#10

INTELLIGENCE

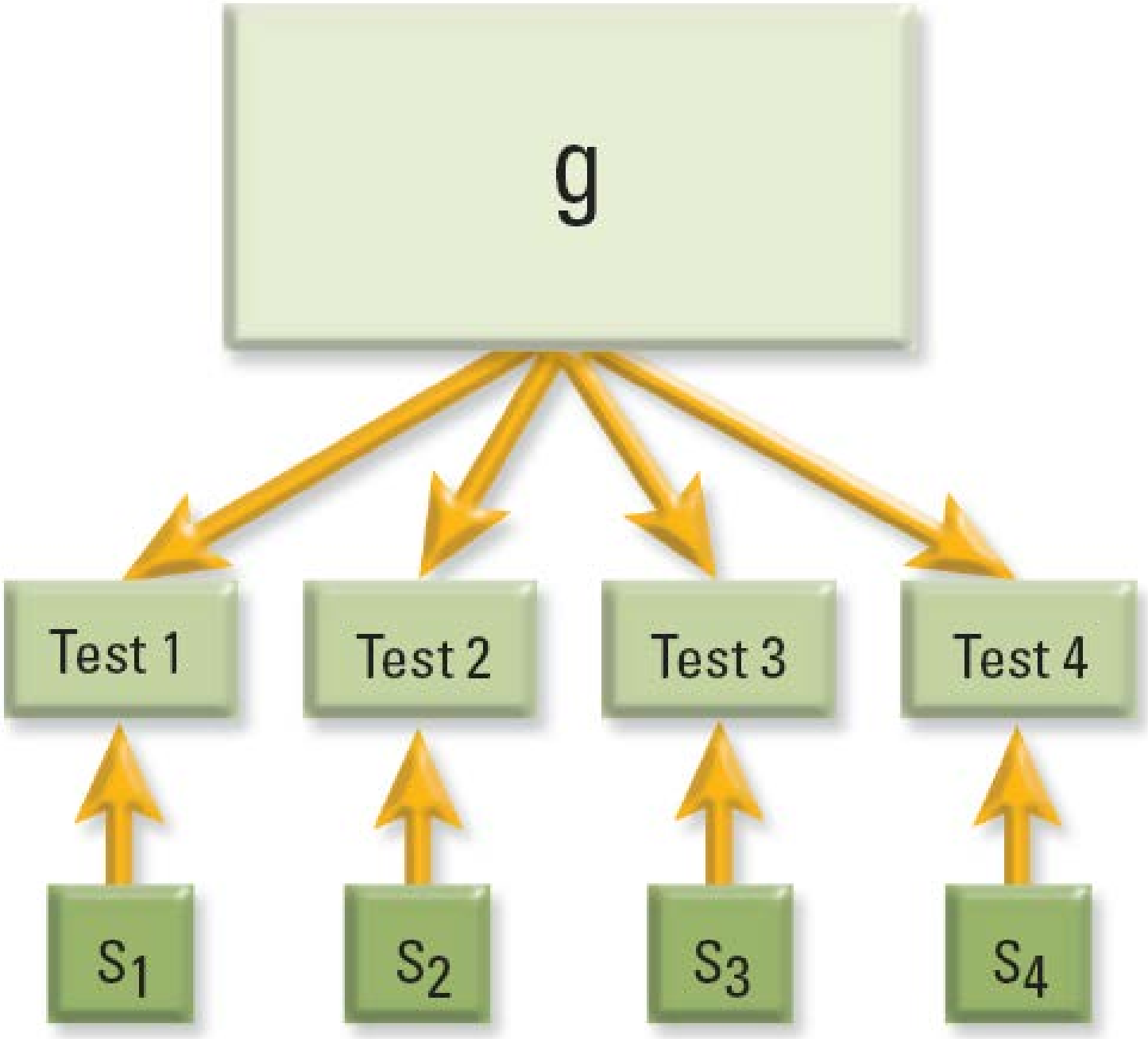
IQ scores are useful, but they fail to cover the many abilities that are important to success.

