

# Ch. 19: Controversy in Testing

1014

Psychology 402 - Fall 2020 - Dr. Michael Diehr

Copyright © 2020 Michael Diehr  
All Rights Reserved  
For use only by students enrolled  
in my sections of Psyc 402  
through May 2020.  
May not be posted, shared or uploaded  
online without permission.

1015

Psychology 402 - Fall 2020 - Dr. Michael Diehr

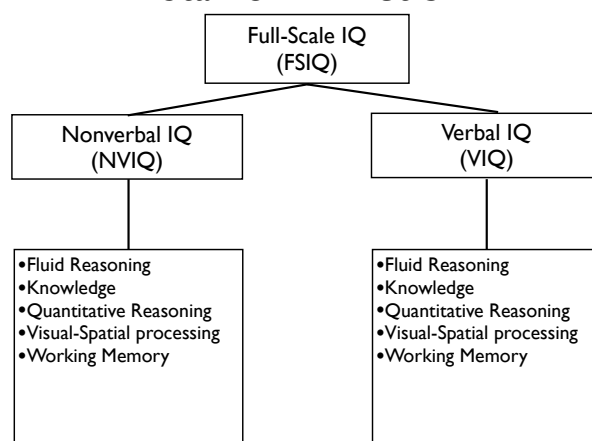
## Review : IQ Tests

- Stanford-Binet (Alfred Binet)
- Wechsler-Bellevue (David Wechsler)
- Theory
  - # of factors of Intelligence?
  - goals of testing?
  - immutability?
- SB-5 and WAIS-4 provide “Full Scale IQ” scores
  - is FSIQ a measure of “Intelligence”?

1016

Psychology 402 - Fall 2020 - Dr. Michael Diehr

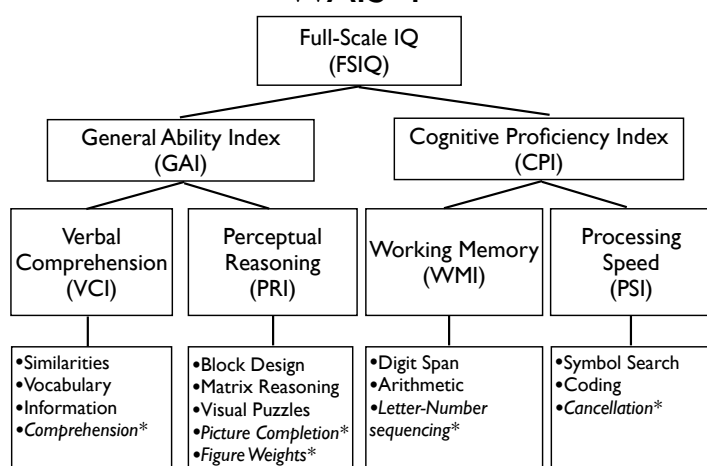
## Stanford-Binet 5



1017

Psychology 402 - Fall 2020 - Dr. Michael Diehr

## WAIS-4



\* is not part of core battery

1018

Psychology 402 - Fall 2020 - Dr. Michael Diehr

## Review: IQ : # of Factors

Researcher	# of Factors	Comment
Binet	multiple	for practical reasons, only measured 1
Spearman	g	acknowledged other smaller factors (S <sub>i</sub> )
Thurstone (et. al)	g <sub>f</sub> , g <sub>c</sub>	fluid vs. crystallized
Sternberg	3	analytic, creative, practical
Gardner	8	"multiple intelligences" (MI) theory

1019

Psychology 402 - Fall 2020 - Dr. Michael Diehr

## Binet's Worry

- “Here is an excellent opportunity for getting rid of all the children who trouble us”
- Binet recommended small classrooms of 15-20 students.

1020

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Controversy in Testing

- Historical viewpoints / Gender and IQ
- Race, Ethnicity, Genetics
- IQ testing and Ethnicity
- Eugenics & Immigration Law
- Test Bias
- Test Fairness and the Law
- Test Selection Philosophy
- *The Bell Curve / Critiques*
- The Flynn Effect
- Twin and Adoption Studies

1021

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Gender and IQ

- In the 1800s, commonly accepted that men were intellectually superior to women
- Darwin, Descent of Man (1871)  
“The chief distinction in the intellectual powers of the two sexes is shewn by man's attaining to a higher eminence, in whatever he takes up, than can woman - whether requiring deep thought, reason, or imagination, or merely the use of the senses and hands”
- Book was edited by Darwin's daughter Henrietta and wife Emma.
- Darwin was in other ways socially liberal

1022

Psychology 402 - Fall 2020 - Dr. Michael Dohr

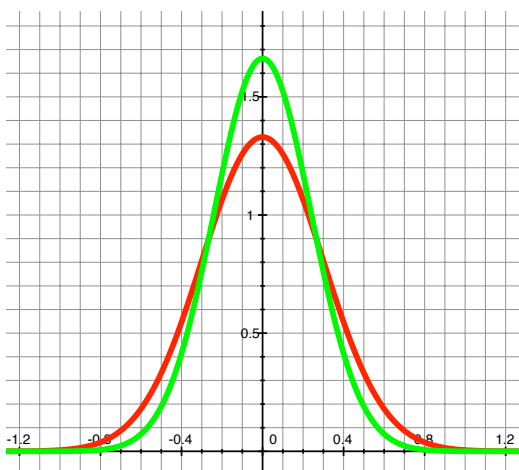
## Gender and IQ

- Modern view: men and women on average have equal IQ scores.
- Differences? Yes but very small (under 3 IQ points ... if any)
- Other findings:
  - Men's IQ slightly more variable (higher variance)
  - Males better at stereotypical “male” tasks (visuospatial skills) whereas women better at “female” tasks (language). Why?

1023

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Men vs. Women IQ



Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Race vs. Ethnicity

- Race - genetic heritage
- Ethnic group -- population whose members identify with each other
- “National, religious, geographic, linguistic and cultural groups do not necessarily coincide with racial groups: and the cultural traits of such groups have no demonstrated genetic connection with racial traits. Because serious errors of this kind are habitually committed when the term “race” is used in popular parlance, it would be better when speaking of human races to drop the term “race” altogether and speak of ‘ethnic groups’.”

