

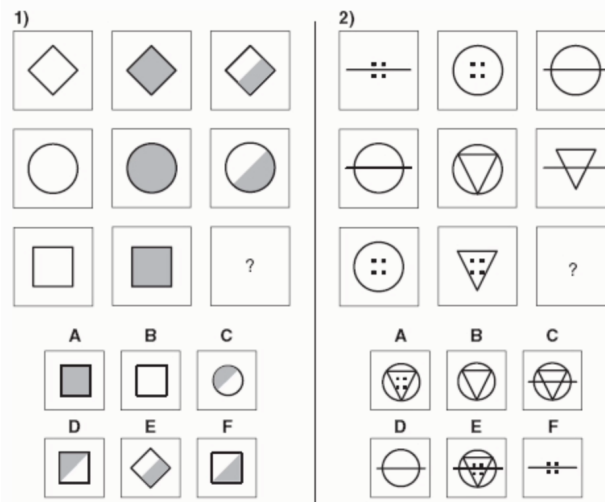
**Open Your Class with this Tomorrow**  
**Intelligence: All That Really Matters KEY**

## Exploring IQ with Graphs and Charts

**Directions:** Review each of the following statements about intelligence and the associated graph from Stuart Ritchie's book *Intelligence: All the Matters* and answer the corresponding questions.

**Types of questions on IQ tests**

IQ is the result of many different tests of reasoning, memory, acquired knowledge, and mental processing speed that are combined into one overall score. The scores from each of the separate tests are totaled and are then compared with those of the rest of the population. IQ tests include sections on reasoning ability, memory, knowledge, vocabulary, verbal fluency (*how many words can you think of in one minute that start with the letter j*), mental processing speed, reaction time, and spatial ability. It is important to note that an IQ test is individually administered by a trained professional and takes at least an hour and a half.



1. The figure above is an example of reasoning ability test questions (question 1 is easy, but question two is more difficult). Which of the options (A-F) located below each question is likely to come next in the sequence?

Question 1: **F**                      Question 2: **B**

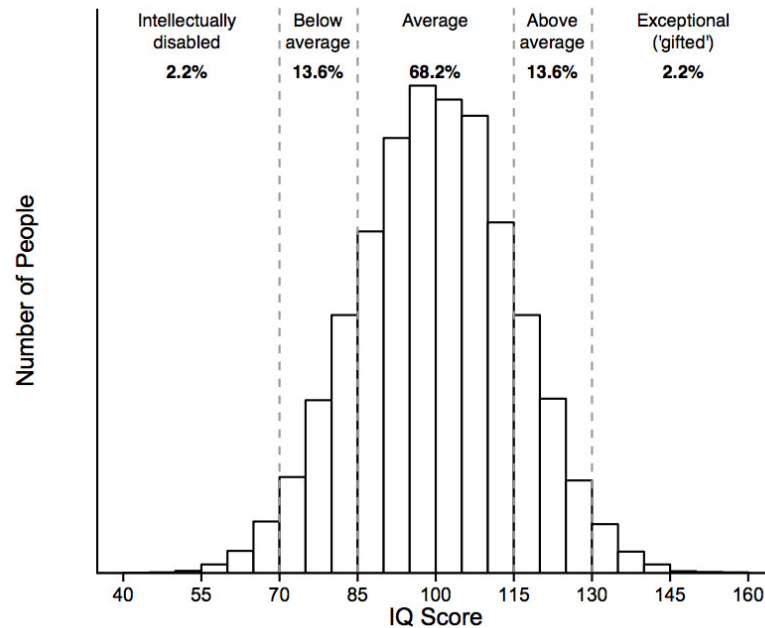
2. Which pioneer in intelligence testing first introduced performance scales in addition to verbal scales? **David Wechsler**

3. Who created the first intelligence test? What concept in testing did this individual create to serve as a method for evaluating individual performance?  
**Alfred Binet (and Theodore Simon); mental age**

4. What was the original formula for determining a ratio IQ that was created by William Stern?  
**Mental Age/ Chronological Age X 100**

## **Most people have average intelligence**

An average score for IQ is usually set at 100 with a standard deviation of 15. Like other variable human traits (e.g. height), the range of IQ is on a standard curve bell curve.



