

# Ch. 19: Controversy in Testing

1147

Psychology 402 - Fall 2021 - Dr. Michael Diehr

Copyright © 2021 Michael Diehr  
All Rights Reserved

For use only by students enrolled  
in my sections of Psyc 402  
through Dec 2020.

May not be posted, shared or uploaded  
online without permission.

1148

Psychology 402 - Fall 2021 - Dr. Michael Diehr

## Review : IQ Tests

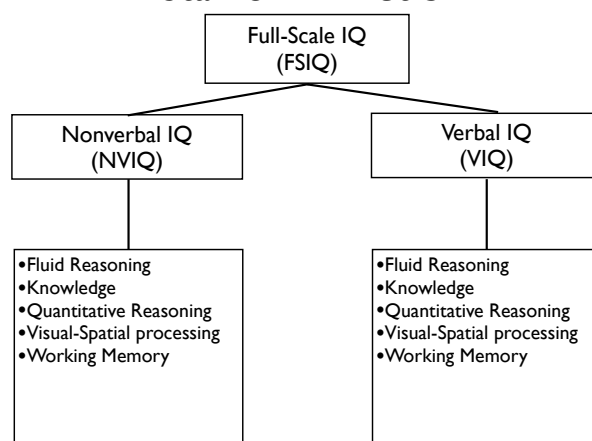
- Stanford-Binet (Alfred Binet)
- Wechsler-Bellevue (David Wechsler)
- Theory
  - # of factors of Intelligence?
  - goals of testing?
  - immutability?
- SB-5 and WAIS-4 provide “Full Scale IQ” scores
  - is FSIQ a measure of “Intelligence”?

1151

Psychology 402 - Fall 2021 - Dr. Michael Diehr

## Stanford-Binet 5

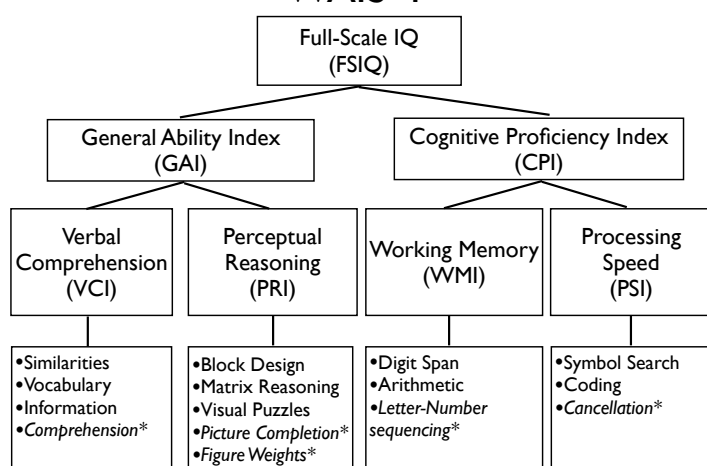
1152



Psychology 402 - Fall 2021 - Dr. Michael Diehr

## WAIS-4

1153



\* is not part of core battery

Psychology 402 - Fall 2021 - 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

1154

Psychology 402 - Fall 2021 - 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.

1155

Psychology 402 - Fall 2021 - 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

1156

Psychology 402 - Fall 2021 - 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

1157

Psychology 402 - Fall 2021 - Dr. Michael Dohr

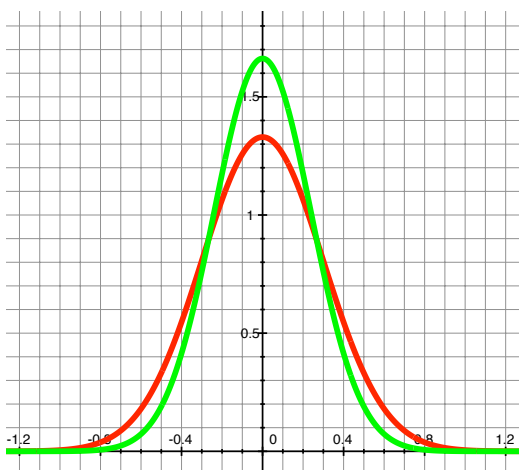
## Gender and IQ

- 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?

1158

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Men vs. Women IQ



Psychology 402 - Fall 2021 - 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’.”

