Cognition: Methods and Models

PSYC 2040

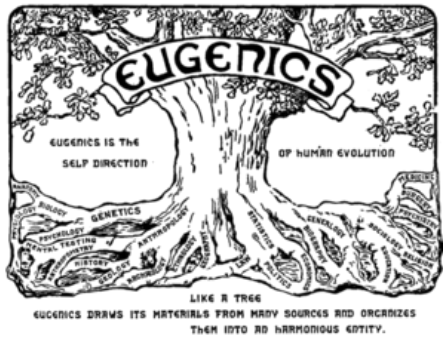
L3: Eugenics, psychology, & intelligence testing

recap: Feb 2, 2023

- what we covered:
  - L2: Mental imagery
  - the imagery debate, newer work
- your to-dos were:
  - *read:* L3 (Eugenics + Intelligence Testing chapters)

today’s agenda

- initial part:
  - eugenics overview
  - psychology and eugenics
- later part:
  - intelligence testing



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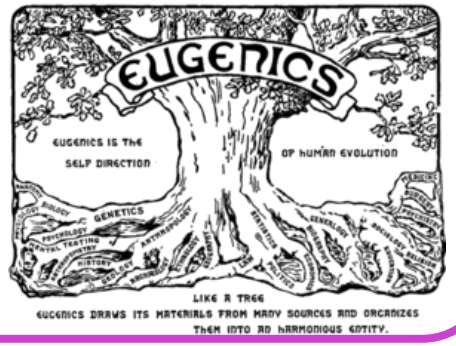
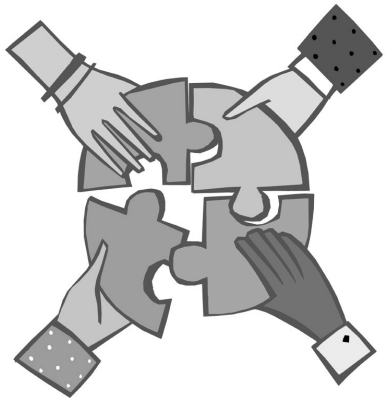
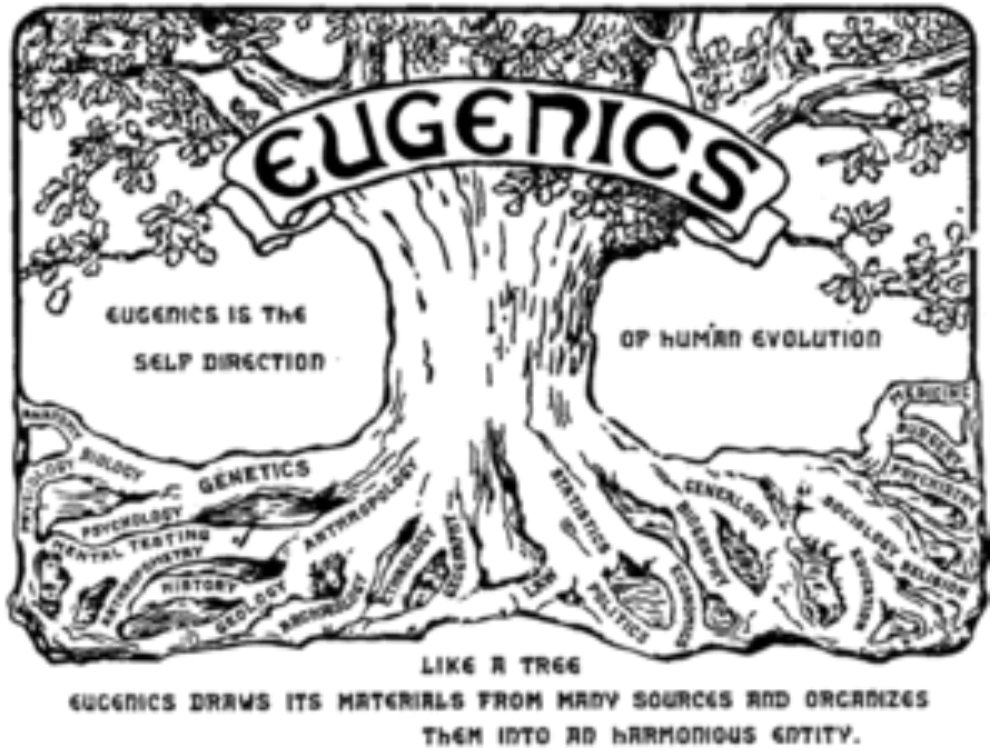




what is eugenics?

- an idea to “improve” society through the selective breeding of humans
- a widespread, worldwide movement that perpetuated and institutionalized racism and white supremacy
- led to many human rights violations

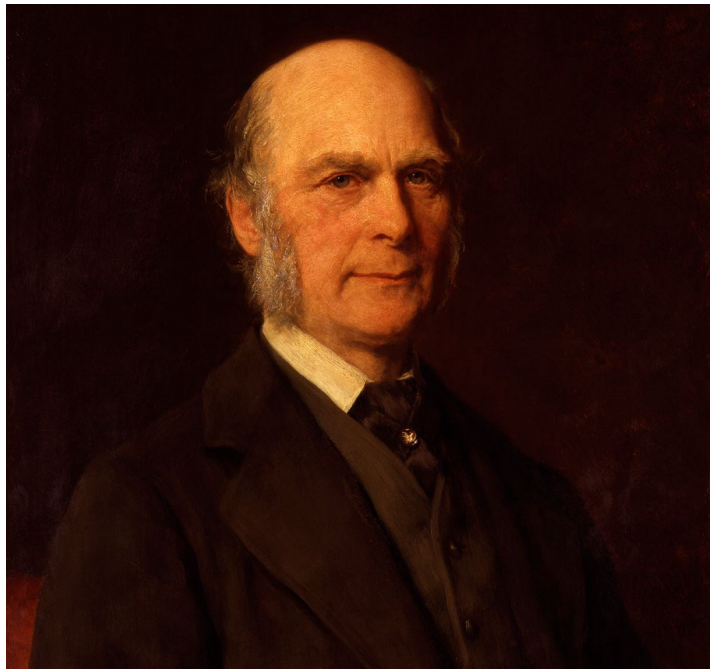


why are we talking about this?