1. What is the name for the process in standardization in which a large and representative group is given an IQ test, and the average score of this sample group becomes the value of 100 (the mean)?

**Norming / Norm creation**

2. For an IQ test with a mean of 100 and a standard deviation of 15, what percentage of scores are located within one standard deviation of the mean?

**68%**

3. How many standard deviations above the mean is an individual with an IQ of 145 if the mean is 100 and the standard deviation is 15?

**3**

4. One finding is that people who score well on one of the subtests on an IQ test tend to score well on them all. A person's score on a task such as how fast he or she can turn off a blinking light (one component of some intelligence tests) is correlated with scores on verbal and spatial reasoning tests. According to Charles Spearman, what is this overlapping of scores called?

**"g-factor" or general intelligence factor**

5. Name two theorists who propose a multi-factor theory of intelligence as opposed to overall general intelligence.

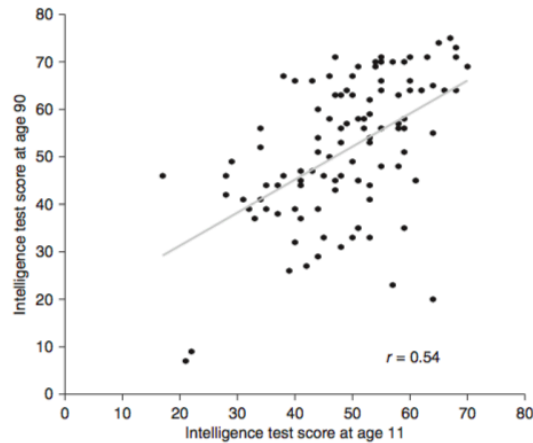
**L.L. Thurstone – 7 primary abilities**

**Robert Sternberg – Triarchic theory (practical, analytical, creative)**

**Howard Gardner – Multiple intelligences theory**

## You are probably stuck with what you have regarding intelligence

Studies have found if you are a smart kid, you will be a smart old person. The following chart shows a Scottish study where a group of 90-year-olds was given an IQ test they previously took at age 11.



▲ Figure 2.5 The stability of intelligence across life. This shows the results of the same intelligence test given to the same people (one person per dot) at age 11 and again at age 90. There is a correlation of  $r = 0.54$ , shown by the grey summary line. (Data adapted from Deary et al., 2013, with permission from Sage.)

1. What type of graph is being used above to illustrate the data from the Scottish IQ study?

**Scatterplot**

2. What are the two variables depicted in the above graph?

**Intelligence score at age 11 and intelligence at age 90**

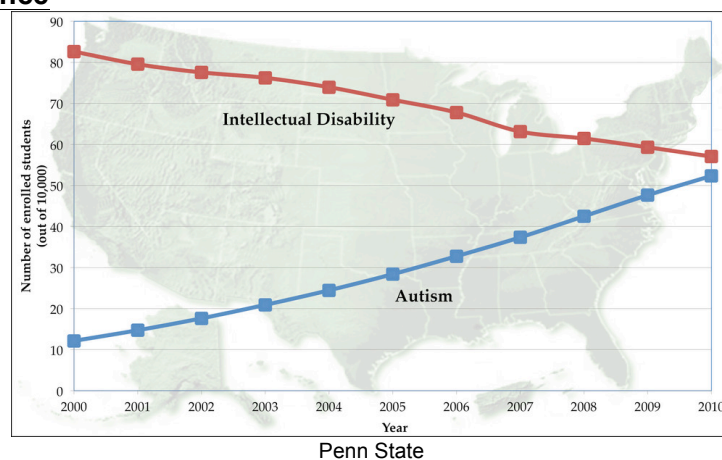
3. What does each dot on the graph represent?