1160

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Pre-DNA views

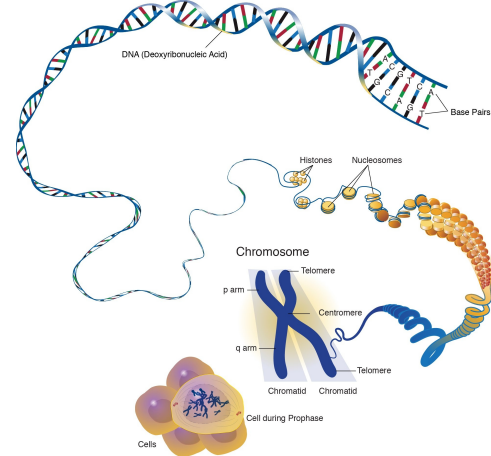
- Gold, Silver, Brass, Iron -- Plato
- “There is a physical difference between the white and black races which I believe will for ever forbid the two races living together on terms of social and political equality.” -- Abraham Lincoln

1161

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Genetics : DNA

1162



Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Visible differences?

Indigenous  
Australian  
Melanesia  
African  
European

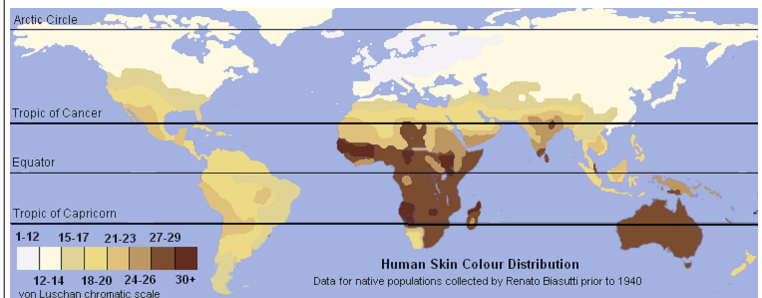
Australian and  
Africans are  
most genetically  
different



1163

Psychology 402 - Fall 2021 - Dr. Michael Dohr

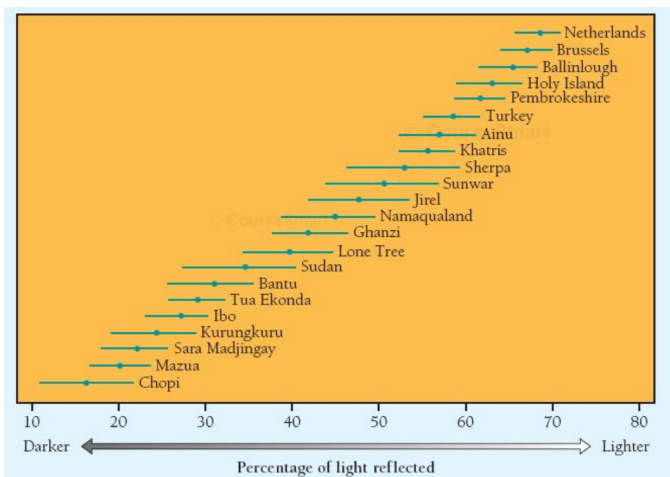
## Worldwide Skin Color



1164

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## “Black” vs. “White”

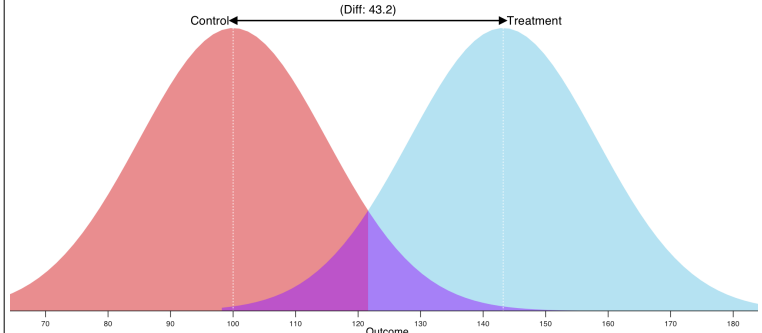


1165

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Skin Color

Cohen's d: 2.9  
(Diff: 43.2)