- many early psychologists were interested in cognitive abilities *because* they were interested in or part of the eugenics movement
- as we embark on a course that describes the history of cognitive research, it would be irresponsible to pretend as if cognitive and/or psychological research did not have serious, problematic, long-term ramifications on society
- to move forward, we must acknowledge this past and learn from it

Galton and eugenics

- Galton's explorations into mental imagery had hidden motives
- "The larger object of my inquiry is to elicit facts that shall define the natural varieties of mental disposition in the two sexes and in different races, and afford trustworthy data as to the relative frequency with which different faculties are inherited in different degrees"



think, pair, and share

- your assigned reading(s)
  - Video on Galton's role in the eugenics movement
  - APA's chronology of events
- think about what you found most surprising or interesting or depressing
  - think [3 minutes]: make notes (individually)
  - pair [3 minutes]: discuss together
  - share [whoever's birthday is earlier in the year]

broader negative consequences

- Nazi propaganda and war crimes
- forced sterilization and institutionalization
- racial segregation and anti-miscegenation
- IQ/standardized testing, gifted school programs
- employment selection procedures

eugenics and psychology

- Galton's anthropometric lab
- legitimizing the study of people's abilities
  - positive and negative eugenics
- Karl Pearson (Galton's student)
- known for inventing the correlation coefficient (Pearson's *r*) and Annals of Eugenics (now called Annals of Human Genetics)

Francis Galton's First Anthropometric Laboratory at the International Health Exhibition, South Kensington, 1884–5.

eugenics and psychology

- The American Psychological Association (APA) and other prominent psychological organizations (e.g., APS) had several prominent eugenicists on their boards, as members, and even had/have awards that are named after them
  - E.L. Thorndike Career Achievement Award (renamed)
  - Granville Stanley Hall Award (renamed)
- APA recently issued an apology for its complicity in perpetuating racism
- psychology as a field legitimized eugenicist ideas by developing tests, tools, methods that were published in scientific journals

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ARTICLE

WILEY

Eugenics and its evolution in the history of western psychology: A critical archival review

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Abstract

Since its inception Western academic psychology has been influenced by and closely affiliated with eugenics, defined by its originators as the "science of racial betterment." The role of eugenics has been minimally acknowledged in historical accounts of Western psychology, although it was fundamental to the establishment of empirical psychology methods as well as its applied theories, specifically behaviorism. The continued influence of eugenics in Western psychology, noted in this article, is traced to biologizing human differences while minimizing the role of social context as well as to dividing individuals into groups according to their supposedly innate fitness levels (such as intelligence and optimism). The impact of eugenics on the practice of psychotherapy is highlighted.

how do we move forward?

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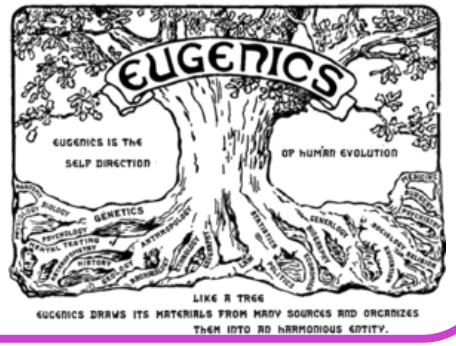

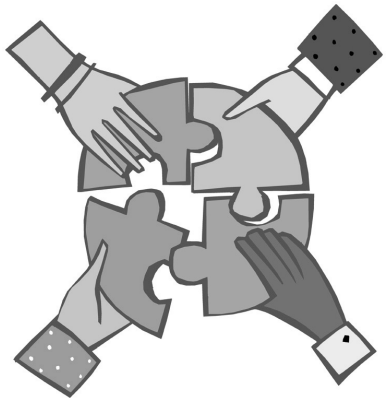

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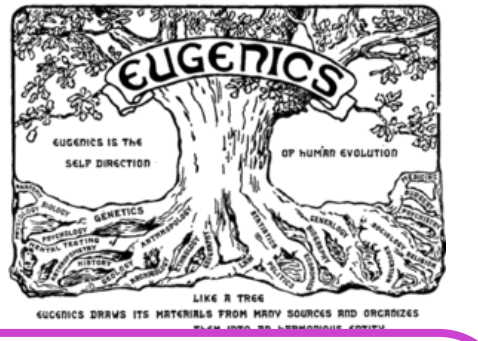
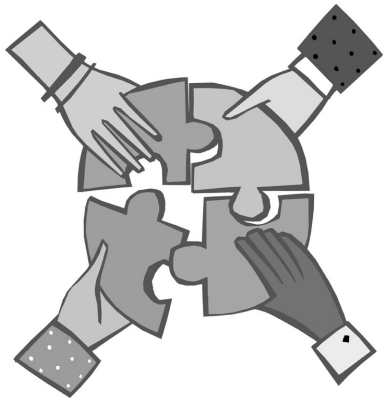




how would you define intelligence?