1025

Psychology 402 - Fall 2020 - Dr. Michael Dohr

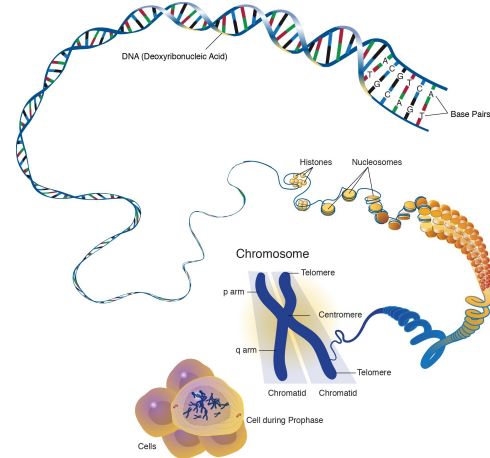
## Pre-DNA views

- Gold, Silver, Brass, Iron -- Plato
- “There is a physical difference between the white and black races which I believe will for ever forbid the two races living together on terms of social and political equality.” -- Abraham Lincoln

1026

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Genetics : DNA



1027

Psychology 402 - Fall 2020 - Dr. Michael Dohr

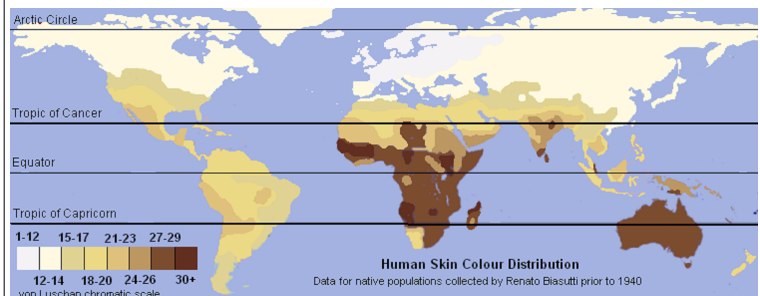
## Nonconcordant traits

- Naive view: Ethnicity → Race → DNA
- Biochemical view
  - Traits & genes show population group differences, but not always, boundaries can be fuzzy
  - Non concordance: phenotypes don't correlate with geography.
- Visible vs. Invisible differences: differences on the genetic level often don't track what is seen in surface differences
- Example: Skin color vs. Blood Type

1028

Psychology 402 - Fall 2020 - Dr. Michael Dohr

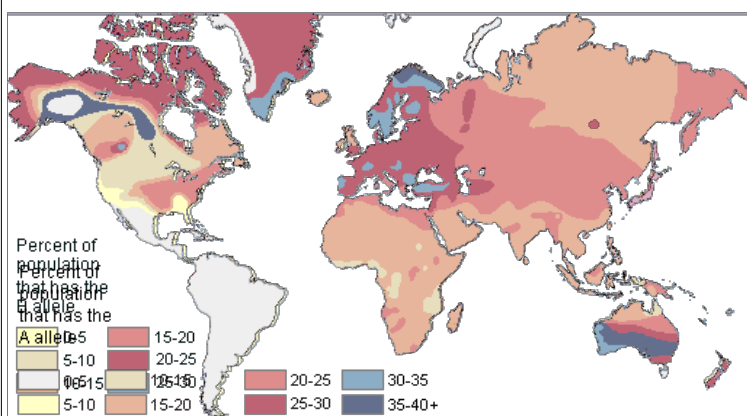
## Worldwide Skin Color



1029

Psychology 402 - Fall 2020 - Dr. Michael Dohr

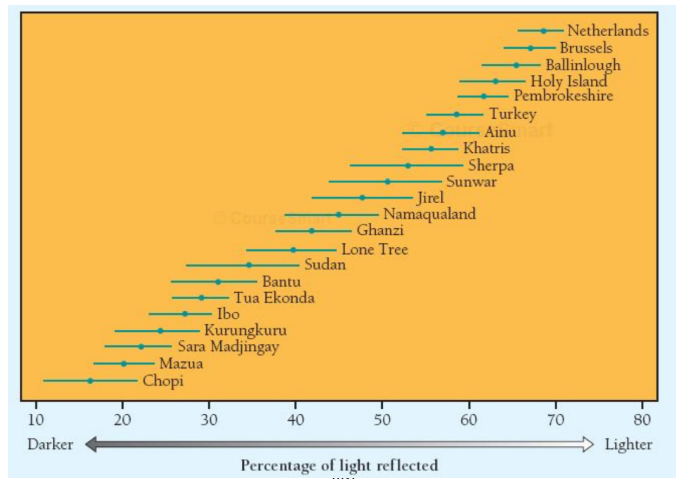
## Worldwide Blood Type



1030

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## “Black” vs. “White”



1031

Psychology 402 - Fall 2020 - Dr. Michael Dohr

# Visible differences?

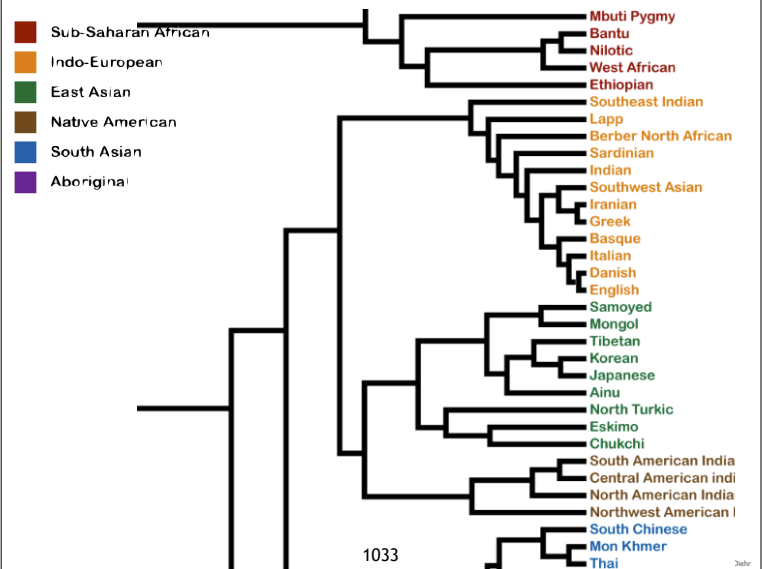
Indigenous  
Australian  
Melanesia  
African  
European