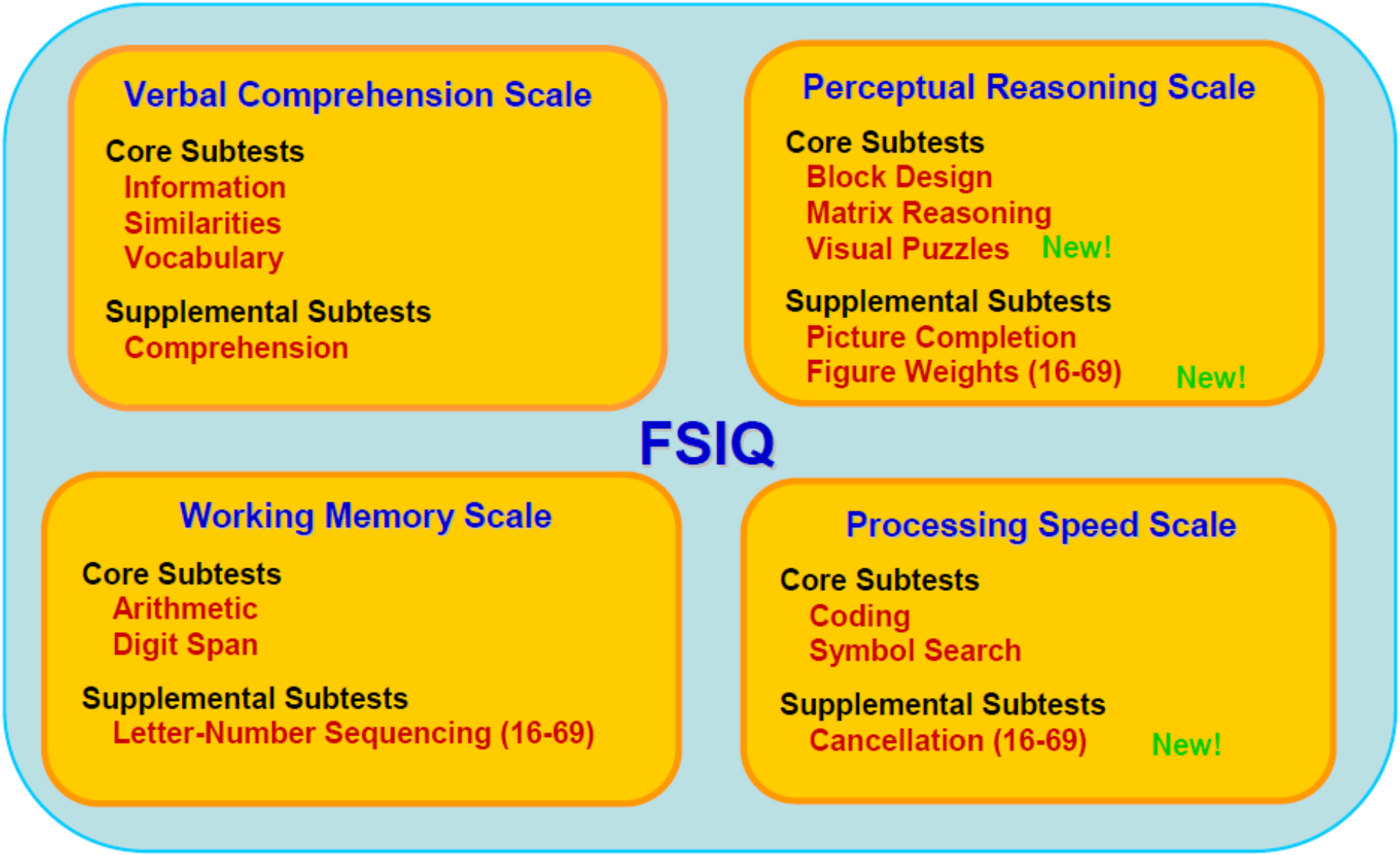
INTELLIGENCE TESTS

- Intelligence tests
  - Tests devised to quantity a person's level of intelligence
  - First developed by Binet and Simon (1905), commissioned by the ministry of public instruction in France to devise a test for identifying slower students

- Binet & Simon (1905)
  - Focused on higher mental processes and abstract thinking
  - Object naming, generating meanings of words, drawing pictures from memory, completing incomplete sentences, identifying similarities between two objects, constructing sentences

