Psychological Testing: Introduction

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Questions You’ll Encounter

- What is a psychological test?
- Are there different kinds of psych tests?
- For what purposes are the used?
- Have psych tests ever been used on me?
- How do we know if a test is reliable? Valid?
- Statistics AGAIN?

Questions You’ll Encounter

- What are qualities of “good” test items?
- How can testing situations affect responses?
- What is an “IQ” anyway?
- Does IQ really measure intelligence?
- Should schools really care about my SAT? GRE? LSAT? MCAT?
Questions You’ll Encounter

- Can my reaction to some weird inkblot really say something about my personality?
- Can my response to a bunch of weird T/F questions really indicate that I have a psychopathology?
- All I want to do is help people, why do I need to submit them to all these torturous tests?

Psychological Testing AKA

- Psychometrics – field of study concerned with the theory and technique of educational and psychological measurement (Wikipedia)
  - measurement of knowledge, abilities, attitudes, and personality traits.
  - It involves two major research tasks
    1. the construction of instruments and procedures for measurement
    2. the development and refinement of theoretical approaches to measurement

Measurement

- In psychology we are interested in either describing the distributions of and/or relationships among abstract concepts: e.g.,
  - Political conservatism
  - Intelligence
  - Neuroticism
  - Aggression
Measurement

- However, in most cases these constructs are abstractions that can often not be directly observed.

  Concept of Intelligence
  
  Operationalization
  
  Measure or Operationalization of Intelligence
  
  IQ test

- Note: that the degree to which the operationalization of the abstract concept actually reflects or mirrors the construct is the degree to which the operationalization can be said to be valid (more later).
- The value of scientific research is completely dependent upon the degree to which the operationalizations are successful or valid.

Concepts and Constructs

- Concept:
  - “An abstraction formed by generalization from particulars”
  - Abstracts are hard to define
  - E.g. intelligence

- Construct:
  - A concept with scientific purpose (i.e. operationalized)
  - Can be measured and studied.
  - E.g. IQ
Terms Review: Variables and Constants

- **Variable**: any condition, event, characteristic or attribute that can take on different values at different times or with different people.
  - Age of people
  - Temperature
  - Intelligence
  - Xenophobia

- **Constant**: One value in a given context.
  - Does not change or vary.

Terms Review: Independent and Dependent Variables

- **Independent variable**: we are referring to a variable that the experimenter has some direct control over and can manipulate
  - In Experiments IVs are the “cause”
  - In non-experiments IVs are the “influence”
  - i.e., \( X \rightarrow Y \)

- **Dependent Variables**: The variable being influenced/predicted
  - The outcome variable

Terms Review: Discrete & Continuous Variables

- **Discrete variables**: can only take on a finite or restricted set of values.
  - Can only take on whole values (think digital)
  - E.g., number of children per family, Number of students taking 100A

- **Continuous variables**: can take an infinite number of values
  - E.g., Temperature (10.3 C, 10.24 C, 15.212 C), Weight (102.2lbs., 116.56 lbs.)

- The difference often limited only by precision
Psych Testing Basics

- Test
  - A measurement device or technique used to quantify behavior or aid in the understanding and prediction of behavior.
- Psychological Test
  - a set of items designed to measure characteristics of human beings that pertain to behavior.
  - Behavior
    - Overt: observable activity of the individual
    - Covert: takes place within the individual

Psych Testing Basics

- Scale
  - Relate raw scores on a test to some defined theoretical or empirical distribution.
  - A method of operationalizing a psychological construct using a multiple item test (e.g. questionnaire)

Types of Tests

- Individual Tests vs. Group Tests
  - Individual tests: test administrator gives a test to a single person
    - e.g. WAIS-III, MMPI-2
  - Group tests: single examiner gives a test to a group of people
    - e.g. SAT, GRE
Types of Tests

- (Human) Ability Tests
  - Achievement Tests
    - evaluates what an individual has learned
    - measures prior activity
  - Aptitude Tests
    - evaluates what an individual is capable of learning
    - measures capacity or future potential
- Intelligence Tests
  - Measures a person’s general potential to solve problems, adapt to novel situations and profit from experience

Types of Tests

- Personality Tests: Objective & Projective
  - Objective Personality Tests
    - present specific stimuli and ask for specific responses (e.g. true/false questions).
  - Projective Personality Tests
    - present more ambiguous stimuli and ask for less specific responses (e.g. inkblots, drawings, photographs, Rorschach, TAT)

