History of Intelligence Assessment

Assessment of Intelligence
PSY 5200
Rick Grieve, Ph.D.

Readings for This Section

- Sattler, Chapters 7 & 8
- Mayer & Salovey (1995)
- Schaie (1994)
- Thorndike (1990)

edtech.tph.wku.edu/~rgrieve

Why not admit it?

"Our society seems to not only allow but applaud certain areas of talent, such as in sports, music, or the arts. Yet intellectual talent spurs considerable ambivalence, perhaps even threatening the self-esteem of others. Why do we develop some talents but not others?" (Benbow, 1992)

IQ Quotes to Ponder

- "If the 'I.Q. test' were a new drug, it would probably never reach the marketplace." (Schwitzgebel & Schwitzgebel, 1980)
- "IQ is like money. Publicly you proclaim that those who have a lot are no better than those who have a little. Privately you wish you had a lot." (Bereiter, 1976)

The Roots of Intellectual Assessment

- Chinese Civil Service Exams
  - Circa 2200 BC
- 19th and early 20th Century
  - Early concepts of intelligence focused on sensorimotor activity
    - Brass Instrument psychology







The Roots of Intellectual Assessment

- The Father of the testing movement:
  - Sir Francis Galton
    - Two important statistical concepts:
      - Regression to the mean
      - Correlation
    - Conceptualization of intelligence:
      - Our knowledge of the environment reaches us through the senses
        - From John Locke
      - Therefore, those with more acute sensory processes should be more intelligent
      - Created tests of sensory discrimination and motor coordination to assess mental function

The Roots of Intellectual Assessment

- Mental inheritance
  - Galton sought to demonstrate that a person's natural abilities are derived by inheritance, just as physical features are
    - Did I tell you his cousin was Charles Darwin?
    - *Hereditary Genius: An Inquiry Into Its Laws and Consequences* (1869)
  - Human abilities are genetically determined and the human species can be improved through controlled breeding practices
    - Eugenics (more on this later)
  - To prove the inheritance of intelligence, Galton examined eminent people
    - Showed that the probability of fame was correlated with having a famous relative
    - The closer the relative, the more likely the fame

The Roots of Intellectual Assessment

- Mental Tests
  - Even though we usually attribute this term to Cattell (see later), it was Galton who influenced Cattell in that direction
- Anthropometric Lab
  - Measured visual and auditory acuity, a judgment of visual distance, breathing power, reaction times, color discrimination, the strength of a blow, and olfactory discrimination
  - International Health Exhibition (1884)
    - Charged people to measure them
    - In 6 years, measured over 9000 people
    - Wanted to define the range of abilities in the British Empire

The Roots of Intellectual Assessment

- Idea was off-target, but methods were on target
  - In fact, still in use today
- Also provided info on developmental trends in the population

- Karl Pearson
  - Others were working on stats in England at this time, too
  - Pearson product-moment correlation
    - Correlation formula for linear correlation, multiple correlation coefficient, phi coefficient, and the chi-square test

The Roots of Intellectual Assessment

- Others in England
  - Cyril Burt
    - Intelligence is strictly inherited
      - No influence of teaching, training, or environment
      - Thus, income levels are determined by intelligence, not environment
    - Unfortunately, it appears as though old Cyril manufactured much of his data.

The Roots of Intellectual Assessment

- Developments in Germany
  - Emil Kraepelin (1855-1926)
    - Psychopathology
    - Developed tests to measure mental functioning
      - Included tests of perception, memory, motor functions, and attention
    - Need to examine individual enough times to reduce chance variation

The Roots of Intellectual Assessment

- Others involved in assessment of motor/ perceptual skills:
  - Munsterburg
  - Ebbinghaus
  - Wernicke

The Roots of Intellectual Assessment

- Developments in the United States
  - The term mental test appeared for the first time in a paper by James McKeen Cattell (1890)
    - In the paper, he called for standardized tests of intelligence and proposed these types of measurements as measurements of intelligence:
      - Dynamometer pressure
      - Rate of movement
      - Two-point skin sensitivity threshold
      - Amount of pressure to the forehead needed to cause pain

The Roots of Intellectual Assessment

      - Just noticeable differences in judging weights
      - Reaction time for sound
      - Time for naming colors
      - Bisection of a 50 cm line
      - Judgment of a 10-second time period
      - Number of letters remembered after a single presentation
  - Others in the U.S.:
    - G. Stanley Hall
    - Franz Boas
    - Henry H. Goddard

The Roots of Intellectual Assessment

- Developments in France
  - 1903
    - Blin & Damaye developed a set of standardized questions ordered by apparent difficulty that they claimed could identify the mentally retarded
  - Alfred Binet
    - At the same time Binet, Victor Henri, & Theodore Simon were developing methods for the study of mental functions
    - Key was to focus on higher mental processes

The Roots of Intellectual Assessment

- Brought together a number of different lines of work which culminated in the 1905 Binet-Simon Scale of Intelligence
- We'll return to Binet in a little while.