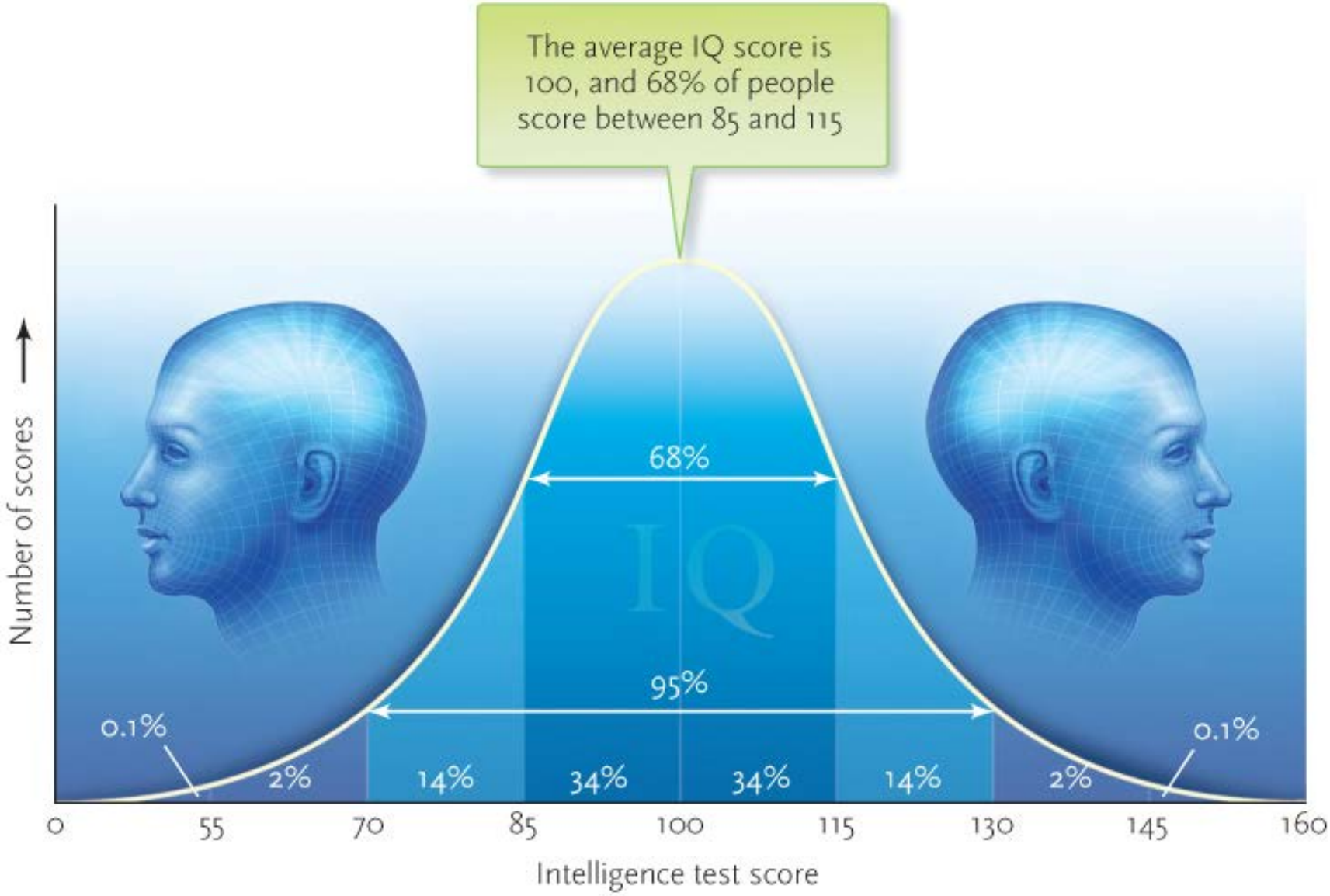
- Spearman (1927)
  - Observed that test items were always positively correlated with each other
  - g or g-factor: the single, hypothetical factor that underlies various intellectual abilities
  - People varies in the amount of g


g
Test 1
Test 2
Test 3
Test 4
S1
S2
S3
S4



Structure of the Weschler Adult Intelligence Scale (WAIS-IV)

- Deviation IQ
  - IQ expresses a person's relative standing in his or her same-aged peers
  - Intelligence of people of the same age are assumed to be normally distributed (with mean = 100 and S.D. = 15)



An IQ of 115 means that the test taker is one SD above the mean of the people of his age. An IQ of 70 means that the test taker is 2 SDs below the mean of the people of his age.