History of Psychometrics

- Chinese influence
- Individual Differences: Darwin and Galton
- Experimental Psychologists
- The study of mental deficiency
- Intelligence Testers
- Personality Testers
History of Psychometrics:
Chinese influence

- **2000 B.C.E.**
  - Scattered evidence of civil service testing in China

- **206 B.C.E. to 220 C.E.**
  - Han Dynasty in China develops test batteries
    - Two or more tests used in conjunction.
    - Test topics include civil law, military affairs, agriculture, revenue, geography

- **1368 C.E. to 1644 C.E.**
  - Ming Dynasty in China develops multistage testing
  - Local tests lead to provincial capital tests; capital tests lead to national capital tests
  - Only those that passed the national tests were eligible for public office

- **1832**
  - British East India Company copies Chinese system to select employees for overseas duty.

- **1855**
  - British Government adopts English East India Company selection examinations.
  - French & German governments follow shortly.

- **1883**
  - United States establishes the American Civil Service Commission
  - Developed & administered competitive examinations for government service jobs.
Individual differences - despite our similarities, no two humans are exactly alike.

Why?

Darwin

- some of these individual differences are more "adaptive" than others
- these individual differences, over time, lead to more complex, intelligent organisms

Galton - cousin of Darwin

- "Applied Darwinist": some people possessed characteristics that made them "more fit" than others.
- Wrote *Hereditary Genius* (1869)
- Sets up an anthropometric laboratory at the International Exposition of 1884
- For 3 pence, visitors could be measured with:
  - The Galton Bar - visual discrimination of length
  - The Galton Whistle (aka "dog whistle" - determining highest audible pitch)

Galton's Anthropometric Lab

*Anthropometric Laboratory*
Individual Differences: Darwin and Galton

Galton also noted that persons with mental retardation also tend to have diminished ability to discriminate among heat, cold & pain.

Other advances (?) of Galton’s:

- Considered by some the founder of psychometrics
- Pioneered rating scales & questionnaires
- First to document individuality of fingerprints
- Studied efficacy of prayer
- First to apply statistics in the measurement of humans
- Founder of eugenics

History of Psychometrics: Galton’s Famous Students

- Karl Pearson
  - Does the name Pearson sound familiar?
  - Student of Galton
  - Extended Galton’s early work with statistical regression

- James McKeen Cattell
  - First to use the term “mental test”
  - U.S. dissertation on reaction time based upon Galton’s work
Early Experimental Psychologists

- Early 19th century scientists, generally interested in identifying common aspects, rather than individual differences.
  - Differences between individuals was considered a source of error which rendered human measurement inexact.
  - Sounds a lot like things from your past (e.g. ANOVA) and your coming future

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Johan Friedrich Herbart - mathematical models of the mind; founder of pedagogy as an academic discipline; went against Kant

Ernst Heinrich Weber - sensory thresholds; just noticeable difference (JND)

Gustav Theodor Fechner - mathematics of sensory thresholds of experience; founder of psychophysics; considered of one founders of experimental psychology; Weber-Fechner Law first to relate sensation and stimulus; considered by some the founder of psychometrics

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Fechner influenced many prominent psychologists (e.g. Wundt, Freud)
  - Wilhelm Wundt – considered one of the founders of psychology; first to set up a psych laboratory
  - Edward Titchner – succeeded Wundt; brought Structuralism to America; His brain is still on display in the psychology department at Cornell
### History of Psychometrics:

#### Early Experimental Psychologists

- Fechner influenced many prominent psychologists (e.g. Wundt, Freud)
  - Guy Montrose Whipple – Student of Titchener’s; pioneer of human ability testing; conducted seminars that changed the field of psych testing; APA issued its first set of standards for professional psychological testing because of his criticisms
  - Louis Leon Thurstone – Large contributor to factor analysis; attended Whipple’s seminars; approach to measurement was termed the law of comparative judgment

### History of Psychometrics:

#### Interest in Mental Deficiency

- 1805 – Jean-Étienne Esquirol, French Physician
  - Favorite Student of Philippe Pinel (founder of psychiatry)
  - Manuscript on “mental retardation.”
    - Differentiated between insanity & mental retardation
    - Insanity had a period of normal intellectual functioning
  - Many degrees to mental retardation
  - Normality to “low-grade idiocy”
  - Attempted to develop system to classify people into these many degrees but found that the individual’s use of language provided the most dependable continuum

- 1840s - Edouard Seguin, French Physician
  - Pioneer in training mentally-retarded persons.
  - Rejected the notion of incurably MR
  - 1837: opens first school devoted to teaching MR children.
  - 1848: emigrates to USA, wide acceptance of theories
  - 1866: experiments with physiological training of MR
    - Sense-training / muscle-training still used today
    - Leads to nonverbal tests of intelligence (Seguin Form Board)
History of Psychometrics:
Intelligence Testing

Alfred Binet
- 50 years after Esquirol & Seguin -- 1905
- French Society for the Psychological Study of the Child urged French ministers to develop special classes for children who failed to respond to normal schooling.
- Ministers required a way to identify the children.