Australian and  
Africans are  
most genetically  
different



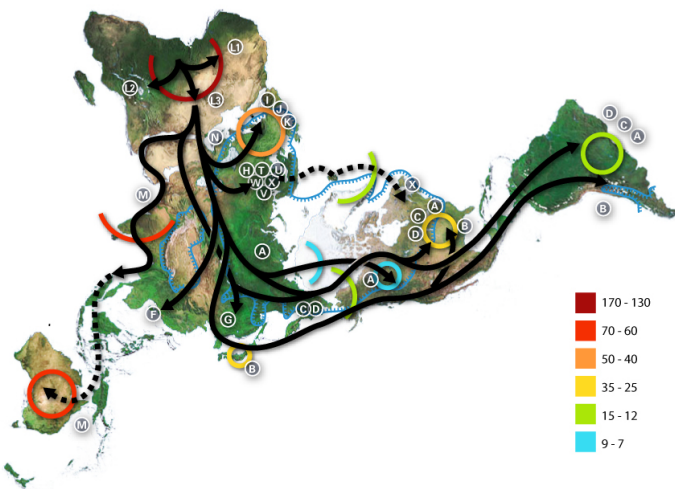
1032

Psychology 402 - Fall 2020 - Dr. Michael Dohr

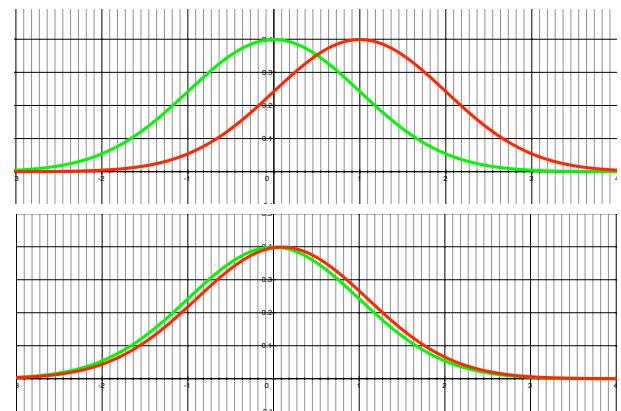


Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Prehistorical Migration



## Between Group vs. Within Group Variance



1035

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Post-DNA views

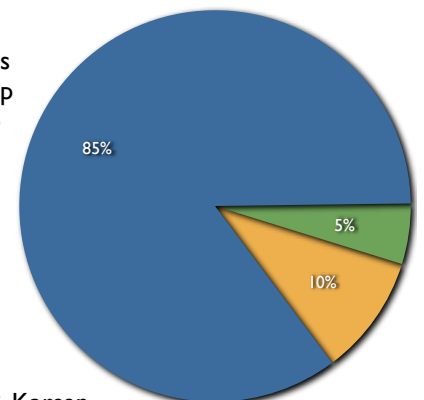
- Variance
  - variation between individuals
    - aka variation *within groups*
  - variation *between groups*
- Variance
  - variation between individuals : 3mbp / person
  - variation within groups : 85%
  - variation between groups: 15%
    - about 5% - within "races"
    - about 10% - between "races"

1036

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Variance: Genetic Variation

- Within local populations
- Within population group
- Between "race" (group)



For example:

- 85% within Japanese
- 5% between Japanese & Korean
- 10% between Asian and Caucasian

1037

Psychology 402 - Fall 2020 - Dr. Michael Dohr



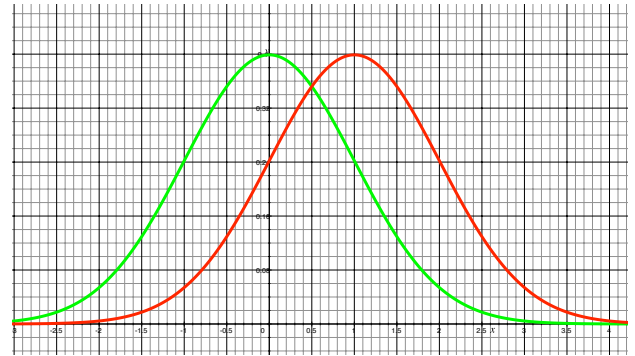
## Ethnicity and IQ (USA)

- Asian-American students perform better on Mathematics, but IQ test scores about average (same as majority / White Americans)
- Hispanic Americans & Native Americans -- do well on Performance & Spatial tests, less well on Verbal tests. Overall performance somewhere between White & Black
- African Americans were thought to score about 1 SD below the mean (e.g. 85). Controversial, and difference has been shrinking (13 points below for young children, 10 point for older children, 9 or less in more recent studies)

1038

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Normal Curve: 1SD difference



1039

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Ethnicity and IQ -- 2

- Why might different ethnic groups score differently?
- Environment?
  - wealth, school, language, culture, values, attitude, trust, nutrition, tutoring...
- Genetics?
  - neurophysiological issues
  - genetics interacting with environment
- Test Bias?
  - Achievement vs. IQ test? (AA score on NAEP = 1.1SD below mean in 1978, only .65 by 1990)

1040

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Eugenics

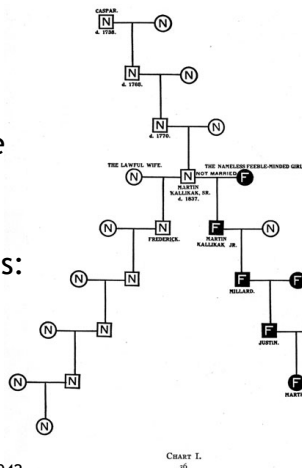
- Social philosophy advocating improvements of human hereditary traits through active intervention.
- Long history ("The best men must have intercourse with the best women as frequently as possible, and the opposite is true of the very inferior" Plato, Republic)
- Francis Galton (1860s) : First scientific formulation. (Note: Galton was Darwin's Cousin)

1041

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Henry H. Goddard & the Feeble Minded Kallikak Family

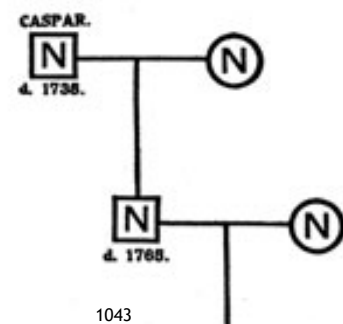
- Intelligence as Mendelian gene
- Single gene for IQ
- Dominant / Recessive
- Terminology: moron, imbecile, idiot
- Proponent of Eugenics:
  - institutionalization
  - sterilization
  - immigration restrictions



1042

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Henry H. Goddard & the Feeble Minded Kallikak Family



1043

## Henry H. Goddard & the Feeble Minded

Child Genotype	Mental Age	IQ range	Terminology
GG	17+	100+	"normal"
Gg	13-16	70-100	"dull"
gg	8 to 12	51-70	moron, "high-grade defective"
gg	3 to 7	26-50	imbecile
gg	< 3 years	0-25	idiot

"Feeble Minded"

1044

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Goddard at Ellis Island

- "We picked out one young man whom we suspected was defective, and through the interpreter, proceeded to give him the test [Binet's IQ test] The boy tested 8 [Mental Age] on the Binet scale. The interpreter said 'I could not have done that when I came to this country' and seemed to think the test unfair. We convinced him that the boy was defective."
- Encouraged by this "success" he did more testing

1045

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Goddard's IQ Testing - 1917

- Goddard hired two women\* to "identify feeble-minded on sight"
- Tested 35 Jews, 22 Hungarians, 50 Italians, and 45 Russians.
- Results:
  - 83% of Jews, 80% of Hungarians, 79% of Italians, and 87% of Russians were Feeble Minded

1046

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Goddard on Politics

- "Democracy means that the people rule by selecting the wisest, most intelligent, and most human, to tell them what to do to be happy. Thus, democracy is a method for arriving at a truly benevolent aristocracy" (Gould, p. 191)

1047

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Eugenics

- A formal academic discipline in many USA colleges in early 1900s
- Notable supporters : Alexander Graham Bell, the Rockefeller Foundation
- Was adopted by the Nazis in the mid 1930s as a scientific basis for racism, segregation, human experimentation, forced sterilization, euthanasia and ultimately genocide.