VARIATIONS OF IQ

- Group differences
  - Caucasians higher than African Americans; Asians higher than Caucasians; Jews higher than non-Jews
  - Few or no average sex differences in IQ; women do better on some verbal tasks; men do better on most spatial tasks

- Genetic influences
  - Family studies (whether a trait runs in a family)
  - Adoption studies (resemblance of adopted children with biological vs. adoptive parents)
  - Twin studies (resemblance within identical twins vs. fraternal twins)

Relationship	Genetic Overlap	Rearing	Correlation
Monozygotic (identical) twins	100%	Together	.86
Dizygotic (fraternal) twins	50%	Together	.62
Siblings	50%	Together	.41
Siblings	50%	Apart	.24
Parent-child	50%	Together	.35
Parent-child	50%	Apart	.31
Adoptive parent-child	0%	Together	.16
Unrelated children	0%	Together	.25
Spouses	0%	Apart	.29

The difference between these two correlations shows the impact of the environment

The relatively low correlation for unrelated children raised together shows the importance of genetic factors

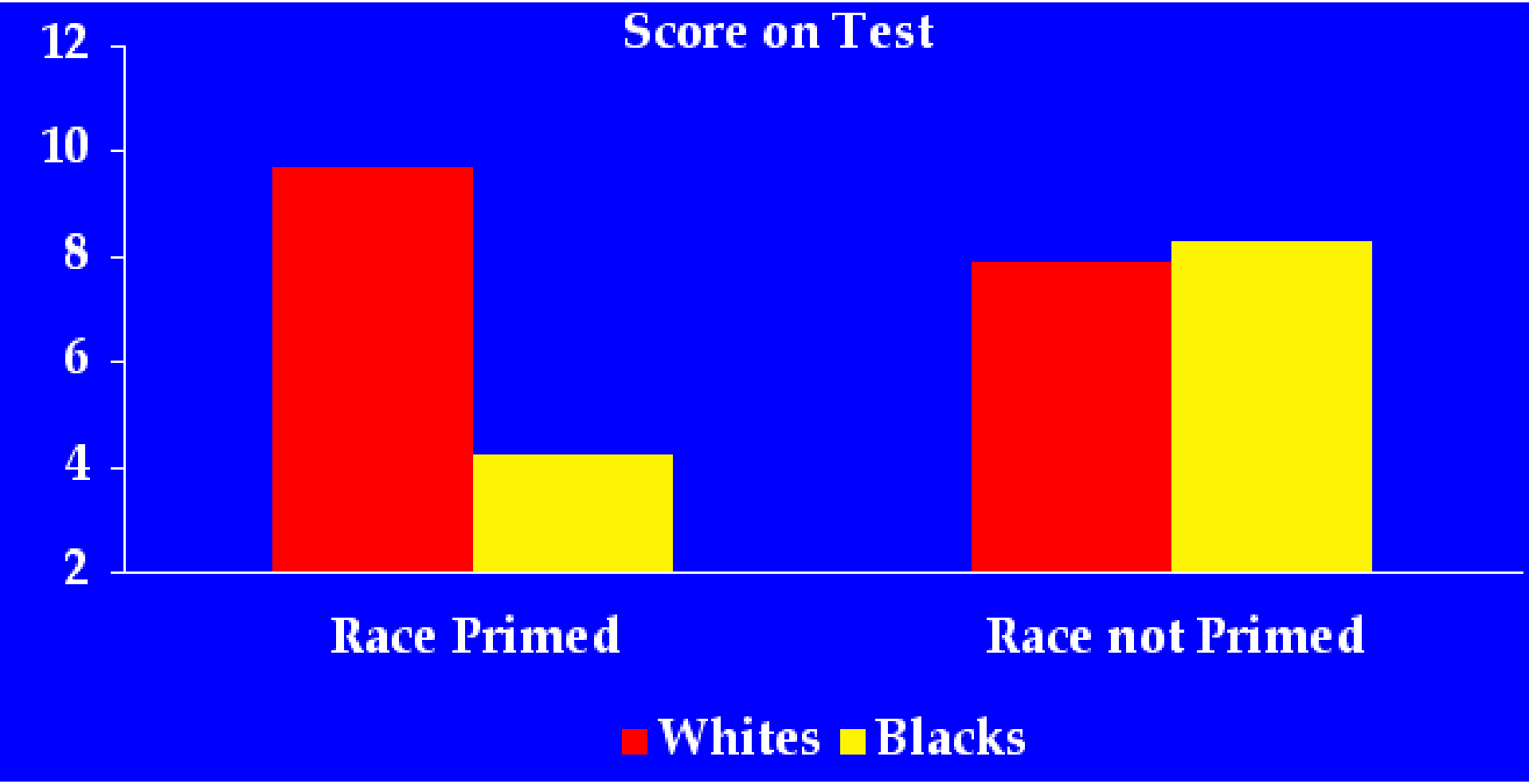
FIGURE 6 The relationship between IQ and closeness of genetic relationship. In general, the more similar the genetic and environmental background of two people, the greater the correlation. Note, for example, that the correlation for spouses, who are genetically unrelated and have been reared apart, is relatively low, whereas the correlation for identical twins reared together is substantial. *(Source: Adapted from Henderson, 1982.)*