First Intelligence Test: Binet-Simon Scale of 1905
- 30 items of increasing difficulty
- Standardized administration
  - Same instructions & format for ALL children
- Standardization sample
  - Created norms by which performance one child can be compared with other children.

History of Psychometrics:
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Standardization Sample
- 50 normal children aged 3-11 yrs
- “Some” mentally retarded children and adults

1908 Binet-Simon Scale
- More items (greater reliability)
- Better standardization sample (300 normal children)
- Introduction of Mental Age
History of Psychometrics: Intelligence Testing

- Alfred Binet’s legacy
  - 1911 Binet-Simon, minor revision
  - Binet dies
  - 1912 Kuhlmann-Binet revision
  - Extends testing downward to 3 months of age
  - 1916 Lewis Madison Terman & Stanford Colleagues revise Binet’s test for use in the United States
  - More psychometrically sound
  - Introduction of the term IQ
  - Mental Age / Chronological Age = IQ

- World War I - Robert Yerkes
  - Need for large-scale group administered ability tests by the army
  - Army commissions Yerkes, then head of the American Psychological Association, to develop two structured tests of human abilities
  - Army Alpha - required reading ability
  - Army Beta - did not require reading ability

- Testing “frenzy” hits between World War I and the 1930s.

- Testing Frenzy of the 1930’s
  - 1937 Revision of the Stanford-Binet includes over 3000 individuals in standardization
  - 1939 Wechsler-Bellevue Intelligence Scale
    - David Wechsler
    - Subscales were “adopted” from the Army Scales
    - Produces several scores of intellectual ability rather than Binet’s single scores (e.g. Verbal, Performance, Full-Scale)
    - Evolves into the Wechsler Series of intelligence tests (e.g. WAIS, WISC, etc.)
History of Psychometrics: Personality Testing

- Rise – 1920s, Fall – 1930s, Slow Rise – 1940s
- Intended to measure personality traits
  - Trait: relatively enduring dispositions (tendencies to act, think or feel in a certain manner in any given circumstance)
  - NOT temporary states

History of Psychometrics: Personality Testing

- First Rise and Fall: Structured Tests
- Woodworth Personal Data Sheet
  - First objective personality test meant to aid in psychiatric interviews
  - Developed during World War I
  - Designed to screen out soldiers unfit for duty
  - Mistakenly assumed that a subject's response could be taken at face value

History of Psychometrics: Personality Testing

- Woodworth

  Test Item
  1. I wet the bed.
  2. I drink a quart of whiskey each day.
  3. I am afraid of closed spaces.
  4. I believe I am being followed.
  5. People are out to get me.
  6. Sometimes I see or hear things that other people do not hear or see.
History of Psychometrics: Personality Testing

- Slow Rise: Projective Tests
  - Herman Rorschach inkblot test (1921)
    - Started with great suspicion; first serious study in 1932.
    - Symmetric colored & b/w inkblots.

- Rorschach inkblot example

- Thematic Apperception Test
  - Henry Murray and Christina Morgan (1935)
  - "Ambiguous" pictures though considerably more structured than the Rorschach
  - Subjects are shown the pictures and asked to write a story including:
    - what has led up to the event shown
    - what is happening at the moment
    - what the characters are feeling and thinking, and
    - what the outcome of the story was.
History of Psychometrics: Personality Testing

- Thematic Apperception Test Example

Second coming of the Structured Test

- Early 1940s – Structured Tests were being developed based on better psychometric properties.
- Minnesota Multiphasic Personality Inventory (MMPI; 1943)
  - Tests like the Woodworth made too many assumptions
  - The meaning of the test response could only be determined by empirical research
  - Most widely used (MMPI-2, MMPI-A)

Sixteen Personality Factor Questionnaire

- Raymond B. Cattell (early 1940s)
- Based on Factor Analysis – method for finding the minimum number of dimensions (factors) for explaining the largest number of variables