- 85% between group, 15% within group
- 98% chance blue person higher than red

1166

Psychology 402 - Fall 2021 - Dr. Michael Dohr

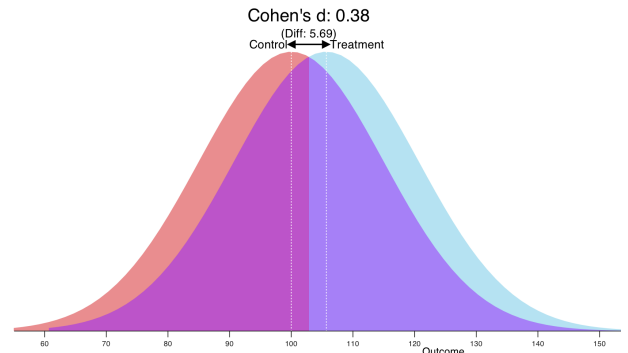
## Nonconcordant traits

- 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

1167

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Most other traits

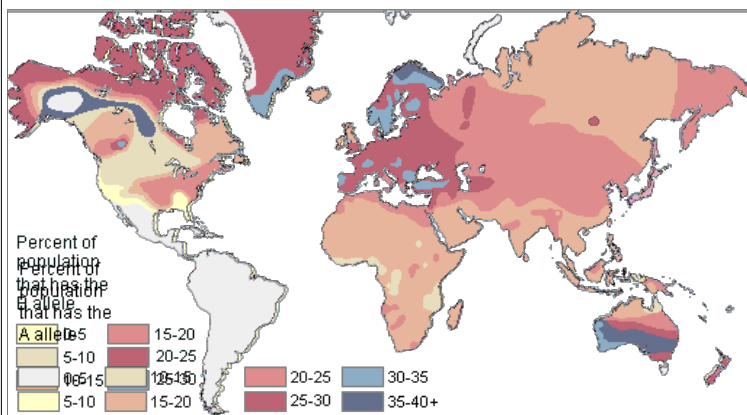


- 15% between group, 85% within group
- 61% chance blue person higher than red

1168

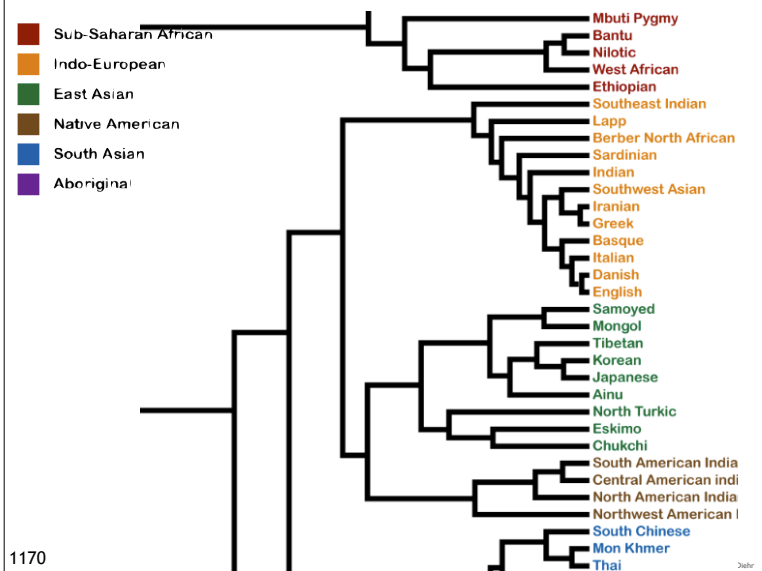
Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Worldwide Blood Type



1169

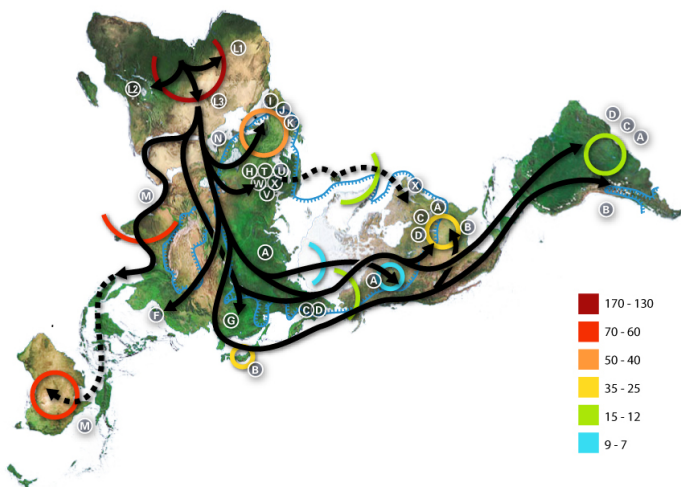
Psychology 402 - Fall 2021 - Dr. Michael Dohr