Both genes and the environment affect IQ scores.

- Environmental influences
  - Education
    - In same-age pairs, the person who started schooling earlier have higher IQ
    - IQ drop in summer vacations
    - Students who drop out end up with lower IQ than do students who stay, even when they start with the same IQ

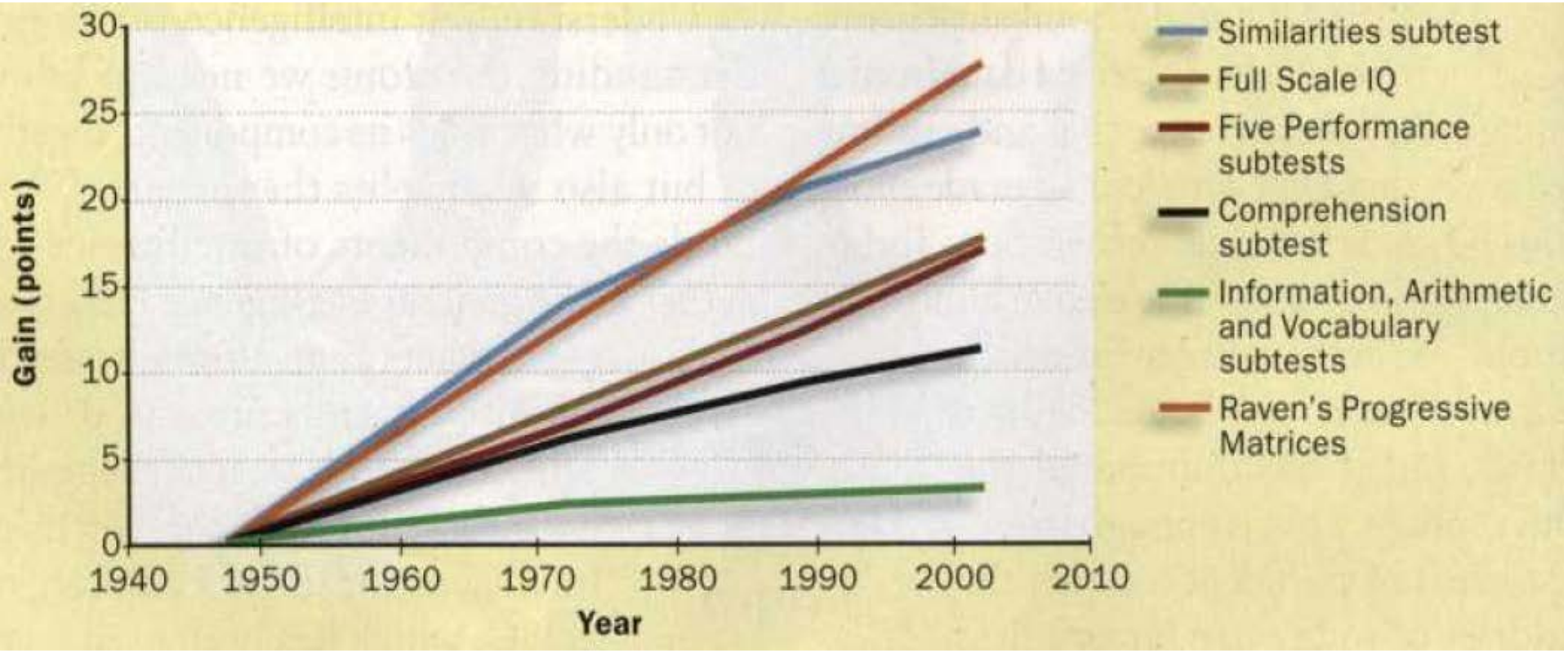
- Environmental influences
  - Education
    - Meta-analyzed 142 effect sizes from 42 quasi-experiment data sets involving over 600,000 participants (Ritchie & Tucker-Drob, 2018)
    - Approximately 1 to 5 IQ points for an additional year of education