Comments on 19th Century Development

- Emphasis on sensorimotor tasks
- Intelligence was narrowly defined
- Influenced by Renaissance philosophers
- Sensorimotor skills too narrow a definition and poorly correlated with what we now call intelligence

Converging Trends

- In the late 1800s/early 1900s, three trends were converging:
  - Individual Differences Testing Movement
    - Sir Francis Galton & James McKeen Cattell
    - Concerned with individual and group differences in IQ and its distribution in the population
    - Led to work of Karl Pearson and Charles Spearman in statistics
    - Created new statistics which we still use today
      - e.g., factor analysis

Converging Trends

  - Education Reforms
    - Formal education became more accessible to the masses
    - Increased variability of students in the schools
    - Many students were also failing
      - Stupid
      - Malicious
  - Mental Illness
    - French led the way in the human treatment of the mentally ill

Converging Trends

- Schemes of classification were proposed
- Major distinction:
  - Dements
  - Aments

Other Movements

- Eugenics
  - Social program that seeks to improve the human condition through controlled breeding
    - Sought to promote the breeding of "desirables" while inhibiting the breeding of "undesirables"
      - In 19th c, this was intelligent people with WASP characteristics
  - Improving the human race by controlling evolution
    - Think of it as helping along natural selection—we select which traits we want and breed for them

Other Movements

- Sir Francis Galton
  - Reasoned that if a person's condition with respect to an inherited characteristic could be measured, it would be possible to direct the course of evolution
- Led to try to develop measures that would accurately identify those people who would benefit the human race

Other Movements

- Ethical Issues
  - How do you choose a good psychological trait?
  - What constitutes a good psychological trait?
  - How would selective breeding be implemented?
  - What happens to those with low amounts of the good psychological traits?
- Nazi Germany
- Galton was more interested in increasing the rate of high intelligence rather than lowering the rate of low intelligence

Other Movements

- Social Darwinism
  - Notion adopted from Darwin's theory of evolution that the "fittest" survive
  - Manifesto for any number of supremacist movements in the U.S. and Europe
  - Differences between Social Darwinism and evolution

Binet Scales of Intelligence

- Alfred Binet (1857–1911), the early years:
  - Student of Wundt's
  - 1899: founding of *Societe Libre pour l'Etude Psychologique de l'Enfant*
    - School people who were interested in the scientific study of education
  - Binet asked to be a member and then elected President

Binet Scales of Intelligence

- 1903:
  - La Societe proposed that the French gov't needed to create tests to differentiate those who could not benefit from normal education from those who would not (stupid vs. malicious)
    - "…[some] children, if considered educably retarded, should be grouped in special classes annexed to the regular school, or in a special establishment, and…that a special class for the educable be opened for the present in one of the Paris schools, as a demonstration."
  - Results of the recommendation:
    - Commission formed to study the matter; Binet was one of the Commissioners

Binet Scales of Intelligence

- 1905 Scale
  - First practical test of intelligence
  - Developed by Binet and Theodore Simon
  - Developed a test that differentiated between normal children and those who required additional instructional resources
  - Had 30 tests
  - Items ordered in level of difficulty
    - The more tasks completed, the greater the assumed intelligence of the subject

Binet Scales of Intelligence

- Used the following types of tests:
  - Association tests in which the child was given 25–30 words and asked to describe the idea each word aroused
  - Sentence completion
  - Picture drawings
  - Object drawing and description
  - Digit repetition and other memory and attention tests

Binet Scales of Intelligence

- Accompanied by relatively careful instructions for administration
- Some concern with age-based cognitive development
- Objectively diagnosed degrees of mental retardation

- Binet would write of the scale:
  - *"We believe that we have succeeded in completely disregarding the acquired information of the subject...It is simply his natural level of intelligence that is taken into account."*

Criticisms of the Binet Scale

- Tests were too easy for the subjects
- Several flaws in the instrument
- Led to the 1908 revision

1908 Revised Binet–Simon Test of Intelligence

- Test items are now grouped by ages at which children usually passed them
  - Rather than by level of difficulty
  - If a majority of children at a given age (75–90%) passed an item, it was assigned to that age level
- 54 tests
  - 14 of the original 30
  - Created different tests for children of different ages

1908 Revised Binet–Simon Test of Intelligence

- Included mental level
  - Emphasized change and fluctuation in intelligence
  - Dramatically increased the attention paid to the test from outside of France
  - When a child was tested, his or her mental level was said to be equivalent to that of the highest age group wherein he or she could pass all of the tests for that group