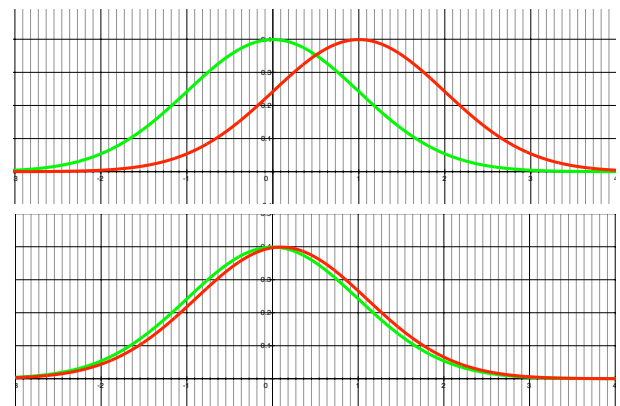
1170

Dohr

## Prehistorical Migration



## Between Group vs. Within Group Variance



1172

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Post-DNA views

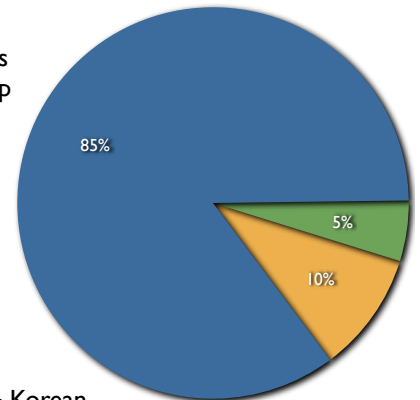
- Variance
  - variation between individuals
    - aka variation *within groups*
  - variation *between groups*
- Variance
  - variation between individuals : 3mbp / person
  - variation within groups : 85%
  - variation between groups: 15%
    - about 5% - within “races”
    - about 10% - between “races”

1173

Psychology 402 - Fall 2021 - 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

1174

Psychology 402 - Fall 2021 - Dr. Michael Dohr

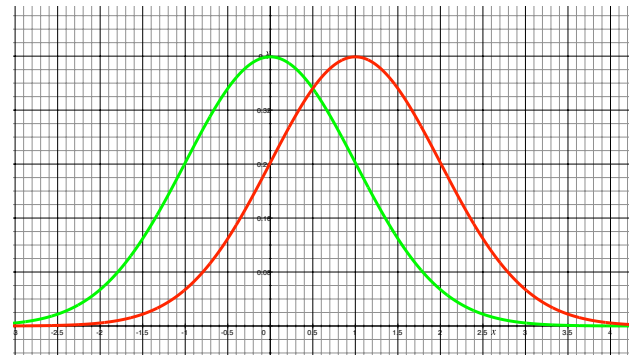
## Ethnicity and IQ (USA)

- 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)

1175

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Normal Curve: 1SD difference



1176

Psychology 402 - Fall 2021 - 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)

1177

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Eugenics

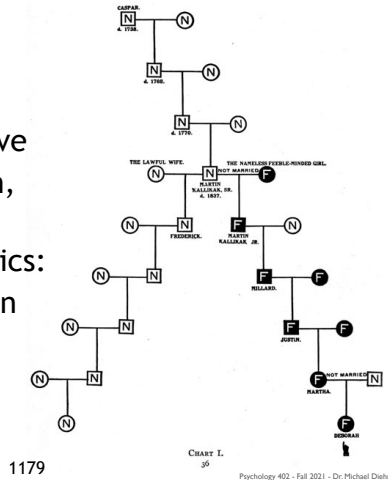
- Social philosophy advocating improvements of human hereditary traits through active intervention.
- Long history (“The best men must have intercourse with the best women as frequently as possible, and the opposite is true of the very inferior” Plato, Republic)
- Francis Galton (1860s) : First scientific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

1178

Psychology 402 - Fall 2021 - 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



1179

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## 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"

1181

Psychology 402 - Fall 2021 - 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

1182

Psychology 402 - Fall 2021 - 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"

1183

Psychology 402 - Fall 2021 - 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)

1184

Psychology 402 - Fall 2021 - 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.

