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Starting December 1

Theories of Intelligence

- How do psychologists use the words intelligence, ability and aptitude?
    - The distinction between ability and aptitude is the most straightforward
    - An ability refers to a skill that people actually have and for which they need no additionally training. An aptitude is a potential ability.
        - Aptitude for playing violin, but can't actually play yet
        - Aptitude Test – A test designed to predict an individual's future achievement in a specific area
    - Intelligence – a general term referring to the ability involved in learning and adaptive behavior
- Theories
    - Early Theories
        - Charles Spearman
            - 20th century British psychologist, maintained that intelligence is quite general – a kind of well, or spring, of mental energy that flows through every action
            - Noted that people who are bright in one area are often bright in others as well
            - The intelligent person understands things quickly, makes sound decisions, carries on interesting conversation, and tends to behave intelligently in a variety of situations
        - L. L. Thurstone
            - 20th century American psychologist who disagreed with Spearman
            - Argued that intelligence comprises 7 distinct mental abilities
                - Spatial ability
                - Perceptual speed
                - Numerical ability
                - Verbal meaning
                - Memory
                - Word Fluency
                - Reasoning
            - Believed abilities independent of each other
            - Seven abilities together make up general intelligence
        - R. B. Cattell

- Identified two clusters of mental abilities
    - Crystallized Intelligence – Includes abilities such as reasoning and verbal and numerical skills
        - Stressed in school, therefore greatly affected by experience
    - Fluid Intelligence – Skills such as spatial and visual imagery, the ability to notice visual details, and rote memory
        - Experience has little effect on fluid intelligence

- Contemporary Theories
    - Sternberg's Triarchic Theory
        - Intelligence involves mental skills (abstract aspect), insight, and creative adaptability (creative aspect), and environmental responsiveness (practical aspect)
            - 3 kinds of intelligence
                - Analytical intelligence – According to Sternberg, the ability to acquire new knowledge and solve problems effectively (Intelligence Tests measure analytical intelligence)
                - Creative Intelligence – The ability to adapt creatively in new situations, to use insight (Combine information in new ways)
                - Practical Intelligence – The ability to select contexts in which you can excel, to shape the environment to fit your strengths and to solve practical problems.
            - While practical intelligence is not taught in school, it is sometimes more important than analytical intelligence because it enables people to get along successfully in the world.
    - Gardner's Theory of Multiple Intelligence
        - Howard Gardner's Theory – not one intelligence but many intelligences, each of which is relatively independent of the others
        - Like Thurstone – Intelligence is made up of several distinct abilities
        - 8 Intelligences
            - Logical – Mathematical
            - Linguistic
            - Spatial
            - Musical
            - Bodily – Kinesthetic – Ability to manipulate one's body in space (Skilled athletes)
            - Interpersonal – Talented at understanding with others (teachers, parents, counselors)
            - Naturalistic – Ability to understand, relate to, and interact with the world of nature

        - Gardner's approach became influential because he emphasized unique abilities that each person possesses
        - He also notes that the different forms of intelligence often have different values placed on them by different cultures
        - Gardner believes that education should be designed to suit the profile of abilities demonstrated by each child
    - Goleman's Theory
        - Emotional Intelligence is a form of intelligence that refers to how effectively people perceive and understand their own emotions and the emotions of others, and can manage their emotional behavior
        - Daniel Goleman was puzzled by the fact that people with high IQ scores sometimes fail in life, whereas those with more modest IQ scores prosper
        - Contends one of the reasons IQ tests sometimes fail to predict success accurately is that they do not take into account an individual's emotional intelligence
        - 5 traits contribute to emotional intelligence
            - Knowing one's own emotions (the ability to monitor and recognize our own feelings is central importance to self-awareness and all other dimensions of emotional intelligence
            - Managing one's emotions: the ability to control impulses; to cope effectively with sadness, depression, and minor setbacks; as well as to control how long emotions last.
            - Using emotions of other people: the ability to read subtle, nonverbal cues that reveal what other people really want and need
            - Managing relationships: the ability accurately to acknowledge and display one's own emotions as well as being sensitive to the emotions of others
        - Recently, a study found that the ability of people to identify emotions accurately in other people correlates with SAT scores
        - In 3 other studies, conclusions show that emotional intelligence may not represent a new concept at all
            - Instead, they argue that emotional intelligence is not different than traits that one already assessed by more traditional measures of intelligence and personality

Lecture #39: Types of Intelligence Tests

- The first intelligence test was designed for the French public school system by **Alfred Binet**, and his colleague, **Theodore Simon**. Binet and Simon developed a number of questions and tested them on schoolchildren in Paris to identify those who might have difficulty in school.