**The score of a particular individual on the intelligence test at age 11 and age 90**

4. What kind of relationship is depicted on the graph?

**Positive**

## Extremes of Intelligence



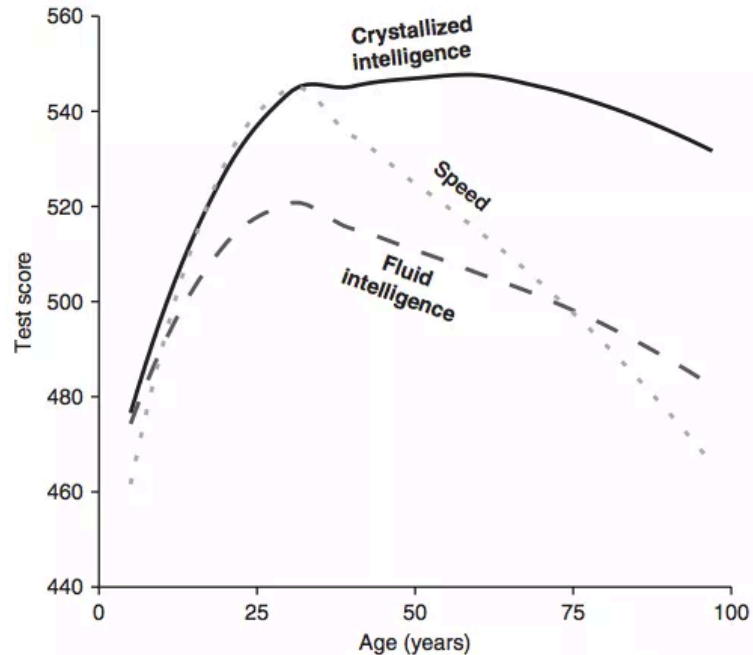
1. By using the above graph from Penn State, suggest one possible reason for the change in data during this ten-year period.

**The increase in autism diagnoses during this period was offset by decreases in the diagnosis of intellectual disability, possibly suggesting that shifting patterns of diagnosis may be responsible for increases in autism diagnosis**

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## Intelligence peaks in a persons mid- the to late 20s, and then slowly declines



▲ Figure 2.4 Change in cognitive abilities with age, taken from a study testing over 6,000 people of all ages (the data for different ages come from different people). 'Fluid' skills (dashed line) decline far more steeply than 'crystallized' ones (solid line). Tests of speed (dotted line) show a particularly pronounced decline. (Figure adapted with permission from Tucker-Drob, 2009.)

1. According to Raymond Cattell, what is the name for the type of intelligence that refers to one's accumulated knowledge typically increases with age?

**Crystallized Intelligence**

2. According to Raymond Cattell, what is the name for the type of intelligence that involves the ability to solve unique tasks, reason quickly, and think abstractly which decreases after middle adulthood?

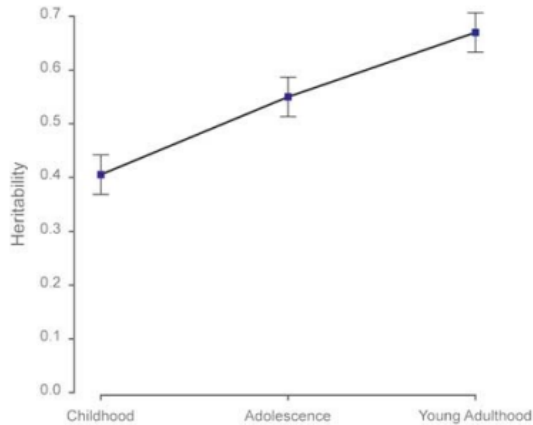
**Fluid Intelligence**

3. Which type of intelligence shows the steepest decline with age according to the graph?

**Speed of processing**

### **Around half the variance in IQ can be explained by genetics**

Studies comparing identical and fraternal twins find about half of IQ can be explained by genetics. Also, studies have also shown that genetics are more predictive of IQ as individuals age. For example, a child with a genetic propensity to be smart may choose to spend more time in a library. A tiny 6-year-old may not be allowed to go to the library by herself. But a 16-year-old can, and so with age individuals assume more control of their environments which can then increase (amplify) the genetic potential of an individual.