- discuss in groups: what does being intelligent mean to you?

many researchers, many definitions

Researcher	Quotation
Alfred Binet	Judgment, otherwise called "good sense", "practical sense", "initiative", the faculty of adapting one's self to circumstances ... auto-critique.[11]
David Wechsler	The aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment.[12]
Lloyd Humphreys	"...the resultant of the process of acquiring, storing in memory, retrieving, combining, comparing, and using in new contexts information and conceptual skills".[13]
Howard Gardner	To my mind, a human intellectual competence must entail a set of skills of problem solving — enabling the individual to resolve genuine problems or difficulties that he or she encounters and, when appropriate, to create an effective product — and must also entail the potential for finding or creating problems — and thereby laying the groundwork for the acquisition of new knowledge.[14]
Linda Gottfredson	The ability to deal with cognitive complexity.[15]
Robert Sternberg & William Salter	Goal-directed adaptive behavior.[16]
Scott Barry Kaufman	"The dynamic interplay of ability and engagement in pursuit of personal goals."[17]
Reuven Feuerstein	The theory of Structural Cognitive Modifiability describes intelligence as "the unique propensity of human beings to change or modify the structure of their cognitive functioning to adapt to the changing demands of a life situation".[18]
Shane Legg & Marcus Hutter	A synthesis of 70+ definitions from psychology, philosophy, and AI researchers: "Intelligence measures an agent's ability to achieve goals in a wide range of environments",[7] which has been mathematically formalized.[19]
Alexander Wissner-Gross	$F = T \nabla S_{\tau}$[20] "Intelligence is a force, F, that acts so as to maximize future freedom of action. It acts to maximize future freedom of action, or keep options open, with some strength T, with the diversity of possible accessible futures, S, up to some future time horizon, τ. In short, intelligence doesn't like to get trapped".

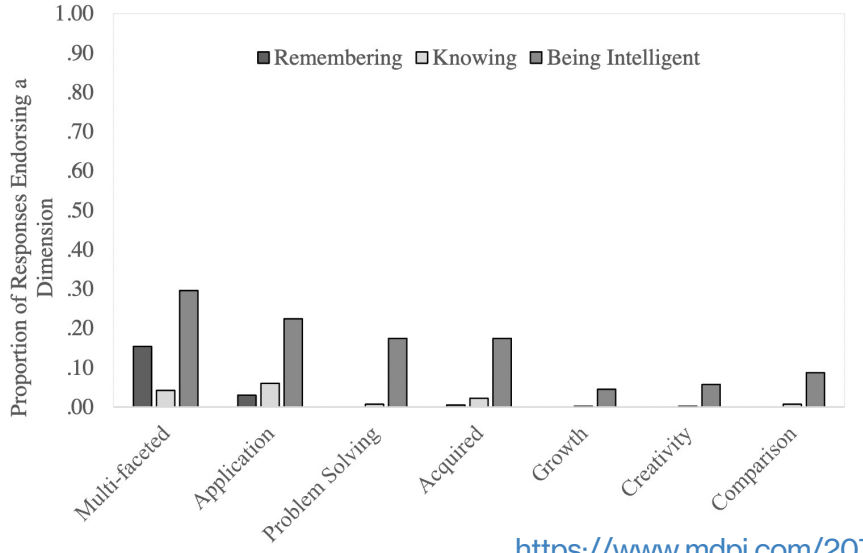
https://en.wikipedia.org/wiki/Intelligence

many researchers, many definitions

- Coane et al. (2023) asked 425 participants what does...
  - "remembering mean to you?"
  - "knowing mean to you?"
  - "being intelligent mean to you?"
- coded responses on several dimensions
- what kind of research method?

DIMENSIONS SPECIFIC TO "BEING INTELLIGENT"

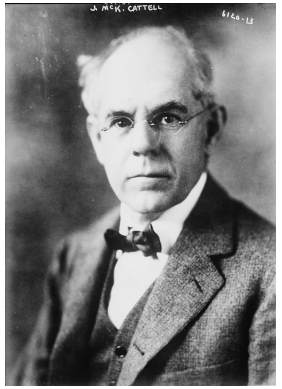
Multi-Faceted	Response refers to multiple types/forms/facets/aspects of the construct, from many sources	Having a knowledge of events, books, life events. Having wisdom. Being emotionally intelligent.
Application	Response refers to using or applying information or knowledge	Knowing many things without reference and using them in ways that are beneficial to you
Problem-Solving	Response indicates importance of construct for solving problems	Being capable of using the knowledge you have in a critical and interpretive manner
Acquisition	Response indicates its importance for learning/acquiring new information	Being intelligent means being able to pick up concepts and ideas quickly and having the ability to apply them.
Mindset	Response refers to fixed or growth mindset/innate/genetic	Having the genetic ability to learn fast.
Creativity	Response refers to thinking outside the box, using information in new/unusual ways	Applying one's knowledge in untraditional ways
Comparison	Response includes some form of comparative judgment relative to others	Knowing more information than those around you.



https://www.mdpi.com/2079-3200/11/5/84

Galton to Cattell

- James Cattell published “Mental tests and measurements” in 1890
- influenced by Galton’s ideas and the eugenics movement
- proposed obtaining a variety of measurements from individuals
- several of these were *physical* measurements that Cattell thought reflected some aspect of intelligence



