

## Correlates of Intelligence

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## Intelligence

- No conceptualization of intelligence has yet answered all the important questions
  - See our discussion of the history of intelligence testing
  - Problems with ability to assess different conceptualizations of intelligence
  - Culture plays a big role in intelligence

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## Intelligence

- Intelligence tests come in many forms
- *g*
- Core mental processes
  - Recognizing the existence of a problem
  - Defining the nature of the problem
  - Constructing a strategy to solve the problem
  - Mentally representing information about the problem

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## Intelligence

- Allocating mental resources in solving the problem
- Monitoring one's solution to the problem
- Evaluating one's solution to the problem
- Importance of culture
  - Difficult to compare intelligence across cultures due to the different meaning of intelligence across cultures

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## Intelligence

- Within group variance is larger than between group variance
- Developmental progression
- Important Point #1:
  - “We should be open to the possibility that our understanding of intelligence in the future will be rather different from what it is today.” (Neisser et al., 1996, p. 80)

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## Intelligence Tests and Their Correlates

- Basic characteristics of test scores
  - Fairly stable during childhood
  - Some things do change over time
    - Absolute performance
    - Relative standing
- Tests as predictors
  - Intelligence tests predict school performance well

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## Intelligence Tests and Their Correlates

- IQ scores correlate positively with:
    - Grades in school
    - Performance on tests of reading comprehension
    - Performance on tests of mathematical knowledge
    - Performance on tests of knowledge of academic content
  - IQ scores predict academic achievement
  - Relationship is reciprocal
    - We'll talk more about this later
- Factors other than intelligence also influence school success

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## Intelligence Tests and Their Correlates

- Intelligence scores predict the number of years of schooling a person has
- Number of years of education associated with IQ scores:

0-7 (elementary school)	82.5
8 (elementary school graduate)	90.9
9-11 (some high school)	96.4
12 (high school graduate)	100.0
13-15 (some college)	107.3
16+ (college graduate)	115.2

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## Intelligence Tests and Their Correlates

- Predict occupational/social status
- Mediated by number of years of education/training a person has
    - Indirect influence of intelligence
    - Direct influence of intelligence



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## Intelligence Tests and Their Correlates

- Comparison of brothers with higher and lower levels of intelligence
  - Variations in IQ influence changes in occupational status
  - Schooling and intelligence make independent contributions to lifetime earnings
- Intelligence tests predict some measures of job performance
- IQ is related to acquisition of knowledge in occupational settings

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## Intelligence Tests and Their Correlates

- Strong evidence supporting general validity for cognitive ability tests for selection across a wide range of jobs
- Using IQ testing for job selection could save the U.S. economy \$80 billion annually
  - Positive impact on the nation:
    - If individuals with high IQs are placed in more demanding jobs and individuals with low IQs are placed in less demanding jobs, we increase utility
    - Place people with high IQ in jobs that are more economically consequential and you impact the economy

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## Intelligence Tests and Their Correlates

- Gains in overall utility come about if the use of IQ tests for job placement increases the difference in intelligence scores between those who are hired and those who are not hired
  - Interpersonal skills or aspects of personality may be more important measures of job performance, but they are not as easily measured
  - Big Question:
    - Are interpersonal skills related to intelligence?
    - See personality & intelligence lecture later...
- Intelligence and U.S. Presidents
- Intelligence scores negatively predict undesirable social outcomes

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## Intelligence Tests and Their Correlates

- Test scores and processing speed
  - Some evidence that people with higher scores on intelligence tests tend to apprehend, scan, retrieve, and respond to stimuli more quickly than those who score lower

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## Intelligence Tests and Their Correlates

- Status and trends in intelligence testing
  - Number of different types of instruments
    - Tests of psychometric abilities
    - Neuropsychological processing models
    - Dynamic assessment
  - Tests of psychometric abilities
    - Abilities identified through factor analysis
      - See discussion from history of intelligence testing
    - 1990s: psychometric abilities = multifactorists

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## Intelligence Tests and Their Correlates

- Pendulum has swung away from *g* to an emphasis on distinct, though correlated, dimensions of intelligence
  - *g* not totally rejected
- Result is a hierarchical model
- Neuropsychological Processing Models
  - Content tends to be theory driven rather than empirically driven
  - Looks at three functional levels, each associated with an area of the brain:

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## Intelligence Tests and Their Correlates