1185

Psychology 402 - Fall 2021 - 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...

1187

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## 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

1188

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## 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.

1189

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## Prism Examples

- [APA style guide for the Project Paper](#)

1190

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## Ch. 19 - Part 2

1193

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## 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

1194

Psychology 402 - Fall 2021 - Dr. Michael Doherty



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

1196

- 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)

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Test Bias

- Content Validity
- Criterion Validity

1197

Psychology 402 - Fall 2021 - 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.

1198

Psychology 402 - Fall 2021 - 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.

1199

Psychology 402 - Fall 2021 - 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?)

1200

Psychology 402 - Fall 2021 - 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

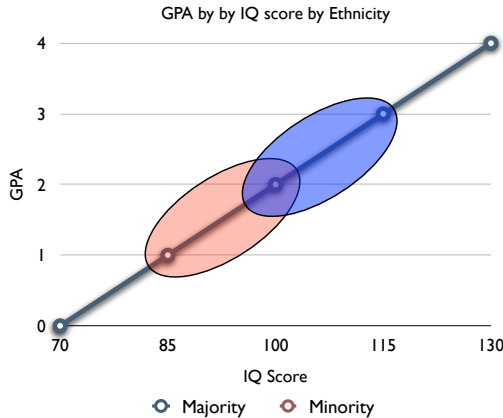
1201

Psychology 402 - Fall 2021 - Dr. Michael Dohr



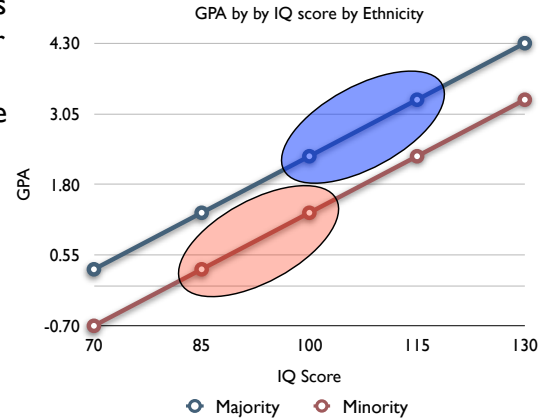
## Same regression line

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



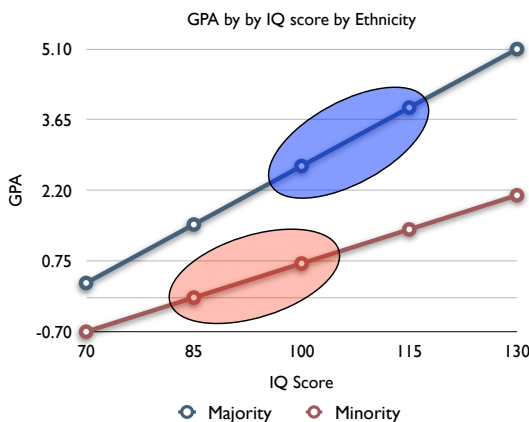
## Parallel regression lines

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



## Different regression lines

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



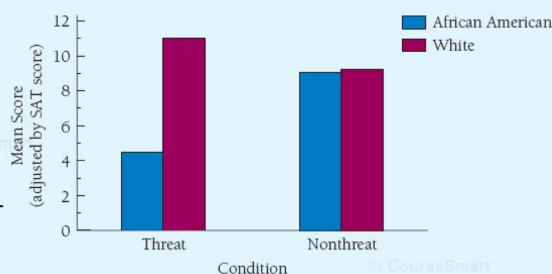
## Test Bias

- 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.

## Stereotyping & Test Performance

AA students perform worse under "threat" condition

Conclusion: self-defeating cognition?