- Environmental influences
  - Stereotype threat (Steele, 1997)
    - Fear of confirming a negative group stereotype burdens the test takers and thereby worsens their performance
    - Group differences are neither stable nor fixed



When participants' identity was made salient (by writing their ethnicity on the cover), black students performed less well. However, when identity was not primed, Black students and white students performed equally well (Steele & Aronson, 1995).

- Environmental influences
  - Flynn effect (Flynn, 1981)
    - Worldwide gains (about 3 IQ points per decade) during last century
    - Test experience; complexity of life (e.g., demand for rapid information processing and abstract reasoning); environment (e.g., nutrition, school)



The average gain of full scale IQ is about 3 points per decade since 1950. The gains have been larger in subtests related to abstract reasoning (Flynn, 2007).

RETHINKING INTELLIGENCE

- Limitations of IQ tests
  - r between IQ and school grades = .50 (Neisser et al., 1996)
  - r between IQ and job performance = .30 to .50 (Neisser et al., 1996)
  - There is more to success than IQ

- Limitation of IQ tests
  - Traditional IQ tests measure academically related skills (mainly verbal, mathematical, logical, and spatial intelligence)
  - The scope and format rule out many kinds of intellectual abilities that matter in everyday life

- Savants
  - Mentally deficient individuals who have a highly developed talent in a single area

- Triarchic theory (Sternberg, 1985)
  - Three distinct types of intelligence
  - Analytical: ability to reason logically
  - Practical: ability to solve real world problems, particularly those involving others
  - Creative: ability to come up with novel and effective solutions

- Triarchic theory (Sternberg, 1985)
  - Most traditional intelligence tests relate to academic success but not career and personal success
  - Two other intelligences that are related to overall success in living, and distinct from academic intelligence

1. "A small child in your family has *homa*. She has a sore throat, headache, and fever. She has been sick for 3 days. Which of the following five *Yadh nyaluo* (Luo herbal medicines) can treat *homa*?
   i. *Chamama*. Take the leaf and *fito* (sniff medicine up the nose to sneeze out illness).
   ii. *Kaladali*. Take the leaves, drink, and *fito*.
   iii. *Obuo*. Take the leaves and *fito*.
   iv. *Ogaka*. Take the roots, pound, and drink.
   v. *Ahundo*. Take the leaves and *fito*."

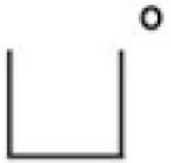
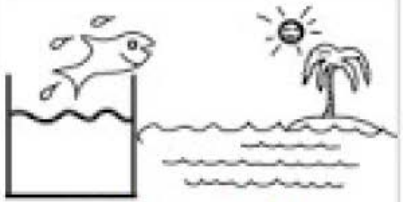
What is considered practical may vary across cultures. For instance, for rural villagers in Kenya, knowledge about the natural herbal medicines is adaptive (Sternberg et al., 2001).

- Creativity
  - Distinct from analytical or practical intelligence (Sternberg, 1985)
  - A meta-analysis of 447 IQ-creativity correlations: the mean effect was small and negligible ($r = .174$) (Kim, 2005)

- Creativity
  - Creative potential: ability to generate original and valuable ideas
  - Creative achievement: "the sum of creative products generated by an individual in the course of his or her lifetime" (Carson et al., 2005)

"How many uses can you think of for a paper clip?" The Alternative Uses Task (Guilford, 1967) is a measure of divergent thinking (i.e., ability to generate different solutions to a problem). Responses are coded in terms of fluency and originality.

1. Picture construction — Draw a picture with a given tear drop shape as an integral part, and give a title for the drawing.
2. Picture completion — Add lines to incomplete figures and give tiles for the drawings.
3. Parallel lines — Make picture from pairs of straight lines and entitle the drawings.

