Intelligence and Academic Achievement

How Children Develop

Chapter 8

Intelligence

Definitions of Intelligence

Dictionary definition: “faculty of thought and reason”

What behaviors are typical of intelligent people?

- Verbal ability
- Problem solving
- Social competence

What behaviors are typical of intelligence at:

- 6 months
- 2 years
- 10 years?

The Study of Intelligence

Research in this area raises many of the most controversial issues about human nature:

- The roles of _________ differences
- The effects of _________________
- The possibility of _________________

Alfred Binet: The holistic view

Asked people to apply functions of intelligent behavior:

- memory, judgment, abstraction.

Devised test of “general mental ability” or “g”

- First developmental test: Intelligence based on age at which child could do tasks.

Tasks on intelligence tests are positively correlated:

- Overall scores correlate with school grades, test performance, information-processing speed, knowledge of non-studied subjects, and speed of neural transmission
2 types of intelligence

- **_________ intelligence**—factual knowledge of the world (e.g., word meaning)
  - Tends to increase across the life span

- **_________ intelligence**—ability to think on the spot (e.g., solve novel puzzles)
  - Tends to peak early in adulthood

Tests for each intelligence correlate more with each other

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### Measuring Intelligence

<table>
<thead>
<tr>
<th>Type of Intelligence</th>
<th>Description</th>
<th>Examples</th>
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<tbody>
<tr>
<td><strong>Linguistic</strong></td>
<td>Sensitivity to the meanings and sounds of words, mastery of language, representation of the ways language can be used</td>
<td>Politician, speaker, teacher</td>
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<tr>
<td><strong>Logical-mathematical</strong></td>
<td>Understanding of concepts, principles, and theories, and the relationships among these concepts, support for logical reasoning, ability to identify problems and see explanations</td>
<td>Math professor, scientist</td>
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<tr>
<td><strong>Spatial</strong></td>
<td>Ability to perceive the visual world accurately, to perform transformations upon objects and to reason about spatial aspects of visual perception, ability to see spatial relations between objects, ability to detect vector patterns</td>
<td>Artist, architect, engineer</td>
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<tr>
<td><strong>Musical</strong></td>
<td>Sensitivity to both visual and stimuli of music, an understanding of ways to combine sounds and melodies, ability to recognize relationships among patterns, ability to create and perform melodies and structures, awareness of emotional aspects of music</td>
<td>Musician, composer</td>
</tr>
<tr>
<td><strong>Naturalistic</strong></td>
<td>Sensitivity and understanding of plants, animals, and other aspects of natural science</td>
<td>Biologist, ecologist, zoologist</td>
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<tr>
<td><strong>Bodily-kinesthetic</strong></td>
<td>Use of one’s body in highly skilled ways for expressive or practical purposes, flexibility</td>
<td>Dancer, athlete, surgeon</td>
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<tr>
<td><strong>Interpersonal</strong></td>
<td>Ability to read and write, understanding of social and cultural conventions, empathy, and intelligence in personal and social relationships</td>
<td>Nurse, therapist, social worker</td>
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<tr>
<td><strong>Intrapersonal</strong></td>
<td>Ability to reflect and discriminate among the moods, tempers, moods, and emotions of others and to feel, understand, and act on one’s own feelings, intuition, and intellectual knowledge</td>
<td>Writer, musician, poet</td>
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Infant Intelligence Tests
Most measure perceptual and motor responses.

Bayley Scale of Infant Development
1. Mental Scale: e.g., turning to sound, naming pictures.
2. Motor Scale: e.g., grasping, sitting, jumping.
But, poor predictors of later intelligence: WHY?

New version:

Best intelligence predictor from infancy?

Habituation procedure
Bornstein & Sigman (1986): median predictive correlation = 0.47.
Infants tested at 4 to 7 months and retested later (IQ, vocab, reading):
Correlation: 0.42.
Infant habituation predicts __________________ at 1 and ______ at 4.
Note: measure is speed of habituation not test behavior.
What is measured?

Measuring Intelligence
• Measuring intelligence is different at different ages
• What’s on a test? Here is an example:

Wechsler Intelligence Test for Children (WISC) (6 and older)

Verbal Section
• Crystallized intelligence
• Tests general knowledge
• Subtests:
  • Information
  • Vocabulary
  • Similarities
  • Arithmetic
  • Comprehension
  • Digit Span

Performance Section
• Fluid intelligence
• Tests spatial and perceptual abilities
• Subtests:
  • Picture Completion
  • Picture Arrangement
  • Block Design
  • Object Assembly
  • Coding
  • Mazes
**Intelligence Tests for Children**

*Stanford-Binet Intelligence Scale (2-adult)*

Measures general intelligence and four factors:

- Verbal, Quantitative, Abstract/visual reasoning + ST memory

1. Verbal & Quantitative = (cultural) intelligence
2. Abstract/visual reasoning = intelligence

Supposed to be sensitive to culture and sex

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**Intelligence Quotient (IQ)**

- Stanford-Binet gives overall quantitative measures of a child’s intelligence relative to that of producing the Intelligence Quotient, or IQ.