## 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

## 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

1209

Psychology 402 - Fall 2021 - Dr. Michael Dehr

## 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

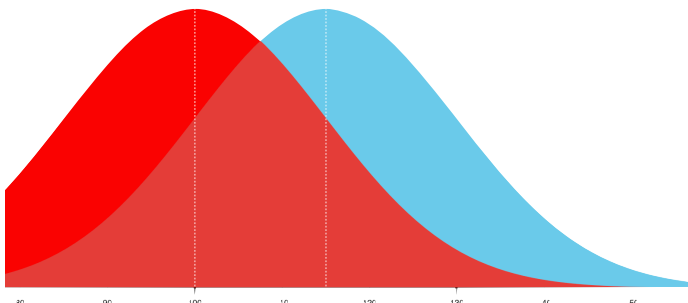
1210

Psychology 402 - Fall 2021 - Dr. Michael Dehr

## Selection Philosophy

1211

- Unqualified Individualism
- Quota System
- Qualified Individualism



Psychology 402 - Fall 2021 - Dr. Michael Dehr

## SAT vs. Ethnicity

SAT score distributions by race

Overall average: 1068



White  
1123

Hispanic  
990

Black  
946

Source: College Board

400

600

800

1000

1200

1400

1600

1212

Source: College Board

1216

## 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?

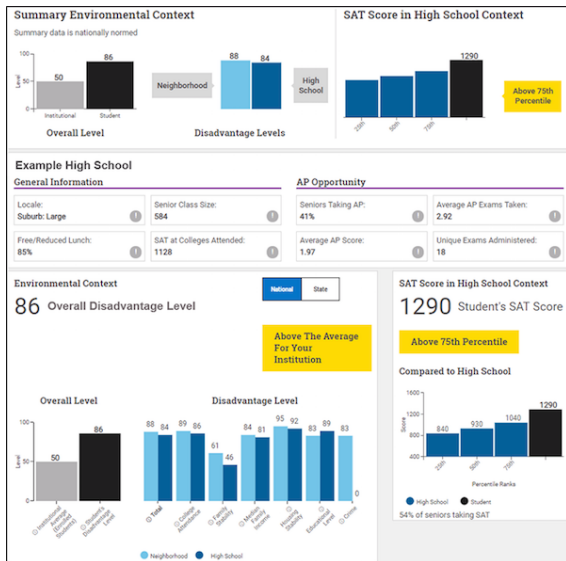
Psychology 402 - Fall 2021 - Dr. Michael Dehr

## 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

1217

Psychology 402 - Fall 2021 - Dr. Michael Dehr



## 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

1220

Psychology 402 - Fall 2021 - 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%

1221

Psychology 402 - Fall 2021 - 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

1222

Psychology 402 - Fall 2021 - 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

1223

Psychology 402 - Fall 2021 - 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)

1224

Psychology 402 - Fall 2021 - Dr. Michael Dohr

# IQ : Genes vs. Environment

- What evidence do we have?

1225

Psychology 402 - Fall 2021 - Dr. Michael Dohr

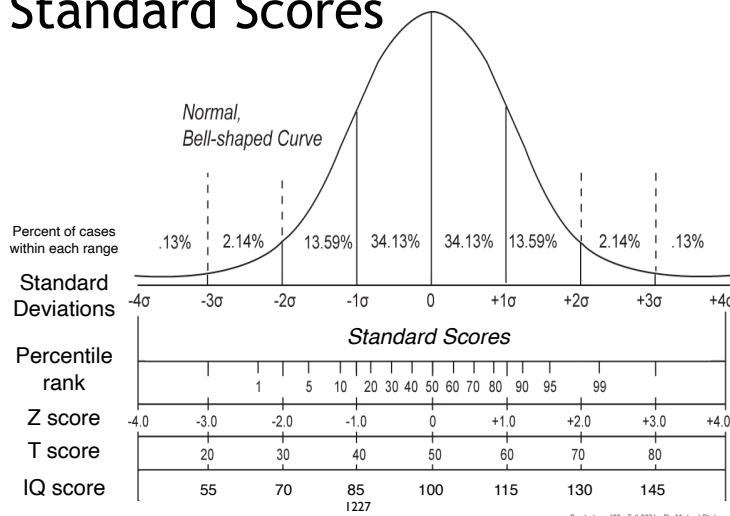
# The Flynn Effect

- 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.