1048

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Eugenics

"This person suffering from hereditary defects costs the community 60,000 Reichsmark during his lifetime. Fellow Germans, that is your money, too." (propaganda poster for newspaper advocating compulsory euthanasia program circa 1938. The patient looks to have cerebral palsy, a non-hereditary disorder)



1049

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Eugenics in the USA

- Discriminatory “eugenics” policies were adopted in many states
- Compulsory sterilization (1907-1963), over 64000 people. This program’s “success” in the USA was cited by Nazi scientists in the Nuremberg trials
- Marriage licenses denied to those with genetic disorders
- Immigration controls...

1050

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Forced sterilization

### Allegations of unwanted Ice hysterectomies recall grim time in US history

A report claims women in immigration centers are being given unnecessary procedures that can leave them unable to conceive. The story is all too familiar



“...multiple harrowing allegations of women held by US Immigration and Customs Enforcement (ICE) at Irwin county detention center in Georgia who have been forced to undergo unwanted hysterectomies...”

1051

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## USA Immigration History

- Few laws/enforcement in 1600s, 1700s, 1800s
- 1865 Civil War / Emancipation of Slaves
- 1882 Chinese Exclusion Act
- 1917 Immigration Act
  - banned “illiterates, feeble-minded” and many other Asians (see Goddard’s theories)
- 1924 Immigration Act
  - Restricted Southern & Eastern Europeans, banned Africans, Arabs, Asians...
- Immigration and Nationality Act of 1965
- Immigration Reform and Control Act of 1986

1052

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Modern Conceptions

- Eugenics theories are scientifically wrong : e.g. impossible to eradicate single-gene heterozygous recessive traits via phenotypic selection alone.
- Genetic “disorders” also have a benefits -- e.g. sickle-cell anemia protects against malaria
- What will happen as genetic tests get cheaper and more available.

1053

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Intermission

- 2 day/week format

1054

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Ch. 19 - Part 2

1055

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Review

- IQ Tests (Binet, Wechsler)
- Intelligence Theory
  - # of factors, goals of testing, immutability
- Gender and IQ : no significant differences
- Race vs. Ethnicity
  - Pre-DNA vs. Post-DNA views
  - Between-group vs. Within-group variance
- IQ tests and Ethnicity
  - results, explanations
- Eugenics
- Immigration

1056

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Morton's Data as printed

Race	N	Cranial Volume Mean
Caucasian	52	87
Mongolian	10	83
American	144	82
Malay	18	81
Ethiopian	29	78

1057

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Possible causes of IQ score differences across population groups...

- Test Bias?
  - the test is unfair to certain groups
- Environmental factors
  - wealth, school, language, culture, values, attitude, trust, nutrition, tutoring...
- Genetics?
  - actual biological brain differences
  - genetics interacting with environment (GxE interactions)

1058

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Test Bias

- Content Validity
- Criterion Validity

1059

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Test Bias - Content Validity?

- Test differences between groups due to test item differences? Different cultures have different knowledge
  - Examples: "Petrol", "Opera", "Shilling"  
"Bourbon" > "Tequila"
  - Some item differences are clear
- However, large-scale testing hasn't shown big differences.
- Quay (1971): gave Stanford Binet in African-American dialect. Result: about 1 point increase.

1060

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Test Bias - Content Validity 2

- Clarizo (1979) - minority children can understand majority dialect. (but not necessarily vice-versa)
- Flaughner (1978) - experts judged "fairness" of items on IQ test and removed unfair items (16%). Result: test scores did not change
- Zores & Williams (1980) - There is a bias in the race, gender, ethnicity of people & situations portrayed in IQ tests.
- More research needed -- but little evidence that test bias can explain score differences.

1061

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Test Bias - info you don't have?

- Mainstream conception:
  - “Biased test” = test with information that I don’t know. It’s unfair.
- Reality:
  - Many people know information outside their immediate day-to-day culture.
  - Amount of this info is probably correlated with knowledge, IQ (and perhaps Intelligence?)

1062

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Test Bias - Criterion Validity

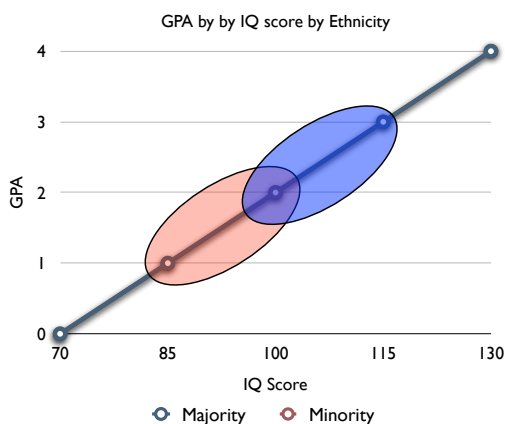
- Criterion-validity considered more important than content validity.
- Does IQ score predict later academic success?
- Is linear regression prediction same for all ethnic groups?
- Three scenarios:
  - Regression line is the same
  - Same slope, different intercept
  - Different slopes

1063

Psychology 402 - Fall 2020 - Dr. Michael Dohr

### Same regression line

Prediction is equally accurate for both ethnic groups but one group scores higher

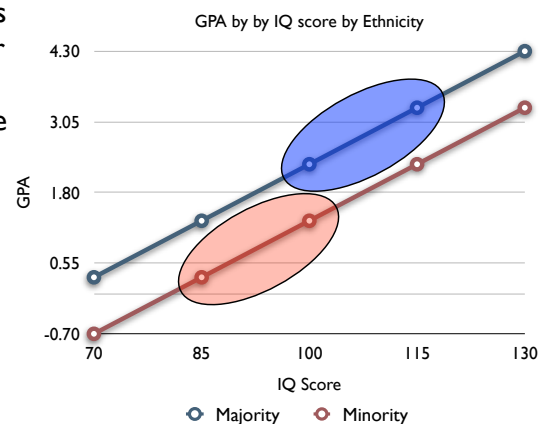


1064

Psychology 402 - Fall 2020 - Dr. Michael Dohr

### Parallel regression lines

Prediction is accurate for both ethnic groups, if we use two regression lines with same slope different intercept

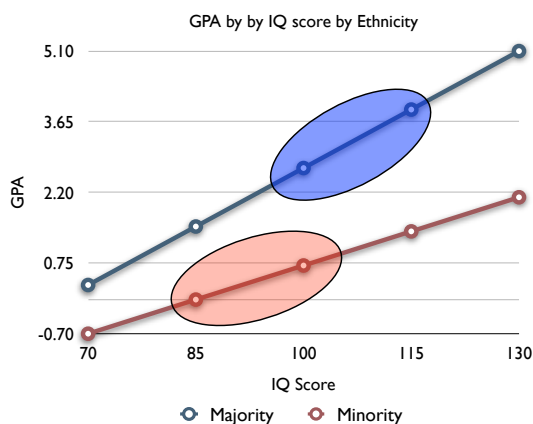


1065

Psychology 402 - Fall 2020 - Dr. Michael Dohr

### Different regression lines

Clear example of bias -- predictions for the two ethnicities have different validity



1066

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Test Bias

- The 2nd example (parallel regression lines with different intercepts) is what the data seems to suggest, at least with the SAT test
- If you use a single regression line, that line over-predicts the academic performance of minority students while under-predicting that of majority students - Cleary (1968), Jensen (1984)
- Similar findings for different tests (IQ) in variety of ethnic groups, and in other countries.