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**A Normal Distribution in IQ Scores**

IQ computation is based on a normal distribution of scores, a pattern of data in which scores fall symmetrically around a mean value, with most scores falling close to the mean and fewer scores at the high and low ends.
What and How Well Do Intelligence Tests Predict?

**Stability of IQ scores**

There are two generalizations about stability:

The ______ the child at first testing, the ______ the prediction of IQ

- 2-5=.32
- 5-8=.70
- 9-12=.85

The ______ in time the two tests, the ______ the relationship

- 4-5=.72
- 4-6=.62
- 4-18=.42

**IQ as predictor of scholastic performance**

Intelligence tests DO predict academic achievement:

Correlations from .40 to .70. Most around .50.

**Why?**

1. IQ and achievement depend on
2. IQ and achievement tap the same

**IQ as predictor of scholastic performance**

Is it genes or experience?

- About 50% of the variation in IQs among Euro-Americans is attributable to genetic variation
- IQ-achievement correlation higher in identical than fraternal twins.
- But, IQ is increased by years of schooling.

**Note:** motivation and personality also important.

**Before 5-6, IQ measures present ability, not a stable measure.**

**Why?**

1. Differences in nature of items (concrete vs. abstract)?
2. Different stage (spurts) experienced earlier or later?

**Stability of Absolute Scores**

- Longitudinal research: from childhood to adolescence IQ fluctuates 10-20 points

Gainers:

Decliners:
IQ as predictor of occupational attainment/performance

2nd grade: high IQ predicts becoming lawyer, scientist, etc.
IQ also correlates with on-the-job performance
But: other variables important: “need to achieve”, family background

Effects of IQ and Education on Income

Racial & Socioeconomic Differences in IQ

The outcomes predicted by IQ vary by race/ethnicity/SES.
- Asian-American scores are higher than those of any other group in the United States.
- Low SES children score 9 points lower than middle SES children.

Are early differences genetic? Or fewer opportunities for some racial/ethnic groups?

Does SES account for racial discrepancy? Yes and no.
- If matched for SES, still a 10 point difference.
But: individual differences: curves overlap

Level I = rote learning
Level II = complex cognitive processing.

- Claimed differences due to Level II not Level I.

But, what about culturally loaded questions?

Jenson: black children do worst on least culturally loaded questions – problem solving.

But: when black children grow up in a white middle-class home?

They attain IQ scores 20 points above mean of black children in low SES communities.
Interventions

- Many home- and center-based intervention programs were initiated in the 1960s to enhance the intellectual development of poor children.
  - Of eleven early-intervention programs, Lazar found that some were lost over time.
  - However, participation linked to reduced rates of school failure, higher rates of high school graduation, and higher earnings as adults.

Project Head Start

- Has provided a range of services to more than 13 million children for 35 years.
- At present, serves about 1 million 3- to 5-year-olds each year in approximately 2,000 centers around the United States.
  - Children receive medical, dental, and nutrition services as well as intellectual stimulation and day care.
  - Emphasizes involving family and community; building on children’s strengths; and fostering social, emotional and physical as well as intellectual growth.
  - Long-term results are consistent with those of other early intervention programs.

Does Schooling Influence IQ?

Intelligence affects achievement: does schooling affect intelligence?


Suggests that events in classroom have profound effects:

**Summer:**
- A small drop in IQ over summer, especially low income children.
- Advantaged children in summer activity show no decline.

What other features of schooling?

Irregular attendance: has larger impact on IQ.

Regular schooling gives 10-30 point advantage.

Delayed entry: 5-7 point loss per year delayed schooling.

Drop out: each year not completed loses 1.8 points.
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Ceci (1991) claims schooling influences IQ in three ways:
1. Teaches children ___________________ relevant to questions
2. Promotes ___________________ tapped by test
3. Encourages attitudes and values for ___________________

Gifted Children

• Some gifted children display astonishing early facility in a particular area such as numbers or music, whereas a smaller number of others are exceptional in a wide range of intellectual areas.

- These globally gifted children often display signs of giftedness from very early in development.
- Exceptional early ability often, but not always, foreshadows outstanding later achievement.
- Exceptional ability in one area does not imply exceptional ability across the board.

Beyond IQ: The Development of Creativity

Creativity is often ignored in IQ tests. Why?
• People who are a “genius” are often highly creative.

Creativity in children: convergent and divergent thinking.

Convergent thinking:

Divergent thinking:

IQ and divergent thinking poorly correlated: in intelligent adults is virtually zero.

Nature and nurture?

Creative children’s parents:
1. Encourage nonconformity & intellectual curiosity
2. Accept individual characteristics

School doesn’t help: answer-centered approach stops unusual ideas.