**Figure 1.** A meta-analysis of 11 000 pairs of twins shows that the heritability of intelligence increases significantly from childhood (age 9) to adolescence (age 12) and to young adulthood (age 17). (Adapted from Haworth *et al.*<sup>49</sup>).

1. Who were the subjects in the study depicted in the above graph?

**11,000 pairs of twins**

2. How is the variable “Young Adulthood” operationally defined in the study depicted in the graph?

**Age 17**

3. What type of developmental study was this meta-analysis (cross-sectional or longitudinal)?

**Longitudinal**

4. What does it mean that the heritability ratio is higher for the same groups of twins when they are in young adulthood as opposed to childhood?

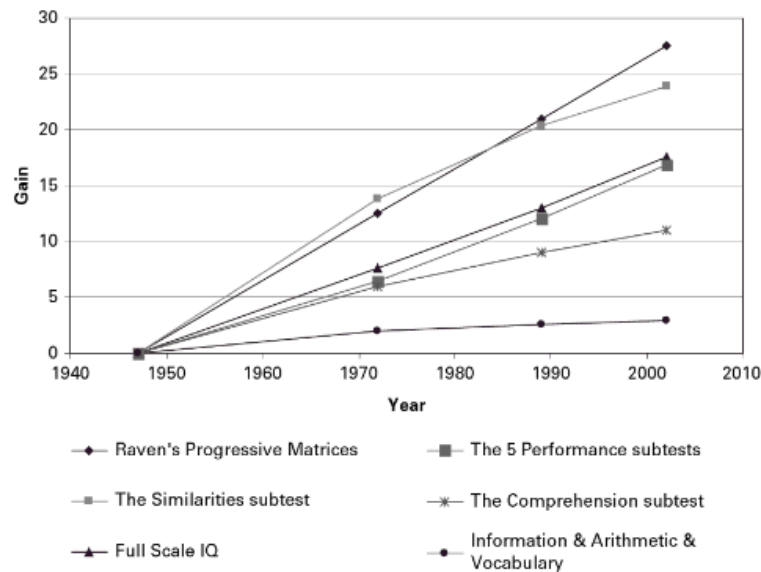
**The estimate of the percentage of a given characteristic (IQ) for a population that can be attributed to genetics is higher for the same population as they get older. It seems that genetics make up a greater amount of influence for intelligence scores as individuals get older.**

5. Who was the first researcher to use the type of design mentioned in question 3 to study gifted children? What was the name of the IQ test created by this famous psychologist?

**Lewis Terman; Stanford-Binet**

### **Humans are getting smarter**

Evidence shows that better access to education and improved nutrition and health care are helpful in raising intelligence and that in many parts of the world access to these benefits has greatly increased over the last 100 years. As a result, intelligence test scores have been increasing by around 3 points per decade since IQ testing was started. The average score on an intelligence test is 100 but researchers began to see that individuals who were born later typically earned average scores above 100 – in other words, they were scoring higher than the norm of the prior generation. As a result, intelligence tests must be periodically re-normed with the score of 100 set to match up to an average of a sample of individuals for the current generation.



1. What is the name for the phenomenon describing how mean IQ scores appear to be increasing by about two or three points per decade?

**The Flynn effect**

2. What is the likely cause of the phenomenon mentioned in the previous question?

- **Environmental factors are increasing including the quality of childhood nutrition, health care, and education.**
- **Potentially the result of an increased emphasis on knowledge as the engine of our economy, which has encouraged the type of abstract thinking measured by IQ exams.**

3. On which of the intelligence tests depicted in the graph has gains been the smallest?

**Information and Arithmetic and Vocabulary**

Ritchie, S. (2016). *Intelligence: All That Matters*. London: Hodder and Stoughton.

Resnick, B. (2016, May 24). *IQ explained in 9 charts*. Retrieved February 07, 2018, from <https://www.vox.com/2016/5/24/11723182/iq-test-intelligence>

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