1226

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Standard Scores



## The Flynn Effect

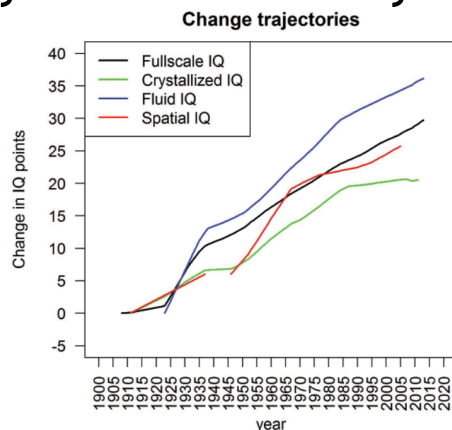
- If IQ (g) is primarily genetic, IQ must be stable over time
- But instead we find:
  - IQ scores rising about 3 points/decade
  - Ethnic group differences shrinking
- This is too fast to be genetic
- Thus, something else is happening.
- Environmental causes? complexity of experience, nutrition, healthcare,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

1228

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Flynn Effect - 100 years

1229



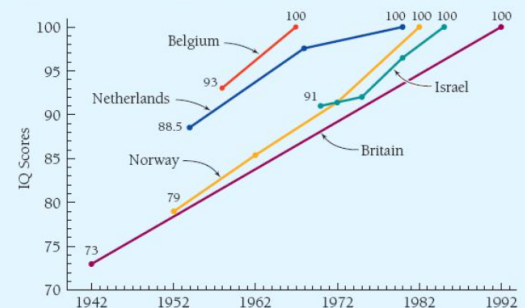
**Fig. 1.** Domain-specific IQ gain trajectories for 1909–2013. Changes are based on weighted average annual IQ changes in all available data.

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Flynn Effect by Country

**FIGURE 19.2**

Gains in average IQ over time in five countries.



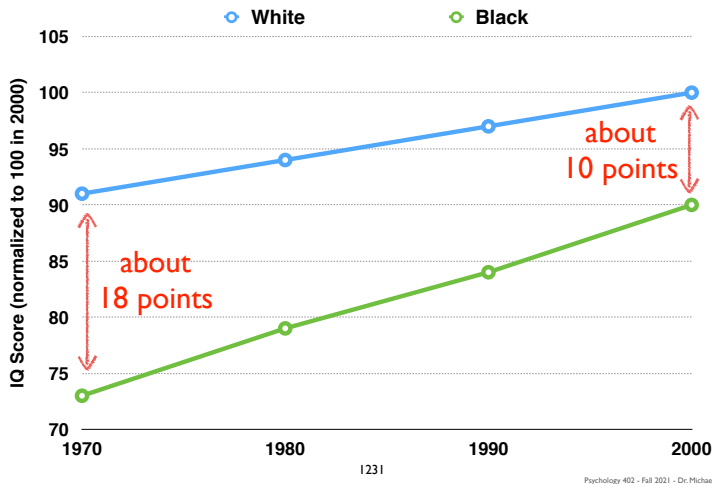
Note: Every nation is normed on its own samples. Therefore, although nations can be roughly compared in terms of different rates of IQ gain, they cannot be compared in terms of IQ scores. That is, the fact that the mean IQ of one nation appears higher than another at a given time is purely an artifact.

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.

1230

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## IQ Differences by Ethnicity are Shrinking



## Ch. 19 - Part 3

1234

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## 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

1235

Psychology 402 - Fall 2021 - Dr. Michael Dohr

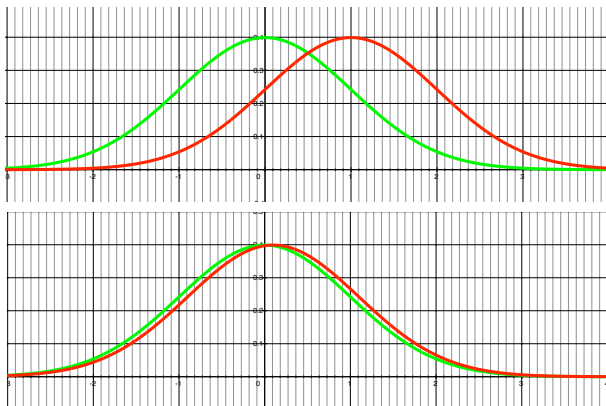
## Between vs. within group

- 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?