- The first test of intelligence (developed for testing children), was developed in 1905. It was called the **Binet-Simon Scale**.
    - The Binet-Simon Scale consisted of 30 tests arranged in order of increasing difficulty.
    - By 1908, enough children had been tested to predict how the average child would perform at each age level. From these scores, Binet develop the concept of ***mental age*** – a child who scores as well as an average 4 yr. old has a mental age of 4, a child who scores as well as an average 12 yr. old has a mental age of 12.
- ***Stanford-Binet intelligence Scale*** – an adaptation to the Binet-Simon Scale, by L.M. Terman, a Stanford University professor. Published in 1916.
    - Terman introduced the term **intelligence quotient (IQ)** – a numerical value given to intelligence that is determined from the scores on an intelligence test; the average IQ is arbitrarily set at 100.
    - Terman arrived at a person's IQ by determining his or her mental age, dividing the mental age by the person's chronological age, and then multiplying by 100. (a five year old with a mental age of 6 has an IQ of 120; a 12 year old with a mental age of 10 has an IQ of 83.
    - The Stanford Binet has been revised several times since 1916.
    - The current version of the Stanford Binet Intelligence Scale is compose of 15 different subtests and is designed to measure four kinds of mental abilities that are almost universally considered to be components of intelligence:
        - Verbal reasoning
        - Abstract/visual reasoning
        - Quantitative reasoning
        - Short term memory
    - Scores on the subtests are used to estimate overall intelligence.
        - For example, a 3 yr. old might be asked to describe the purpose of a cup and to name objects such as a chair and a key.
        - A 6 yr. old might be asked to define words such as *orange* and *envelope* and to complete a sentence such as "An inch is short; a mile is _____."
        - A 12 yr. old might be asked to define *skill* and *juggler* and to complete the sentence "The streams are dry _____ there has been little rain."
    - The Stanford Binet test is given individually by a trained examiner and resembles an interview.
    - Testing usually begins with an item that is just below the expected mental age of the subject. If the person fails that item he or she is then tested at the next lower level until he or she is successful.
        - This level is then established as the subject's ***basal age*** – beginning age level in which a test taker is successful.
        - Once the basal age is determined, the examiner continues testing at higher and higher levels until the person misses a certain number of items in a row when the test stops.
        - The examiner determines the subject's mental age by adding to the basal age credits for each test item above that age level.

        - The Stanford Binet is best suited for children, adolescents, and very young adults.
    - ***Wechsler Adult Intelligence Scale – Third Edition (WAIS-III) –*** an individual intelligence test developed especially for adults; it yields verbal, performance, and full scale IQ scores.
        - The first versions was developed in 1939 by David Wechsler, a psychologist from New York city.
        - He wanted a test that would be more suitable for adults than the Stanford Binet.
        - The Stanford Binet emphasizes verbal skills, whereas Wechsler felt that adult intelligence consists more in the ability to handle life situations than in solving verbal and abstract problems.
        - The **WAIS-III** is divided into two parts:
            - One part stresses verbal skills
            - The second part stresses performance skills
            - The verbal part includes tests of factual information (Who wrote War and Peace?), simple arithmetic (Joe had three pieces of candy, and Sam gave him for more. How many pieces of candy does Joe now have?), and comprehension (What should you do if you see someone forget a book on a bus?) = each of these requires a verbal response.
            - The performance scale measures routine non verbal tasks such as finding the missing part, copying patterns; and arranging three to five pictures so that they tell a story.
        - The content of the WAIS-III is more sophisticated than the Stanford Binet.
        - The scoring is the biggest difference, however.
            - Separate verbal and performance scores as well as an overall IQ.
            - On some items, points can be earned depending on the complexity of the answer given.
                - This gives credit for the reflective qualities that we expect to find in intelligent adults.
            - On some questions, both speed and accuracy affect the score.
        - Wechsler also developed a similar intelligence test for use with school aged children = ***Wechsler Intelligence Scale for Children – Third Edition (WISC – III)*** – An individual intelligence test developed especially for school aged children; it yields verbal, performance and full scale IQ scores.
- The Stanford Binet, the WAIS-III, and the WISC-III are individual tests. The examiner takes the person to an isolated room and spends anywhere from 30 to 90 minutes administering the test.
- The examiner may then take another hour or so to score the test according to detailed instructions in the manual (time consuming, costly, and often the score is influenced by the examiners behavior.
- For these reasons, test makers have devised **Group Tests** – intelligence tests administered by one examiner to many people at one time.
    - Instead of an interview type session, test takers are given a test booklet that contains questions to answer within a certain time frame.
    - **Advantages over individualized tests**:
        - Eliminate bias on the part of the examiner
        - Answer sheets can be scored quickly and objectively