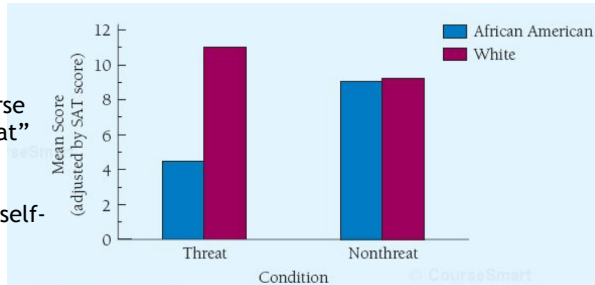
1067

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Stereotyping & Test Performance

AA students perform worse under "threat" condition

Conclusion: self-defeating cognition?



**FIGURE 19.4** Effects of stereotyping upon test performance. When told they were taking a test of intellectual abilities, white students scored significantly higher than African American students. However, some students were randomly assigned to take the same test but under conditions where there was no threat. Without a threat present, white and African American students performed equivalently. (Adapted from Steele, 1997, p. 621)

1068

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Stereotype Threat Review

- Studies claim between 17% to 80% of test differences (SAT, IQ) due to S.T.
- Theory: self-defeating cognitions increase load on Working Memory, lower engagement, motivation, etc.
- Effect reduced when subjects told
  - Intelligence is malleable
  - Environment can affect test scores
  - Individuals may outperform group averages

1069

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## CSUSM Research - Apr 2016

San Marcos, April 25, 2016

### Research Shows Female Engineering Students Underestimate Their True Ability

By Whitney Frasier



## Test Fairness and the Law

- 1964 Civil Rights Act
  - Created EEOC
- EEOC Guidelines
  - 1970, 1978
  - Uniform Guidelines on Employee Selection Procedures
- Adverse Impact : minority applications rejected at higher rate than non-minority
- May be acceptable if test is shown to be Valid

1071

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Test Selection Philosophy

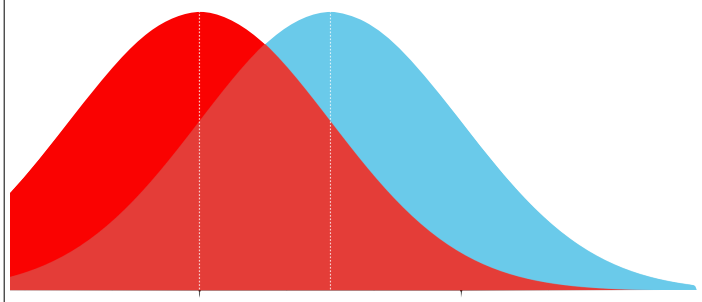
- Unqualified Individualism
  - high scores overall are selected
- Quota System
  - high scores within each group are selected
- Qualified Individualism
  - high scores overall are combined with other information to improve differential prediction