The following ten tests are proposed:

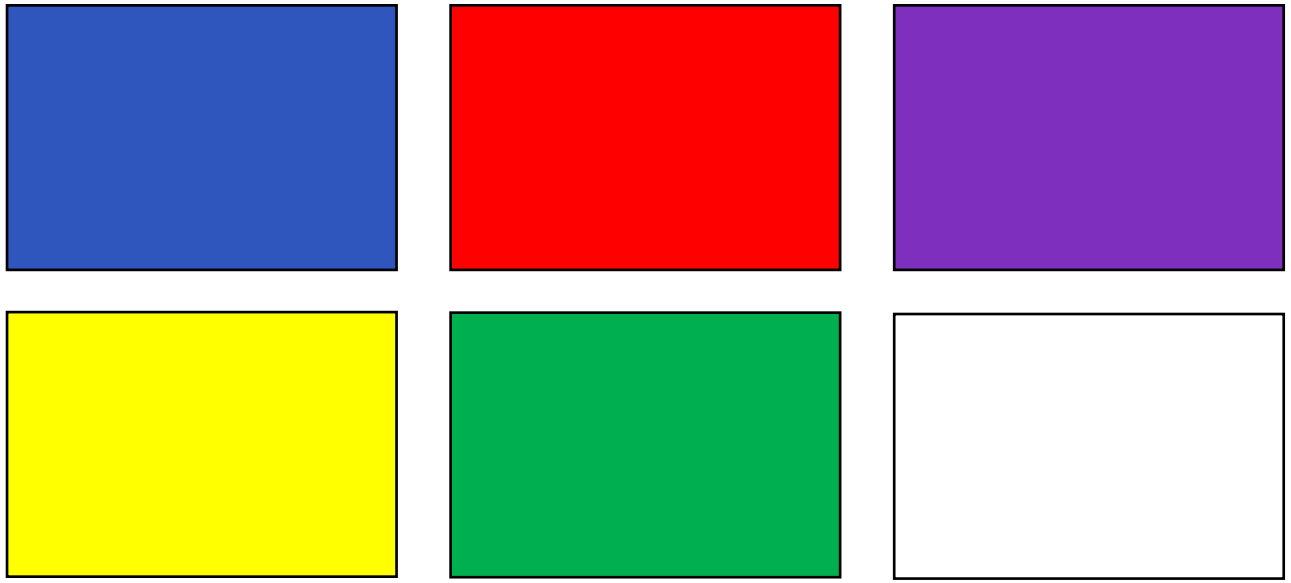
I. Dynamometer Pressure.
II. Rate of Movement.
III. Sensation-areas.
IV. Pressure causing Pain.
V. Least noticeable difference in Weight.
VI. Reaction-time for Sound.
VII. Time for naming Colours.
VIII. Bi-section of a 50 cm. line.
IX. Judgment of 10 seconds time.
X. Number of Letters remembered on once Hearing.

activity 1: Cattell's tests!

- I will read out a paragraph
- after I'm done, you will write down **word for word** what I said
- then, we will score your responses

activity 2: Cattell’s tests!

- make a note of which color you prefer

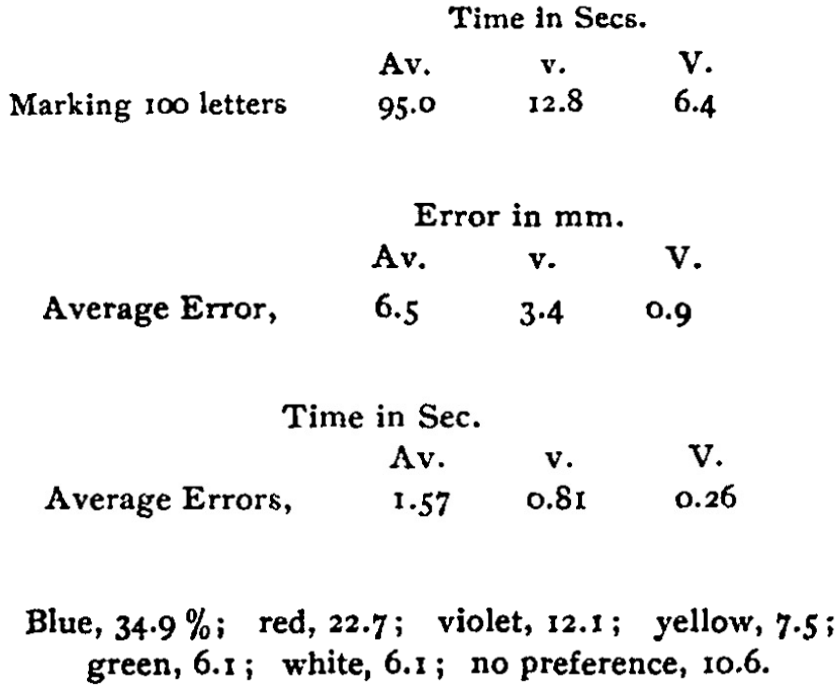


discuss

- did these tests feel like they were measuring intelligence?