1911 Binet-Simon Test of Intelligence

- Final revision to the test
  - Even in the early days, tests were revised continually
- Contained only minor revisions
  - Tests were relocated
  - Number of tests per age was set at 5
- Binet died October 18, 1911

Binet's Theory of Intelligence

- Awfully vague about what he considered intelligence
  - Inconsistencies in his conceptualization
  - Generally came down on the side of a single entity that he called "the intelligence"
  - Judgment is a critical part of intelligence
  - However, he also used the term intelligence as synonymous with personality or attention

Binet's Theory of Intelligence

- Probably was a G-Man
  - *"It seems to us that in intelligence there is a fundamental faculty, the alteration or lack of which is of the utmost importance for practical life. This faculty is judgment, otherwise called good sense, practical sense, initiative, the faculty of adapting one's self to circumstances. To judge well, to comprehend well, to reason well, these are the essential activities of intelligence…indeed the rest of the intellectual faculties seem of little importance in comparison with judgment."*

Binet and Simon, 1905, pp. 42-43

Binet's Assumptions About Intelligence

- Whatever intelligence is, it is something that shows a normal and fairly consistent course of average intelligence
- Intelligence is needed for success in school
- These two points formed the basis for the Binet-Simon scales

Binet's Views on Heritability

- Scientific atmosphere dominated by Darwinism and the theory of evolution
- Binet, however, felt that intelligence was modifiable.
  - He proposed mental orthopedics
  - Reaction to the idea that intelligence is fixed and inherited:
    - "…we must protest and react against this brutal pessimism…"

Binet's Views on Heritability

- Some of his writings indicated that he felt intelligence was inherited to some degree:
  - *Anyone's intelligence is susceptible to development; with practice and training, and especially with appropriate methods [of teaching] we can augment a child's attention, his memory, his judgment—helping him literally to become more intelligent than he was before…right up to the moment when he arrives at his limit. Thereafter, progress is ruled by a remarkable law of fixity; the ordinarily great progress at the beginning diminishes little by little…and despite great efforts, the moment arrives when it becomes practically equal to zero…incontestably there is a limit. It varies according to the persons and functions under consideration.*

The Verdict on Binet

- Nature or Nurture?
  - Contemporaries painted him as believing that intelligence was not completely malleable and dependant upon experience
  - It appears that his conceptualization of intelligence is consistent with that of a reaction range
    - Organism's observed level on any trait will fall in a range dictated by genetics, but the exact manifestation will be a function of the environment and experience

Binet in Context

- Just one of many working on a test of intelligence
  - How intelligence was defined differed among these theoreticians
    - And continues today
- Binet worked methodically
  - Desired to improve classification of students rather than define intelligence as a concept

Binet in Context

- As early as 1890, Cattell had pointed out the need for a normative data base
- However, early work in intelligence focused on reaction times and sensory processing
- Binet's contribution was to move beyond sensory processes and into higher cognitive functions

1916 Stanford-Binet and "IQ"

- Henry Goddard
  - Director at Vineland Hospital
  - Encountered and tried out the 1908 Binet scale
    - Liked it a lot
    - Developed translation of the scale
    - Worked to popularize the scale
    - Wanted to use adaptations of the Binet scale to differentiate classes of mental retardation and facilitate treatment

1916 Stanford-Binet and "IQ"

- Lewis Terman
  - Stanford University
  - 1911:
    - Observed that the 1908 Binet had great practical and theoretical value
    - Also recognized the need for standardization since there was now a proliferation of Binet scales
  - 1916:
    - Revised the Binet-Simon scale
    - Later called the Stanford-Binet
    - Replaced all other tests of intelligence

1916 Stanford-Binet and "IQ"

- Terman added additional tests to supplement those in the Binet-Simon test
- Standardized the test on 2600 California children
- Adopted the concept of mental quotient
  - Idea originated with Wilhelm Stern of Germany (1914)
    - Terman provided the formal expression
  - MA/CA = MQ
  - Also known as a Ratio IQ Score
  - Terman renamed this ratio Intelligence Quotient
  - Later in the 1920's, the formula would be amended so that the quotient was multiplied by 100
    - MA/CA x 100 = IQ
- Binet would not have liked this

Criticisms of the IQ

- Ratio IQ is highly age dependant
  - Certain tasks should be completed by certain ages
  - If people complete the tasks early, they are intelligent
  - Wildly inaccurate as people age
  - Robert Yerkes
    - Proposed that IQ be derived from the mean score for people of the same age as the examinee
      - coefficient of intelligence

Criticisms of the IQ

- Terman, obviously, did not agree and kept the Ratio IQ score in the Stanford-Binet
- Terman's prestige won out all the way to the 1956 version of the Stanford-Binet, which incorporated a Deviation IQ score