1072

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Selection Philosophy

- Unqualified Individualism
- Quota System
- Qualified Individualism



1073

Psychology 402 - Fall 2020 - Dr. Michael Dohr

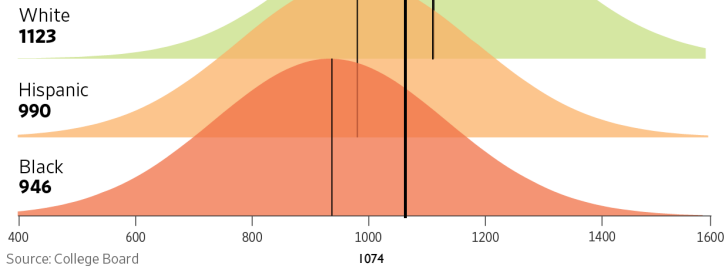


## SAT vs. Ethnicity

SAT score distributions by race



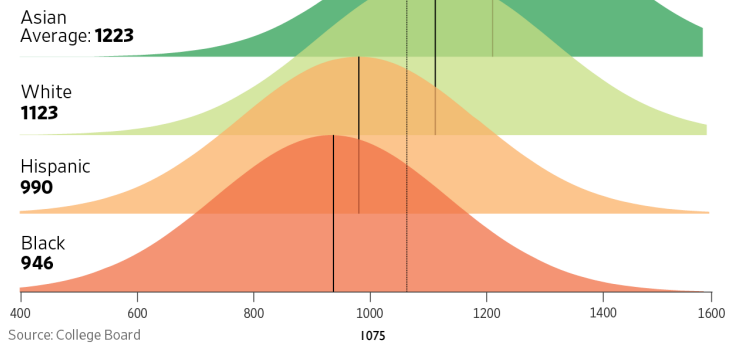
Overall average: 1068



## SAT vs. Ethnicity

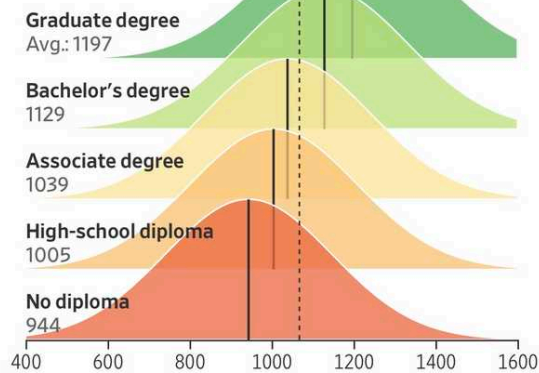
SAT score distributions by race

Overall average: 1068



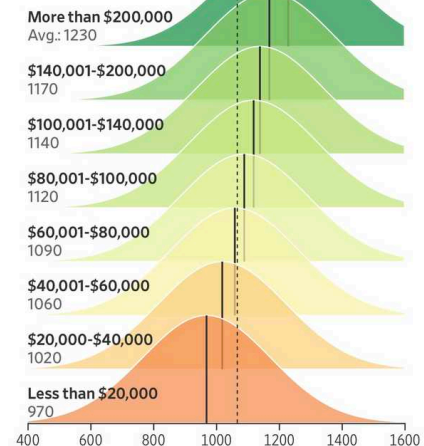
### By parents' highest education level

Overall avg.: 1068



### By household income

Overall avg.: 1068

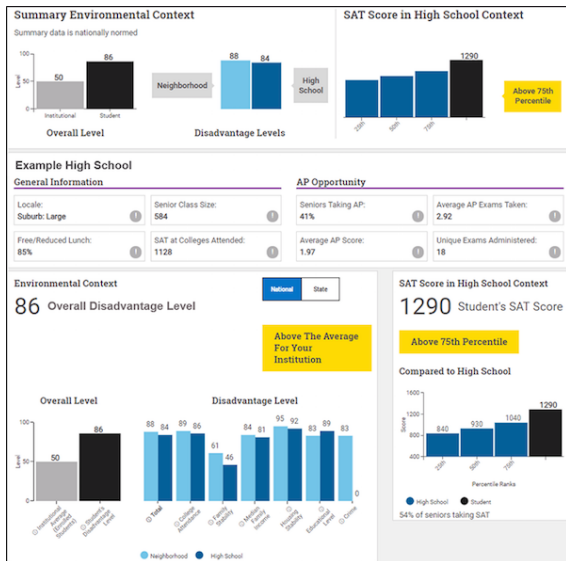


## California Propositions

- Prop 209 (1996)
  - prohibited California government from considering race, sex, ethnicity in public employment and education
- Prop 16 (2020)
  - would have repealed prop 209 allowing affirmative action
  - failed (57% to 43%)
- Instead of ethnicity, what about using other data?

## SAT to add Adversity Score

- May 2019
- Measures 15 facets in 3 factors:
  - neighborhood environment
    - crime & poverty, housing cost...
  - family environment
    - parent's education, single parent...
  - high school environment
    - AP classes, free lunch (poverty)...
- Single Score from 1 to 100



© 2020 - Dr. Michael Dohr

## SAT 'Adversity Score' Is Abandoned in Wake of Criticism



Stanford University in Palo Alto, Calif. The College Board said on Tuesday that it is rethinking the adversity score it recently introduced in college admissions. Jim Wilson/The New York Times

By Anemona Hartocollis

Aug. 27, 2019

“...it is a retreat from the notion that a single score is better”

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## The Bell Curve (1994)

- Controversial book by Herrnstein\* and Murray (uses research by Arthur Jensen)
- “g” exists and is measurable by IQ scores
- Social stratification (difference between rich and poor) increasing, due to IQ differences
- IQ predicts “success” (poverty, crime, etc.) better than many other measures
- IQ differences between ethnic groups are the cause of social/economic differences
- Recommends policy changes: ending welfare, etc.
- Argued Griggs v. Duke Power was wrong
- \* died before publication

1082

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Social correlates of IQ

Measure	IQ		
	<75	90 to 110	> 125
Unemployed > 1 month/year	12%	7%	2%
Lives in Poverty	30%	6%	2%
Chronic welfare recipient	31%	8%	< 1%
Married by age 30	72%	81%	67%

1083

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Criticisms of The Bell Curve

- “The authors seem to show the evidence and leave the implications for the reader to figure out; discussing scientific work on intelligence, they never quite say that intelligence is all important and tied to one's genes, yet they signal that this is their belief and that readers ought to embrace the same conclusions.” - Howard Gardner

1084

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Criticisms of The Bell Curve

- “I believe this book is a fraud, that its authors must have known it was a fraud when they were writing it, and that Charles Murray must still know it's a fraud as he goes around defending it. [...] After careful reading, I cannot believe its authors were not acutely aware of [...] how they were distorting the material they did include.”
- Nunley

1085

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Gould's Criticisms of The Bell Curve

- The Bell Curve's claim requires 4 logical arguments:
  - Intelligence can be expressed as IQ
  - Ordinal - people can be ranked by worth
  - Genetic
  - Immutable
- "most of the premises are false" (Gould, 1996, p. 368)

1086

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## IQ : Genes vs. Environment

- What evidence do we have?

1087

Psychology 402 - Fall 2020 - Dr. Michael Dohr

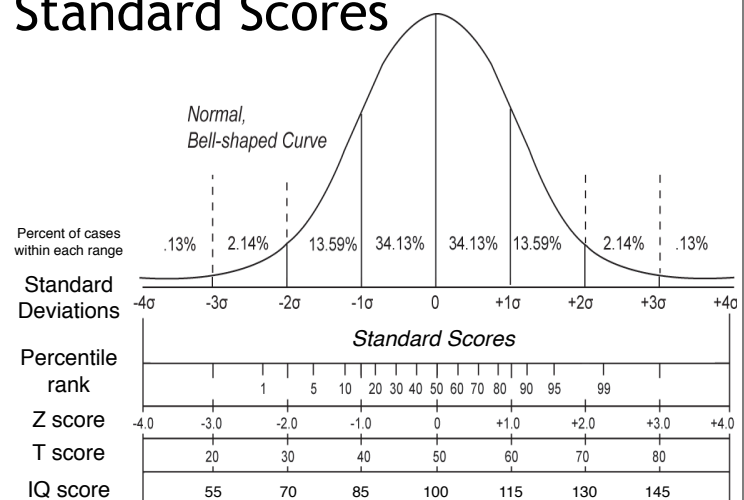
## The Flynn Effect

- IQ tests are re-normed over time
- Distribution of Raw scores forms normal curve
- Average score is defined as IQ=100
- Using today's IQ tests (mean = 100) the mean in 1910 would have been 70.

1088

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Standard Scores



1089

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## The Flynn Effect

- If IQ (g) is primarily genetic, IQ must be stable over time
- But instead we find:
  - IQ scores rising about 3 points/decade
  - Ethnic group differences shrinking
- This is too fast to be genetic
- Thus, something else is happening.
- Environmental causes? complexity of experience, nutrition, healthcare, parents literacy, family structure...

1090

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Flynn Effect - 100 years

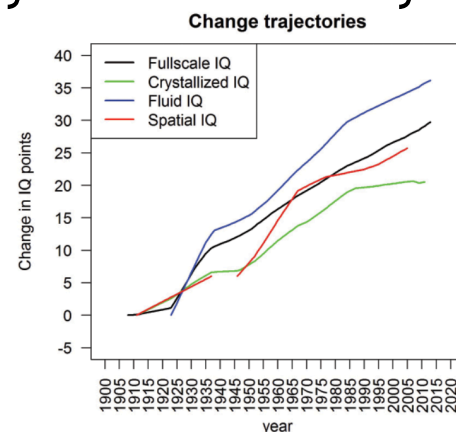
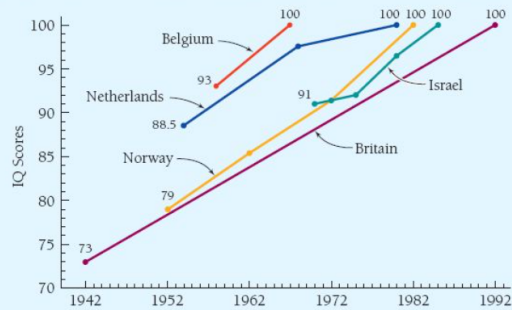


Fig. 1. Domain-specific IQ gain trajectories for 1909–2013. Changes are based on weighted average annual IQ changes in all available data.