Cattell's mental tests

- several of Cattell's tests were about physical attributes (vision, touch, etc.)
- the one you did today (mostly mental):
  - read aloud paragraph (memory testing, RBANS, Wechsler Memory Scales)
  - color preference
- other tests:
  - reaction time (processing speed: intelligence)
  - spatial perception (judgment of line orientation: neuropsychological testing)
  - time perception
  - read aloud numerals (working memory, also tested backwards)



	Time in Secs.		
	Av.	v.	V.
Marking 100 letters	95.0	12.8	6.4

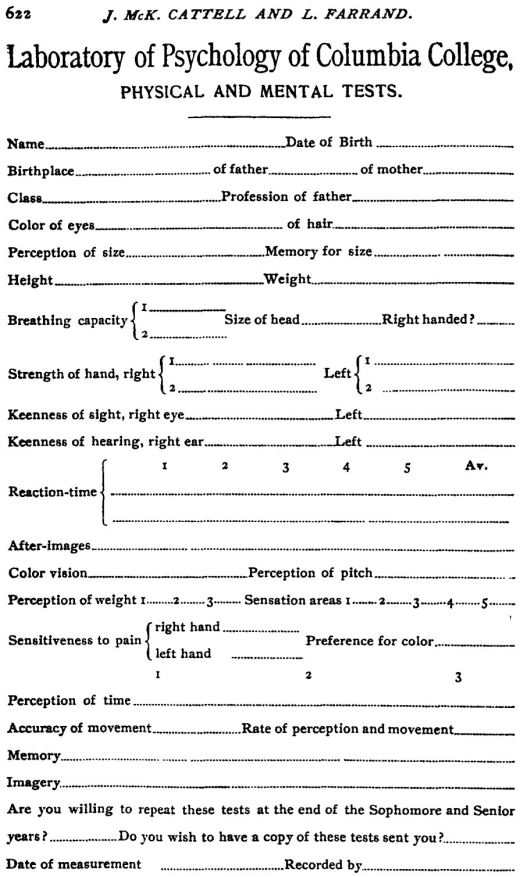
	Error in mm.		
	Av.	v.	V.
Average Error,	6.5	3.4	0.9

	Time in Sec.		
	Av.	v.	V.
Average Errors,	1.57	0.81	0.26

Blue, 34.9 %; red, 22.7; violet, 12.1; yellow, 7.5;
green, 6.1; white, 6.1; no preference, 10.6.

Cattell's mental tests at Columbia

- Cattell tested 100 students at Columbia university and published the results in 1896 on a whole host of measures
- Although the hope was these measurements would correlate with grades, there was no consistent relationship between test performance and student grades



622 *J. McK. CATTELL AND L. FARRAND.*

Laboratory of Psychology of Columbia College,

PHYSICAL AND MENTAL TESTS.

Name ..... Date of Birth .....

Birthplace ..... of father ..... of mother .....

Class ..... Profession of father .....

Color of eyes ..... of hair .....

Perception of size ..... Memory for size .....

Height ..... Weight .....

Breathing capacity { 1 ..... 2 ..... Size of head ..... Right handed? .....

Strength of hand, right { 1 ..... 2 ..... Left { 1 ..... 2 .....

Keenness of sight, right eye ..... Left .....

Keenness of hearing, right ear ..... Left .....

Reaction-time { 1 2 3 4 5 Av. .....

After-images .....

Color vision ..... Perception of pitch .....

Perception of weight 1 ..... 2 ..... 3 ..... Sensation areas 1 ..... 2 ..... 3 ..... 4 ..... 5 .....

Sensitiveness to pain { right hand ..... left hand ..... Preference for color .....

1 2 3

Perception of time .....

Accuracy of movement ..... Rate of perception and movement .....

Memory .....

Imagery .....

Are you willing to repeat these tests at the end of the Sophomore and Senior years? ..... Do you wish to have a copy of these tests sent you? .....

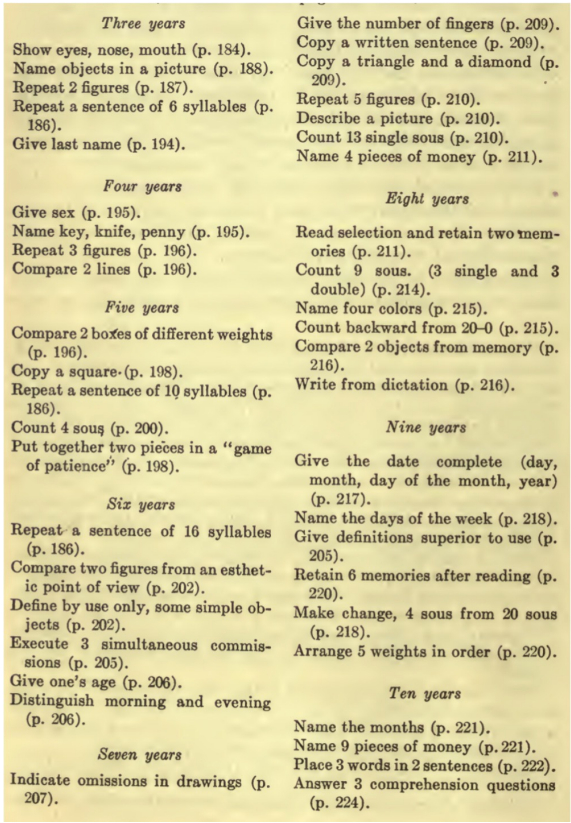
Date of measurement ..... Recorded by .....

