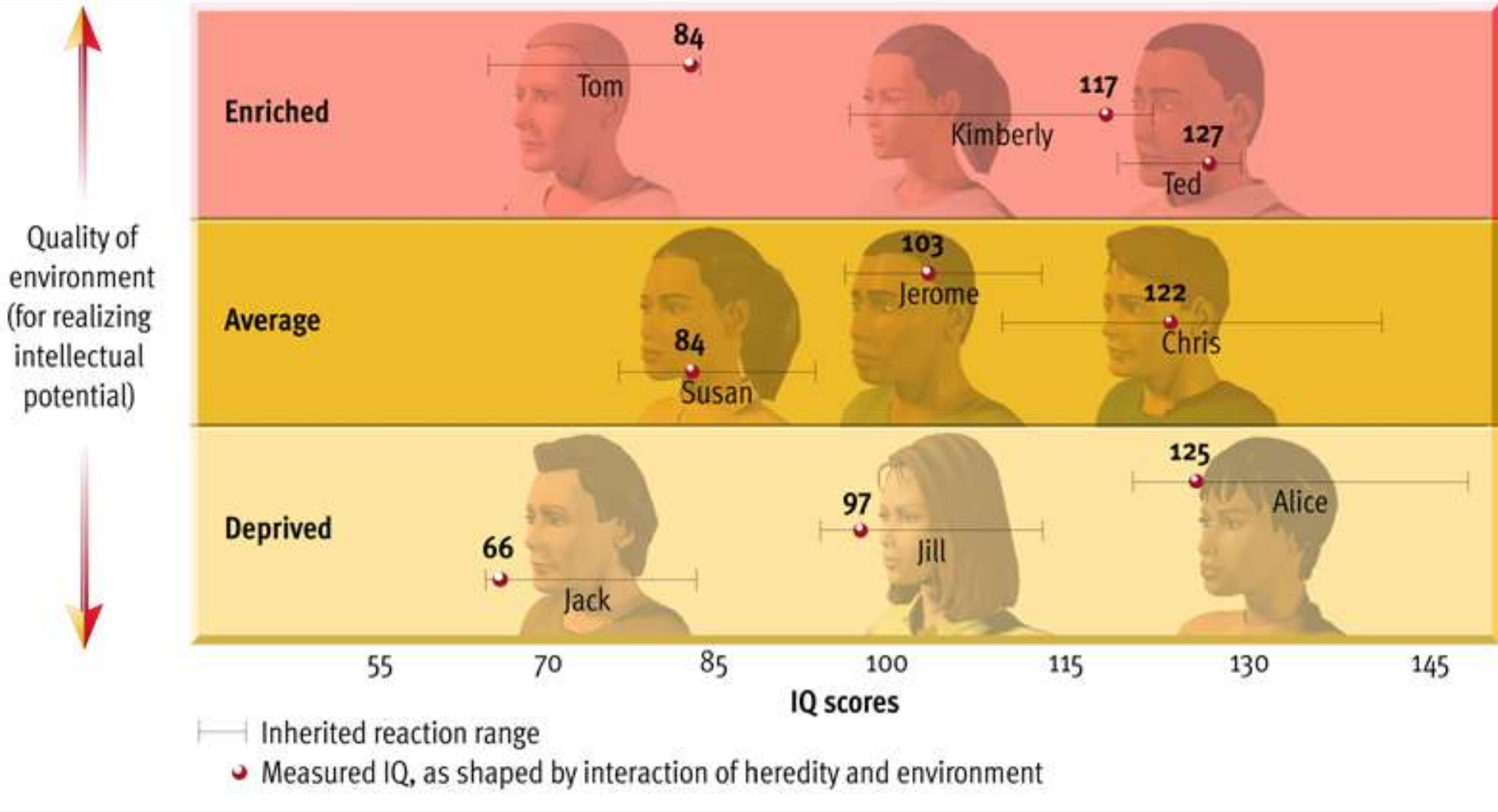


**Shared  
genes**

**Median Correlation in IQ Scores**



Source: Adapted from  
Bouchard & McGue, 1981;  
Plomin & Petrill, 1997



# What do IQ tests measure about your mind?



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- Mental speed and span of working memory; Jensen (1982, 1987, 1992)
  - typically use a digit span test to measure this
  - more recent studies found modest correlations (.30) between reaction times and IQ scores
- Why is this important?
  - mental quickness may expand capacity of working memory
  - Inspection time may be a more important factor (.40s) correlation between inspection time scores and measures of fluid intelligence (Deary, 2000)

# History: defining & measuring intelligence



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- Raymond Cattell (1963) & Horn (1985)

- student of Spearman's
- modified Spearman's intelligence theory
- thought that general intelligence was not one factor but two

# Cattell's Fluid & Crystallized Intelligence



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## ■ Fluid intelligence

- ability to perceive relationships without previous specific experience
- Memory capacity, reasoning ability, and speed of information processing

# Cattell's Fluid & Crystallized Intelligence



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- Crystallized intelligence

- mental ability derived from previous experience

- word meanings

- use of tools

- cultural practices

# What do IQ tests measure about your mind?



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- Cognitive processes in intelligent behavior

- Sternberg

- studies more complex decision-making abilities
- states that the mind is made up of different components, each of which works on different problem solving tasks
- Triarchic theory – Contextual (behaviors considered intelligent), Experiential (the reciprocal relationship between experience and intelligence) & Componential (cognitive processes underlying all intelligent behavior)



# Expanding the Concept

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- Gardner (1989)
- Eight intelligences (logical-mathematical, linguistic, musical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, naturalist)
- Is this too broad to make the concept of intelligence meaningful?