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Flynn Effect by Country

**FIGURE 19.2**  
Gains in average IQ over time in five countries.



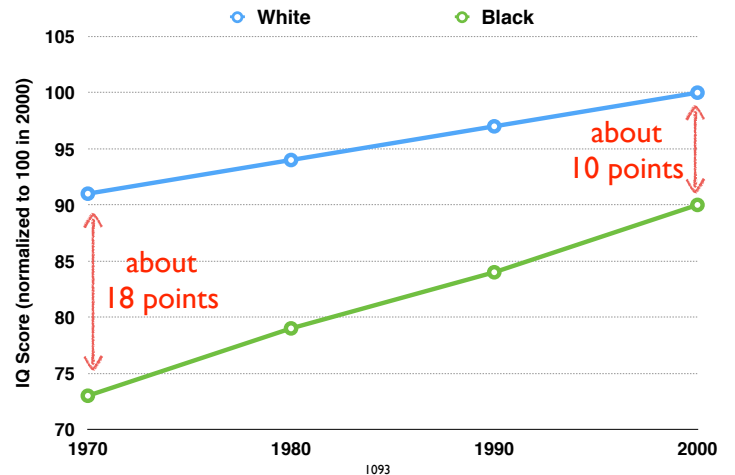
Note: Every nation is normed on its own samples. Therefore, although nations can be roughly compared in terms of different rates of IQ gain, they cannot be compared in terms of IQ scores. That is, the fact that the mean IQ of one nation appears higher than another at a given time is purely an artifact.

From J. R. Flynn, Searching for Justice: The discovery of IQ gains over time. *American Psychologist*, Jan V 54 (n1), 1999, 5-20. Copyright © 1999 American Psychological Association. Reprinted by permission.

1092

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## IQ Differences by Ethnicity are Shrinking



1093

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## James Flynn



1094

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Intermission

- 2 day/week format

1095

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Ch. 19 - Part 3

1096

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Review

- IQ & Ethnicity
  - unlike IQ & Gender, average scores differ widely
- Possible explanations
  - Test Bias? (can only explain a small part)
- Selection Philosophy
  - differences exist: how to deal with them
- The Bell Curve (1994 book)
  - 4 Claims: IQ=Intelligence, Ranking, Genetic, Immutable,
- The Flynn Effect

1097

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## UC Berkeley law school confronts the racist legacy behind its famed Boalt Hall

By TERESA WATANABE  
NOV 12, 2018 | BERKELEY



UC Berkeley's elite law school is confronting the racist legacy behind its famed Boalt Hall. (Brian van der Brug / Los Angeles Times)

For more than a century, UC Berkeley's elite law school has been closely tied to the name of the building that houses it, Boalt Hall.

John Boalt  
was key to  
passing the  
1882  
Chinese  
Exclusion  
Act

Psychology 402 - Fall 2020 - Dr. Michael Dohr

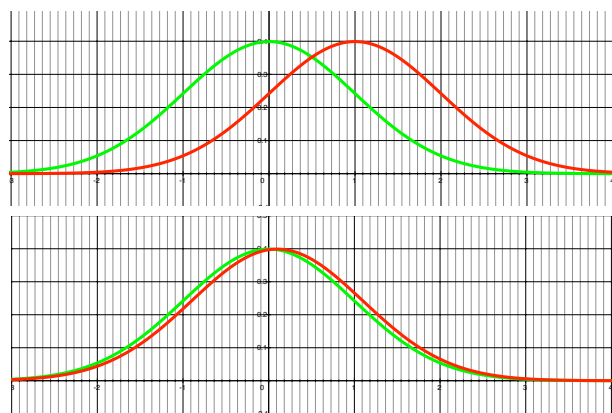
## Between vs. within group

- Within a racial group, evidence that IQ is partially genetic. Thus it is *heritable*.
- Between racial groups, large differences in IQ scores.
- Therefore, difference between races is genetic.
- Sound logic? Or a fallacy?

1099

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Between Group vs. Within Group Variance



1100

Psychology 402 - Fall 2020 - Dr. Michael Dohr

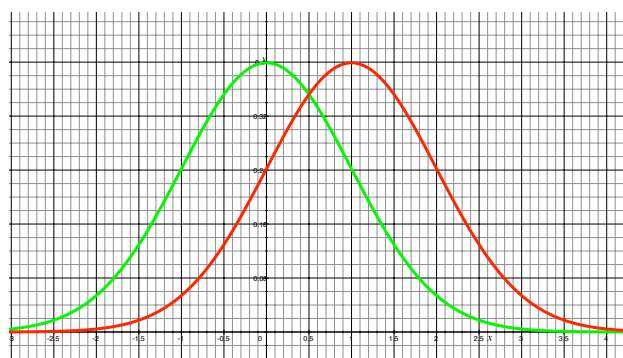
## Between vs. within group

- Example: height of adult males
  - tall fathers tend to have tall sons, and vice versa.
- Village A : average height 5'6"
- City : average height 5'9"
- Is the between-group difference due to
  - genetics?
  - other factors?
- How to test this theory?

1101

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Normal Curve: 1SD difference



1102

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Heritability

- Children are similar to but not identical to parents
- Variation in children's traits: a kind of variance
  - $h^2$  : genetically inherited
  - $1 - h^2$  : environmental influences
- Can not ethically alter these variables in humans, so research must be observational, rather than experimental

1103

Psychology 402 - Fall 2020 - Dr. Michael Dohr



## Heritability is not always Biological

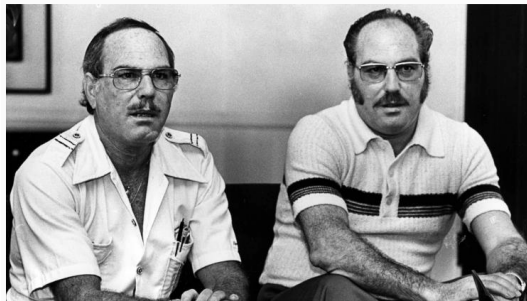
- Vocabulary has a high heritability constant
- Yet vocabulary, which consists of knowledge about word meanings, is clearly 100% environmental -- all words are learned.
- Important to remember that high (statistical) heritability does not prove or imply biological or genetic reality.

1104

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Recent Events

Jack Yufe dies at 82; he was raised Jewish, his identical twin as a Nazi



It sounded like a tabloid headline: Identical twins separated after birth. One grew up Jewish, the other a Nazi.