Alfred Binet

- Binet was a French psychologist also interested in developing intelligence tests
- he criticized Cattell's tests on face-validity and came up with his own set of tests that were arguably more challenging
- was motivated by the unfair institutionalization practices of the French government for children

Binet-Simon test

- the tests measured a whole host of abilities across different ages
- Binet equated mental ability with age and assumed that intelligence grew with age linearly
- came up with an algorithm to compute "mental age" based on number of tests passed for that age



Three years

Show eyes, nose, mouth (p. 184).
Name objects in a picture (p. 188).
Repeat 2 figures (p. 187).
Repeat a sentence of 6 syllables (p. 186).
Give last name (p. 194).

Four years

Give sex (p. 195).
Name key, knife, penny (p. 195).
Repeat 3 figures (p. 196).
Compare 2 lines (p. 196).

Five years

Compare 2 boxes of different weights (p. 196).
Copy a square (p. 198).
Repeat a sentence of 10 syllables (p. 186).
Count 4 sous (p. 200).
Put together two pieces in a "game of patience" (p. 198).

Six years

Repeat a sentence of 16 syllables (p. 186).
Compare two figures from an esthetic point of view (p. 202).
Define by use only, some simple objects (p. 202).
Execute 3 simultaneous commissions (p. 205).
Give one's age (p. 206).
Distinguish morning and evening (p. 206).

Seven years

Indicate omissions in drawings (p. 207).
Give the number of fingers (p. 209).
Copy a written sentence (p. 209).
Copy a triangle and a diamond (p. 209).
Repeat 5 figures (p. 210).
Describe a picture (p. 210).
Count 13 single sous (p. 210).
Name 4 pieces of money (p. 211).

Eight years

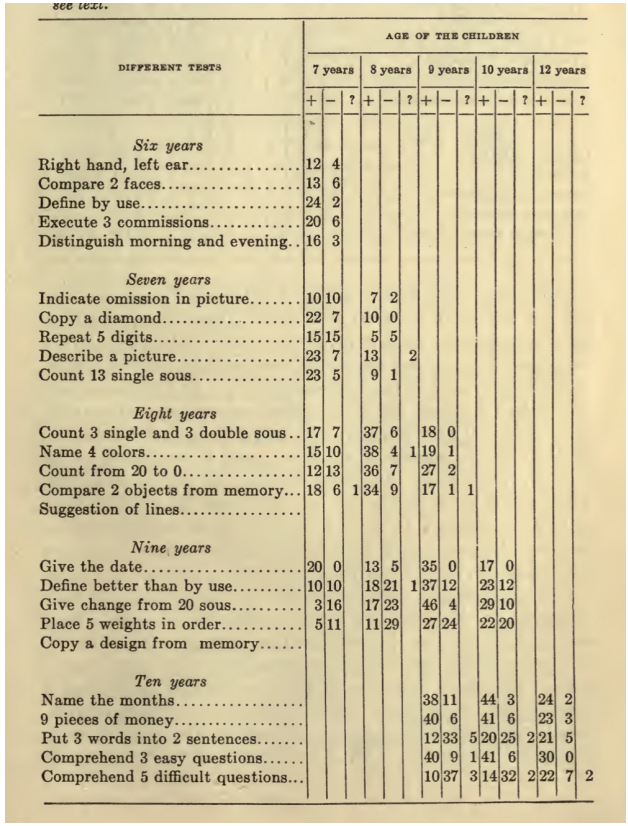
Read selection and retain two memories (p. 211).
Count 9 sous. (3 single and 3 double) (p. 214).
Name four colors (p. 215).
Count backward from 20–0 (p. 215).
Compare 2 objects from memory (p. 216).
Write from dictation (p. 216).

Nine years

Give the date complete (day, month, day of the month, year) (p. 217).
Name the days of the week (p. 218).
Give definitions superior to use (p. 205).
Retain 6 memories after reading (p. 220).
Make change, 4 sous from 20 sous (p. 218).
Arrange 5 weights in order (p. 220).

Ten years

Name the months (p. 221).
Name 9 pieces of money (p. 221).
Place 3 words in 2 sentences (p. 222).
Answer 3 comprehension questions (p. 224).



see text.

DIFFERENT TESTS	AGE OF THE CHILDREN														
	7 years			8 years			9 years			10 years			12 years		
	+	−	?	+	−	?	+	−	?	+	−	?	+	−	?
Six years															
Right hand, left ear	12	4													
Compare 2 faces	13	6													
Define by use	24	2													
Execute 3 commissions	20	6													
Distinguish morning and evening	16	3													
Seven years															
Indicate omission in picture	10	10		7	2										
Copy a diamond	22	7		10	0										
Repeat 5 digits	15	15		5	5										
Describe a picture	23	7		13		2									
Count 13 single sous	23	5		9	1										
Eight years															
Count 3 single and 3 double sous	17	7		37	6		18	0							
Name 4 colors	15	10		38	4	1	19	1							
Count from 20 to 0	12	13		36	7		27	2							
Compare 2 objects from memory	18	6	1	34	9		17	1	1						
Suggestion of lines															
Nine years															
Give the date	20	0		13	5		35	0		17	0				
Define better than by use	10	10		18	21	1	37	12		23	12				
Give change from 20 sous	3	16		17	23		46	4		29	10				
Place 5 weights in order	5	11		11	29		27	24		22	20				
Copy a design from memory															
Ten years															
Name the months							38	11		44	3		24	2	
9 pieces of money							40	6		41	6		23	3	
Put 3 words into 2 sentences							12	33	5	20	25	2	21	5	
Comprehend 3 easy questions							40	9	1	41	6		30	0	
Comprehend 5 difficult questions							10	37	3	14	32	2	22	7	2

Binet-Simon test correlations

- Binet recognized that a single test did not mean anything, but believed that the collection of them could represent something meaningful
- Binet also proposed the idea of norms/standardization, i.e., building a pattern from a large database and then comparing individuals on that pattern
- strengths/limitations?