        - Intelligence norms are easier to establish because some many people are participating at once
    - **Disadvantage of group tests:**
        - Examiner is less likely to notice whether a person is tired, ill, or confused by directions
        - People not used to being tested do not do as well on group tests as they do on individual tests
        - Emotionally disturbed children and children with learning disabilities often do better on individual tests than on group tests
- **Performance and Culture-Fair Tests**:
    - the tests discussed so far share one limitation; to perform well, people must be able to read, speak, and understand English.
    - In an effort to get around that problem, psychologists have devised performance and culture-fair tests of intelligence.
    - **Performance Tests** – intelligence tests that minimize the use of language.
        - One of the earliest performance tests was the ***Seguin Form Board –*** it was devised in 1866 to test people with mental retardation (basically a puzzle where the examiner removes specifically designed cutouts, stacks them in a predetermined order, and asks the person to replace them as quickly as possible).
        - A more recent performance test, the ***Porteus Maze*** – consists of a series of increasingly difficult printed mazes. Subjects trace their way through the maze without lifting the pencil from the paper.
            - Such tests require the test taker to pay close attention to a task for an extended period and to continuously plan ahead in order to make the correct choices that solve the maze.
        - On of the most effective tests used for very young children is the ***Bayley Scales of Infant Development*** – used to evaluate the developmental abilities of children from 1 month to 3.5 years old.
            - The **Bayley-II** has three scales:
                - One tests perception, memory, and the beginning of verbal communication
                - A second measure sitting, standing, walking, and manual dexterity
                - A third is designed to assess emotional, social, and personality development
            - The Bayley Scales can detect early sign of sensory and neurological deficits, emotional difficulties, and troubles in a child's home environment.
    - **Culture-Fair Tests** – Intelligence tests designed to reduce cultural bias by minimizing skills and values that vary from one culture to another.
        - Minimize or eliminate the use of language. Try to downplay skills and values (speed)
        - ***Goodenough-Harris Drawing Test –*** people are asked to draw the best picture of a person that they can. Drawings are scored for proportions, correct and complete representation of the parts of the body, detail in clothing, and so on. They are not rated on artistic talent.

- ***Cattell's Culture-Fair Intelligence Test –*** combines some questions that demand verbal comprehension and specific cultural knowledge with question that are not tied to North American culture. By comparing scores on the two kinds of questions, cultural factors can be isolated from general intelligence.
- ***Progressive Matrices –*** consists of 60 designs, each with a section removed. The task is to find, from among 6-8 patterns, the one that matches the missing section. The test involves various logical relationships, requires discrimination and can be given to one person or to a group.

Lecture #40: Determining Intelligence and Extremes of Intelligence

- ***What Makes a Good Test?***
  - Each test measures a broad range of intelligence. **Reliability** and **Validity** apply to each of these tests.

Reliability

- *Ability of a test to produce consistent and stable scores.*
  - Compare tests to an alarm clock. If you set your alarm clock for 8 am and it goes of at 8 am, it is reliable. If it goes off at 8 am one day 8:30 the next and 8:15 the next, it is not reliable.
  - The easiest way to tell if a test is reliable is to give the test to a group of people and then, after a short time (a year or so), give the same people the same test again. If they obtain similar scores each time, the test is said to have a ***high test-retest*** reliability.
  - This can pose a serious problem. If the same test is use on both occasions, people might not only remember their answers from the first testing and repeat them the second time around but also give correct answers to items that they missed the first time around (called the ***practice effect***).
  - To avoid this, alternate tests are designed to measure the same ability. If people get similar scores on both forms, the tests are considered to be highly reliable.
  - One way to create alternate forms is to split a single test into two parts; for example, assign odd-numbered items to one test and even-numbered items to the other. If the scores on the two halves agree, the test is said to have ***split-half reliability*** – a method of determining reliability by dividing the test into two parts and checking the agreement of scores on both parts.
- If a person takes an intelligence test on Monday and obtains an IQ score of 90, and then retakes the test on Tuesday and scores 130, something is wrong. A reliable score should always range within +/- 6 points.
- Psychologists express reliability in terms of ***correlation coefficients*** – statistical measure of the degree of association between two variable/scores. If test scores on one occasion are consistent with those on another occasion, the correlation coefficient with be near 1.0
- Intelligence scores remain fairly consistent from 5 years old and on. However, some performance tasks tend to decline from about age 20 and on.

Validiity:

- The ability of a test to measure what it has been designed to measure.
    - ***Content Validity*** – refers to a test's having an adequate sample of question measuring the skills or knowledge it is supposed to measure.
        - If all question on an algebra test concerned behavior genetics, the test would lack validity.
        - To have content validity, an intelligence test must assess the full range of mental abilities that constitute intelligence.
        - No intelligence test has perfect content validity, however, most adequately sample all aspects of intelligence.
    - ***Criterion-Related Validity –***validity of a test as measured by a comparison of the test score and independent measure of what the test is designed to measure.
        - Various intelligence tests are supposed to correlate with one another despite differences in their content.
        - People with high scores on one test, should receive high scores on another.
        - The correlation coefficient between the Stanford Binet and WISC is around .80.