1237

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Between Group vs. Within Group Variance



1238

Psychology 402 - Fall 2021 - Dr. Michael Dohr

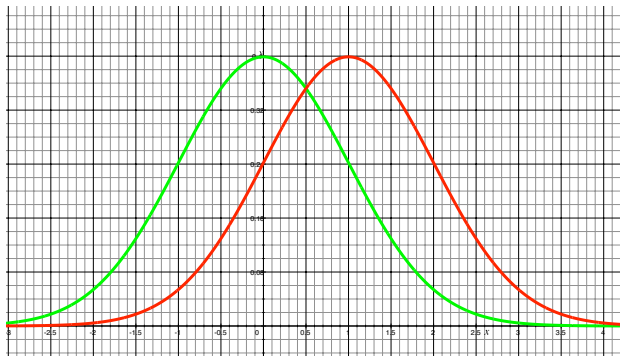
## Between vs. within group

- 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?

1239

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## Normal Curve: 1SD difference



1240

Psychology 402 - Fall 2021 - 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

1241

Psychology 402 - Fall 2021 - 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.

1242

Psychology 402 - Fall 2021 - Dr. Michael Dohr

## 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.

1244

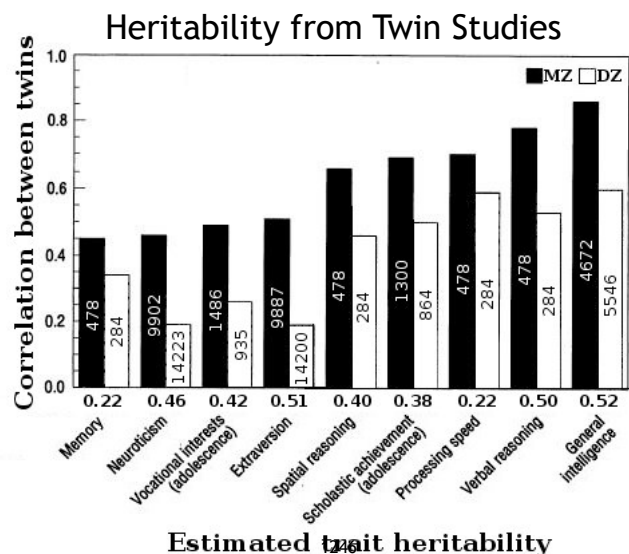
Psychology 402 - Fall 2021 - Dr. Michael Dohr

## 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

1245

Psychology 402 - Fall 2021 - Dr. Michael Dohr



Estimated trait heritability

Isabel Dohr

## Twin Studies Criticism

1247

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## 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

1249

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## 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

1250

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## 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

1251

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## 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%

1252

Psychology 402 - Fall 2021 - Dr. Michael Doherty

## Recent 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?

1253

Psychology 402 - Fall 2021 - Dr. Michael Doherty



## Kendler et al. (2015)

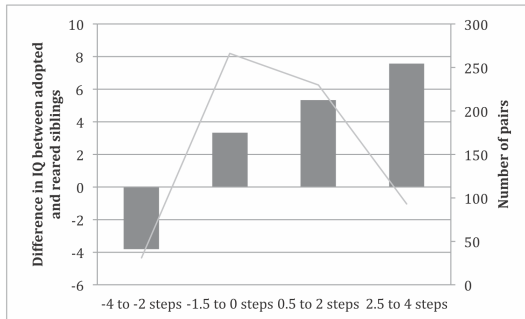


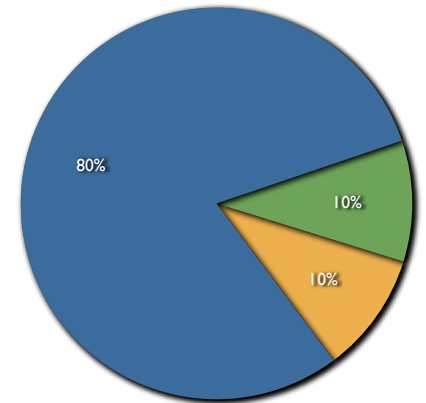
Fig. 1. Magnitude of IQ difference (black bars and left y axis) between adopted and nonadopted full-siblings as a function of the difference in educational level between biological and adoptive parents of the adopted siblings (x axis). The four bars represent (from left to right) -4 to -2 steps; -1.5 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 2021 - Dr. Michael Doherty

## Explaining Variance

● Genetics  
● Environment  
● Unexplained

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



1255

Psychology 402 - Fall 2021 - 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.
  - Recent research : IQ is very mutable through environment (Kendler et al. Sibling study)

1256

Psychology 402 - Fall 2021 - 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?

1257

Psychology 402 - Fall 2021 - Dr. Michael Doherty