TABLE IV

This table shows the relation between the intellectual level and the scholastic level

	CHILDREN BEHIND IN SCHOOL INSTRUCTION	CHILDREN REGULAR IN SCHOOL INSTRUCTION	CHILDREN ADVANCED IN SCHOOL INSTRUCTION
Intelligence above the average.....	1	16	7
Average intelligence.....	9	33	5
Intelligence below the average.....	14	16	0

One test signifies nothing, let us emphatically repeat, but five or six tests signify something. And that is so true that one might almost say, 'It matters very little what the tests are so long as they are numerous

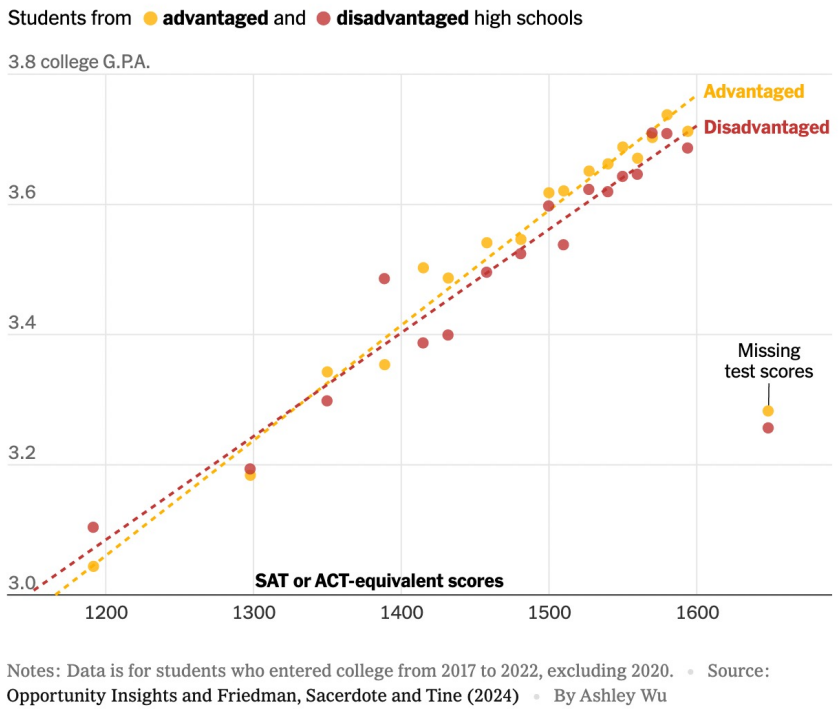
modern IQ tests

- Binet's tests were linked to "mental age" based on a standardized scale
- modern "intelligence tests" also use a standardized scale called the intelligence quotient (IQ)
- Binet's tests were popularized by American psychologists to further the eugenics cause (e.g., Lewis Terman, Stanford-Binet test)
- criticisms: formation of Association of Black Psychologists (ABPsi) in 1978

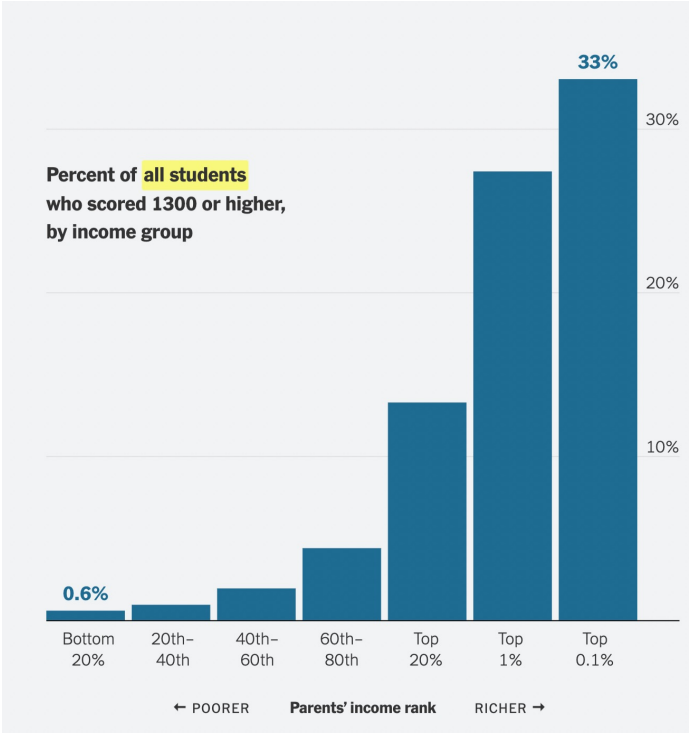
22. Show the pretty and ugly faces in pairs. "Which of these two faces is the prettier (or uglier)?" Or: "Which is the good looking one?" 1 2 3 All three must be correct. Both are pretty = —.

standardized tests (SAT / ACT)

- should we use test scores for college admissions?
- who is benefiting and who is being left out?
- how should colleges select for students?