- Arousal and attention
- Information encoding and processing
- Planning and monitoring functions
- May test different systems than tests of psychometric ability
- **Dynamic assessment**
  - Diverse approaches that share the same assumptions
    - Validity of "static" testing is adversely affected by differential familiarity with the types of thinking required

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## Intelligence Tests and Their Correlates

- Measure that directly assesses learning ought to be a good predictor of success in learning and ought to be useful for educational planning
- D.A. procedures provide several types of information:
  - More valid measures of the abilities measured
  - Measures of different abilities
    - Especially learning ability or modifiability
  - Insights into the cognitive processes the client uses or fails to use
  - Clues about the instructional methods that are most effective for the client

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## Intelligence Tests and Their Correlates

- Less concerned about the structure of abilities and more concerned with ability to learn
- Techniques
  - Use clinical, nonstandardized intervention by the examiner
  - Use standardized assessments but track the number and types of prompts or hints required
- Educational implications

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## Genes and Intelligence

- Children's IQ scores are highly correlated with parental IQ scores
  - Maternal IQ has highest correlation
  - Magnitude of correlation is a function of the degree of genetic relationship

Identical Twins Raised Together	.86
Identical Twins Raised Apart	.72
Same-Sex Fraternal Twins Raised Together	.62
Opposite-Sex Fraternal Twins Raised Together	.57
Nontwin Siblings Raised Together	.47
Unrelated (Adopted) Siblings Raised Together	.30

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## Genes and Intelligence

- Most inherited differences in cognitive ability can be explained by differences in a single, overarching factor (that we like to call *g*)
- IQ scores are correlated with the amount of gray matter in the brain

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## Genes and Intelligence

- Effects of genetic material will always be potentially modifiable by environmental input
- Individuals are active in creating their own environment
  - Some believe that the types of environments we prefer are genetically-driven

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## Environment and Intelligence

- Lots of influences are environmental
  - Social influences
  - Occupational influences
  - Schooling influences
    - School is both an IV and a DV
    - In order to promote development of intelligence, schools need to meet a minimum standard of quality
    - Staying in school elevates intelligence

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## Environment and Intelligence

- Effect of intermittent school attendance
  - Early studies examined children in isolated areas
    - Longer children went to school, higher their IQ scores
- Effect of delayed school start-up
  - Children whose schooling is delayed experience a decline of 5 IQ points for every year schooling is delayed
- Effect of staying in school longer
  - Vietnam War avoiders
    - July 9<sup>th</sup> vs. July 7<sup>th</sup>

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## Environment and Intelligence

- Effect of discontinued schooling
  - For every year of high school not completed, there was a loss of 1.8 IQ points, up to a maximum of 8 points
- Effect of summer vacations
  - Children score lower on intelligence tests at the end of summer vacation as compared to the beginning of summer vacation
- Effect of music lessons
- Parental influences
  - Parents with higher IQ may place greater emphasis on education and achievement

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## Environment and Intelligence

- Parents with higher IQ may be more successful at providing stimulation for their children
- Parental behavior is a strong predictor of children's intellectual performance
- Caveat
  - Exposure to toxins
- What constitutes intelligent behavior may differ from one environment to another
  - Sorting task
  - Professional groups

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## Environment and Intelligence

- Environmental interventions
  - Long-term gains from interventions have been elusive
  - Head Start
  - More later
- Family Environment
  - Beyond a minimum, the impact of the family is questionable

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## Environment and Intelligence

- Question of correlation vs. causation
- Number of children in the family
  - Some studies have indicated that the more children in the family, the lower the IQ scores of each of the children
    - Depends on the type of data used
  - Causal arrow is unknown
- Zajonc (2001) argues for **Confluence Model**
  - Mental maturities of children growing up in the same families flow together over time and influence each other

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## Environment and Intelligence

- Intelligence is the result of positive and negative contributions of siblings
  - Positive contribution
  - Negative contribution
- Effects are seen at around age 11
- **Resource Dilution Model (Downey, 2001)**
- Children who grow up in large families have fewer resources for intellectual development than children growing up in smaller families
  - Parental resources are finite
  - Additional siblings reduce the amount of parental resources received by any one child

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## Environment and Intelligence

- Parental resources are an important contributor to a child's educational success
- **Admixture Hypothesis**
- These findings can be explained by causes outside of the family
  - e.g., SES has an influence on both family size and intelligence

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