- Criticisms of Intelligence tests:
    - One major criticism of IQ tests concerns their content. Many critics believe that intelligence tests assess only a very narrow set of skills: passive verbal understanding; the ability to follow instructions; common sense; and scholastic aptitude.
    - Another criticism is that all IQ tests measure is the ability to take a test.
    - However, they do a good job of predicting academic performance, but do not account for motivation, emotions, and attitudes toward academics.

<u>What Determines Intelligence?</u>

- H***eredity*** – Robert Tryon (University of California) – was a pioneer in behavioral gentetics.
    - Tryon bred "smart maze" rats with one another and "dumb maze" rats with one another.
    - Within a few generations, the difference between the two groups was astounding. The dumb rats made many mistakes and were more difficult to train.
    - The smart rats demonstrated that this specific ability of running a maze can be passed down from one generation of rats to another.
    - Studies with identical twins shows that IQ scores are very similar while raised together or raised apart.
    - Adopted children have been found to have IQ scores that are more similar to those of their biological mothers than to those of the mothers who are raising them.
- ***Environment –*** extreme malnutrition during infancy can lower IQ scores.
    - Severely undernourished children in South Africa had IQ scores that averaged 20 points lower than the IQ scores of similar children with adequate diets.
    - Psychologists raised one group of mixed smart and dumb rats from Tryon's experiment in plain surrounding and another mixed group in a stimulating environment.

        - Fount the when the rats were grown, the experimenters discovered there was no longer much difference between genetically smart and dumb rats.
            - In the restricted environment, the inherited abilities of the smart rats failed to develop, and all the rats acted like dumb rats.
            - In the stimulating environment, the genetically dumb rats made up in experience what they lacked in heredity, and as a result, acted like the smart maze rats.

Mental Abilities and Human Diversity

- ***Gender –*** In most studies, no differences at all between males and females are found. However, a few differences did appear in cognitive abilities:
    - Girls tended to display greater verbal ability and boys tended to exhibit stronger spatial and mathematical abilities.
    - Men are much more likely than women to fall at the extremes of the intelligence range.
        - In a recent study (1996), males accounted for seven out of eight people with extremely high IQ scores.
        - An almost equally large proportion of males had IQs within the range of mental retardation.
- ***Culture –*** Research confirms the existence of significant differences in student performance across various cultures. The evidence suggest that these difference reflect cultural attitudes toward the importance of ability and effort and the differing nature of the school systems, not an underlying difference in intelligence across cultures.

Extremes of Intelligence

- Average IQ score is 100. 70% of the population has IQ scores between 85 and 115. All but 5% have IQ scores that fall between 70 and 130.

- ***Mental Retardation*** – condition of significantly below average intelligence combined with deficiencies in adaptive behavior. The condition must appear before the individual is 21 years old (American psychiatric assoc.)
    - a low IQ is not sufficient for diagnosing mental retardation. It also implies the inability to perform at least some of the ordinary tasks of daily living.
    - Some who are mentally retarded display exceptional skills in areas other than general intelligence. ***Savant Performance*** – highly remarkable abilities in specialized areas such as numerical computation, memory, art, or music. (determining the day of the week for any date over many centuries; playing a long musical composition after hearing it played only once.
- ***Mild Retardation*** *– Low 50s to 70s IQ range – may be able to function adequately in society. Can learn academic skills comparable to those of a 6th grader and can be minimally self supporting, although requiring special help at times of unusual stress.*
- ***Moderate Retardation*** *– Mid 30s to low 50s IQ range – can learn on a second grade level and perform skilled work in a sheltered workshop if provided with supervision and guidance.*

- ***Severe Retardation –*** *Low 20s to mid 30s IQ range – do not learn to talk or to practice basic hygiene until after age six. Simple tasks can be carried out with supervision.*
- ***Profound Retardation –*** *Below 20 or 25 IQ – constant care is needed. Usually have a diagnosed neurological disorder.*
    - ***Causes of Mental Retardation:***
        - Most often causes cannot be identified
        - When identified, most often stems from a variety of genetic, environmental, social, nutritional, and other risk factors.
        - About 25% of cases, especially the more sever forms of retardation, appear to involve genetic or biological disorders.

- ***Giftedness –*** Refers to superior IQ combined with demonstrated or potential ability in such areas as academic aptitude, creativity, and leadership.
    - People have used various criteria to identify gifted students, including scores on intelligence tests, teacher recommendations, and achievement test results.