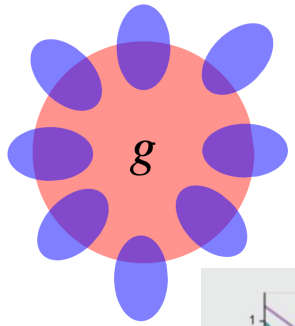
Notes: Data is for students who entered college from 2017 to 2022, excluding 2020. • Source: Opportunity Insights and Friedman, Sacerdote and Tine (2024) • By Ashley Wu

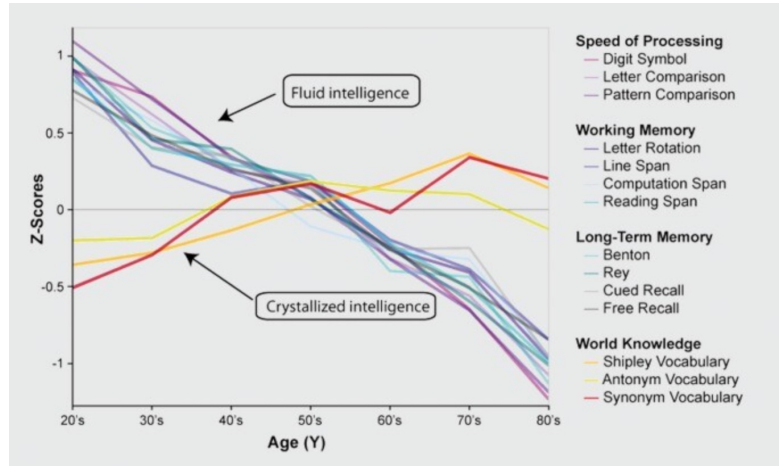


https://www.nytimes.com/interactive/2023/10/23/upshot/sat-inequality.html
https://www.nytimes.com/2024/01/07/briefing/the-misguided-war-on-the-sat.html

other measures of intelligence

- "g-factor"
  - Charles Spearman proposed the idea of "general intelligence", after observing high correlations between unrelated tasks administered to children
  - two factors: general (g) and specific abilities (s_i)
- fluid and crystallized intelligence:
  - Raymond Cattell proposed dividing g into two independent constructs: crystallized and fluid intelligence
  - fluid: basic reasoning, less reliant on prior knowledge
  - crystallized: learned knowledge





Park and Bischof (2022)

idea of genius/brilliance/smartness

WOMEN IN SCIENCE

Expectations of brilliance underlie gender distributions across academic disciplines

Sarah-Jane Leslie,[1*†] Andrei Cimpian,[2*†] Meredith Meyer,[3] Edward Freeland[4]

The gender imbalance in STEM subjects dominates current debates about women's underrepresentation in academia. However, women are well represented at the Ph.D. level in some sciences and poorly represented in some humanities (e.g., in 2011, 54% of U.S. Ph.D.'s in molecular biology were women versus only 31% in philosophy). We hypothesize that, across the academic spectrum, women are underrepresented in fields whose practitioners believe that raw, innate talent is the main requirement for success, because women are stereotyped as not possessing such talent. This hypothesis extends to African Americans' underrepresentation as well, as this group is subject to similar stereotypes. Results from a nationwide survey of academics support our hypothesis (termed the field-specific ability beliefs hypothesis) over three competing hypotheses.

Gender stereotypes about intellectual ability emerge early and influence children's interests

Lin Bian,[1,2*] Sarah-Jane Leslie,[3] Andrei Cimpian[1,2*]

Common stereotypes associate high-level intellectual ability (brilliance, genius, etc.) with men more than women. These stereotypes discourage women's pursuit of many prestigious careers; that is, women are underrepresented in fields whose members cherish brilliance (such as physics and philosophy). Here we show that these stereotypes are endorsed by, and influence the interests of, children as young as 6. Specifically, 6-year-old girls are less likely than boys to believe that members of their gender are "really, really smart." Also at age 6, girls begin to avoid activities said to be for children who are "really, really smart." These findings suggest that gendered notions of brilliance are acquired early and have an immediate effect on children's interests.

modern conversations on intelligence

- intelligence continues to remain a popular and scientifically important topic in the field but the goals have evolved over time
- intelligence is thought to be multifaceted, and the study of intelligence has many different motivations and goals
  - what makes humans different/unique?
  - how can we build artificial intelligence?

A Theory of Adaptive Intelligence and Its Relation to General Intelligence

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Abstract: Intelligence typically is defined as consisting of "adaptation to the environment" or in related terms. Yet, it is not clear that "general intelligence" or *g*, traditionally conceptualized in terms of a general factor in a psychometrically-based hierarchical model of intelligence, provides an optimal way of defining intelligence as adaptation to the environment. Such a definition of adaptive intelligence would need to be biologically based in terms of evolutionary theory, would need to take into account the cultural context of adaptation, and would need to take into account whether thought and behavior labeled as "adaptively intelligent" actually contributed to the perpetuation of the human and other species, or whether it was indifferent or actually destructive to this perpetuation. In this article, I consider the similarities and differences between "general intelligence" and "adaptive intelligence," as well as the implications especially of the differences.

Keywords: intelligence; general intelligence; adaptive intelligence; analytical thinking; creative thinking; practical thinking; wisdom

Building machines that learn and think like people

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big takeaways

- the history of intelligence testing is fraught with biased assessments, measures, and policies
- the field has moved from measuring abilities for the purpose of classifying/ranking people to instead testing theories and claims about how cognition works
- the rest of the course will focus on this second piece, i.e., how does cognition work and how do we study it?

next class

- **before** class:
  - *complete:* L2/L3 quiz
  - *explore:* L2/L3 writing assignments
  - *read:* L4 (Associations) chapter
- **during** class:
  - learning by association!