(upon first meeting)  
“We had identical clothes. I got mine in Israel and he got his in Germany. Exactly the same color, with two buttons”

1105

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Twin & Adoption Studies

- Monozygotic (MZ) twins: identical DNA (100%)
- Dizygotic (DZ) share 50% DNA (like siblings)
- Twins adopted into same families, or separated to different families
- 2x2 quasi-experimental design
  - family vs. genetics
- $h^2$  is approximately twice the difference in correlation between MZ and DZ twins.

1106

Psychology 402 - Fall 2020 - Dr. Michael Doherty

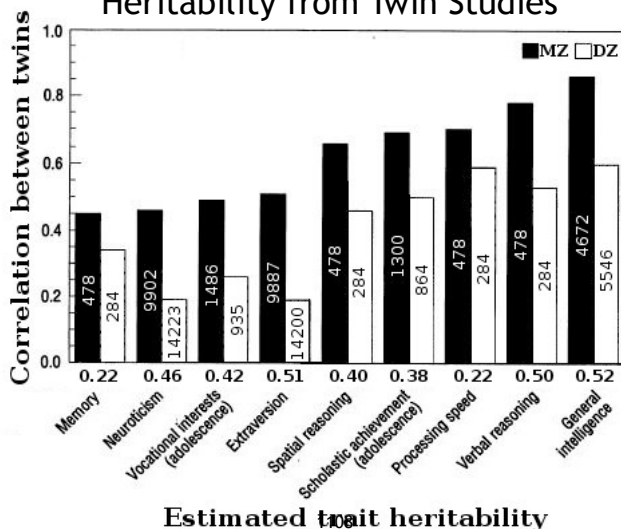
## Twin & Adoption Studies

	MZ Twins	DZ Twins
Reared together	100% genes 100% environment	50% genes 100% environment
Reared apart	100% genes 0% environment	50% genes 0% environment

1107

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Heritability from Twin Studies



Isabel Doherty

## Twin Studies Criticism

1109

Psychology 402 - Fall 2020 - Dr. Michael Doherty



## Identical Twins: Identical DNA?

- “The DNA in white blood cells of 66 pairs of monozygotic twins was analyzed for 506,786 single-nucleotide polymorphisms known to occur in human populations. Polymorphisms appeared in 2 of the 33 million comparisons, leading the researchers to extrapolate that the blood cells of monozygotic twins may have on the order of **one DNA-sequence difference for every 12 million nucleotides...**”
- 0.00012% different, e.g. 99.99988% identical

1110

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Twin Studies Criticism

- Generalizability : % of women having DZ twins varies with age, may run in families
- In-utero environment : MZ twins raised apart still share the same environment for 9 months. Delvin et al (1997) claims this could account for ~20% of variance
- Adoptive families are often very similar (middle class, white, etc.) which may lead to under-estimation of environmental influence
- GxE interactions -- genetic factors may feedback on environment resulting in overestimate of IQ heritability

1111

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## GxE interactions

- Biological Sex: genetic
- “Girls are bad at math”
- Pupils, families, friends, teachers have lower expectations
- Girls get poorer math education
- Girls show lower scores on Math tests
- Comparison of Math abilities vs. Sex
  - differences appear to be genetic
  - could really be 100% environmental

1112

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Delvin et al 1997 (DD97)

- Most twin adoption studies ignore the shared environment of twins (both in-utero, and in home prior to adoption)
- They performed a meta analysis of 212 correlations from prior studies
- HM94 had estimated  $h^2$  at 60% to 80%
- DD97 arrives at an estimate of 34% to 48%
- Big difference with large policy implications

1113

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## IQ Score Correlations

Group	R	R <sup>2</sup>
Same person (tested twice)	0.95	90%
Identical twins raised together	0.86	74%
Identical twins raised apart	0.76	58%
Fraternal twins reared together	0.55	30%
Fraternal twins raised apart	0.35	12%
Siblings raised together	0.47	22%
Siblings raised apart	0.24	6%
Unrelated children raised together	0.28	8%

1114

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Latest Research: Kendler et al. (2015)

- Swedish study of male siblings
- One child raised at home
- One child adopted
- IQ test at age 18
- Measured adopted family Educational level
- Largest study to date (436 pairs)
- Question:
  - How would IQ of adopted siblings vary?

1115

Psychology 402 - Fall 2020 - Dr. Michael Dohr

## Kendler et al. (2015)

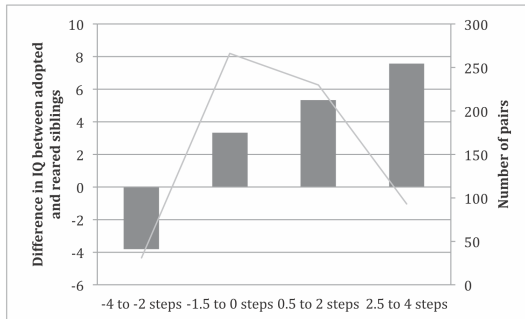


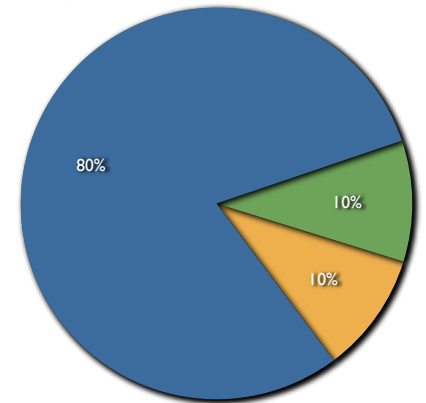
Fig. 1. Magnitude of IQ difference (black bars and left y axis) between adopted and nonadopted full-siblings as a function of the difference in educational level between biological and adoptive parents of the adopted siblings (x axis). The four bars represent (from left to right) -4 to -2 steps; -1.5 to 0 steps; 0.5-2 steps; and 2.5-4 steps difference on the education scale. The gray line (right y axis) illustrates the number of pairs in each group.

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Explaining Variance

● Genetics  
● Environment  
● Unexplained

Heritability / Genetics variance estimates range from 34% to 80%



1117

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Conclusions

- Gender differences on IQ tests are small (less than 0.2 SD) but still controversial especially at extremes
- Ethnic differences were large (1.0 SD) but are shrinking
- Explanations:
  - Test bias? Some, but small.
  - Genetic differences? Perhaps, but recent results suggest this % was overestimated.
  - Environmental differences? **Yes.** Explains Flynn effect and shrinking ethnic differences.
  - Latest research : IQ is very mutable through environment (Kendler et al. Sibling study)

1118

Psychology 402 - Fall 2020 - Dr. Michael Doherty

## Conclusions 2

- IQ and Race (Ethnicity) is a Highly Controversial, Politicized topic
- Gould suggests “scientific racism” exists today
  - conscious or unconscious biases?

1119

Psychology 402 - Fall 2020 - Dr. Michael Doherty