	Starting Shapes	Completed Drawing	
		More Creative	Less Creative
Use		 Mickey Mouse	 Chain
Combine		 King	 Face
Complete		 A fish on vacation	 Pot

Torrance Tests of Creative Thinking (Torrence, 1966)

B. Music

__0. I have no training or recognized talent in this area (Skip to Dance).

__1. I play one or more musical instruments proficiently.

__2. I have played with a recognized orchestra or band.

__3. I have composed an original piece of music.

__4. My musical talent has been critiqued in a local publication.

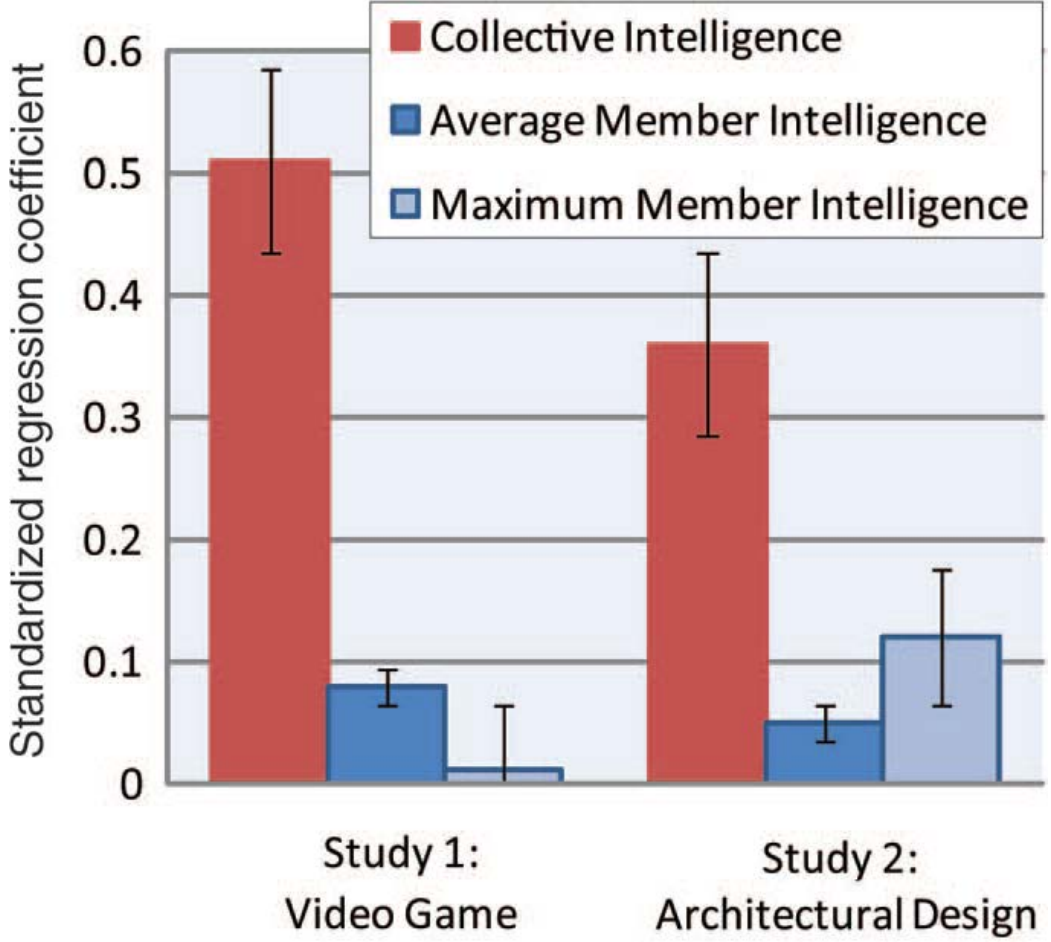
__5. My composition has been recorded.

__6. Recordings of my composition have been sold publicly.

*__7. My compositions have been critiqued in a national publication.

Creative Achievement Questionnaire (Carson et al., 2005)

- Collective intelligence
  - General ability of a particular group to perform well across a wide range of different tasks (Woolley et al., 2015)
  - Group composition (interpersonal skills, diversity skills, cognitive diversity)
  - Group interaction (communication frequency and distribution)



Groups worked together on a diverse set of simple tasks (matrix reasoning, moral reasoning, typing, word completion). Factor analyses revealed that groups' performance on these tasks can be explained by a single factor (i.e., collective intelligence). This factor in turn is a powerful predictor for performance on more complicated tasks (e.g., checker game, architectural design) (Woolley et al., 2010).