

## Ch. 19: Controversy in Testing

- Test misuse
  - Validity for employment
  - Deception / Lie detector tests
- Intelligence (g) vs. Multiple Intelligences (MI)
- Gender and IQ

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417

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## Controversy in Testing 2

- Race, genetics and IQ
  - Historical viewpoints
  - Eugenics
  - WW II / Holocaust
  - Modern IQ testing and Race
  - The Bell Curve
  - The Mismeasure of Man
  - What is Race / Genetics?

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## Gender and IQ

- It was commonly accepted in the 1800s 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

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## Gender and IQ

- Modern scientific consensus is that men and women, on average, have equal IQ scores.
- Differences are small and generally insignificant (1-3 IQ points when differences are found)
- Men's IQ scores tend to be slightly more variable (higher variance) so more men tend to fall at either end of the spectrum
- Some evidence that males are better at stereotypical "male" tasks (visuospatial skills) whereas women are better at "female" tasks (language). Evolutionary reasons? Testosterone?

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## 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'.

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## Nonconcordant traits

- Naive view : Race = Genetics or heritage
- Biochemical view : traits & genes are spread out among groups. Group difference occur, but often the differences have fuzzy edges
- Non concordance : visible traits (skin color, eye shape, hair texture, etc.) don't go together
- Visible vs. Invisible differences: differences on the genetic level often don't track what is seen in surface differences (such as skin color)

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## Nonconcordant traits

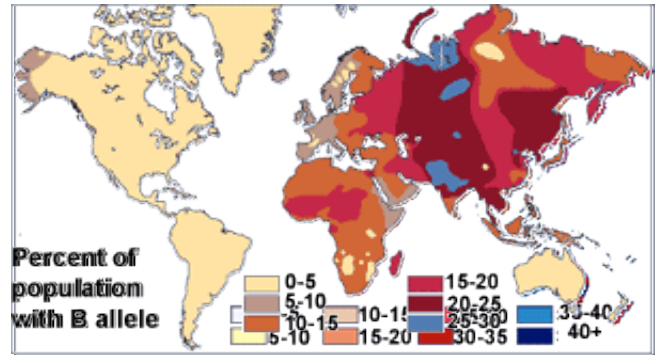


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## Race vs. Genetics



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## Visible differences?

Indigenous  
Australian  
Melanesia  
African  
European



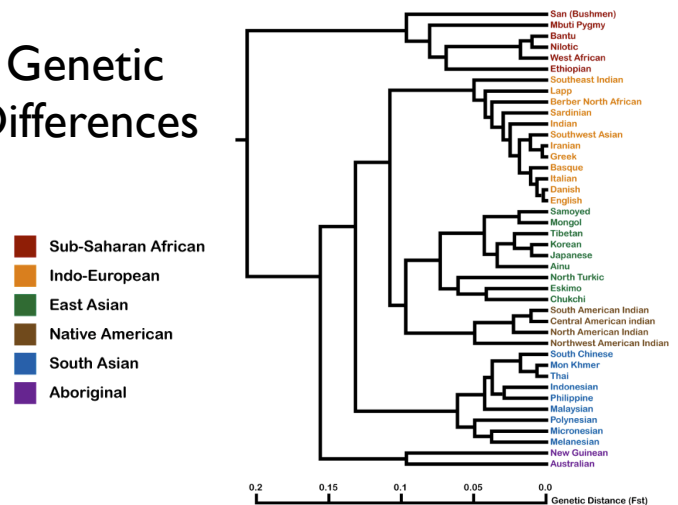
Australian and  
Africans are  
most genetically  
different

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## Genetic Differences



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## Ethnicity and IQ

- Chinese & Japanese American students perform better on Mathematics, yet IQ test scores are about average (same as majority / white)
- 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)

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## 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)

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428

## 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)

## Eugenics

- Was a formal academic discipline in many 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.

## 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)



## Eugenics in the USA

- Discriminatory "eugenics" policies were adopted in many states
- Compulsory sterilization (1907-1963), over 64000 people. A report of this program's success in the USA was cited by Nazi scientists in the Nurmberg trials
- Marriage licenses denied to those with genetic disorders
- Immigration controls
- Etc.

## Modern Conceptions

- Many principles of eugenics were scientifically wrong : For example, you can't eradicate single-gene heterozygous recessive traits via phenotypic selection alone.
- Many genetic "disorders" also have a benefit -- e.g. sickle-cell anemia protects against malaria
- Some genetic-based programs are underway currently, based primarily on genetic screening.
- Question about what will happen as genetic tests get cheaper and more available.

## Test Bias - Content Validity?

- Perhaps score differences between ethnic groups are simply due to test item differences? Different cultures/ethnic groups are exposed to different information growing up?
  - 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.

## Test Bias - Content Validity 2

- Clarizo (1979) - AA children can understand mainstream dialect. (Reverse, however is not necessarily true)
- Flaugher (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.

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## 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?)

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436

## Test Bias - Criterion Validity

- Generally, criterion-validity is considered more important than content validity.
- How well does an IQ test predict later academic success? Is this prediction the same across ethnic groups?
- Three basic scenarios:
  - Regression line is the same
  - Same slope, different intercept
  - Different slopes

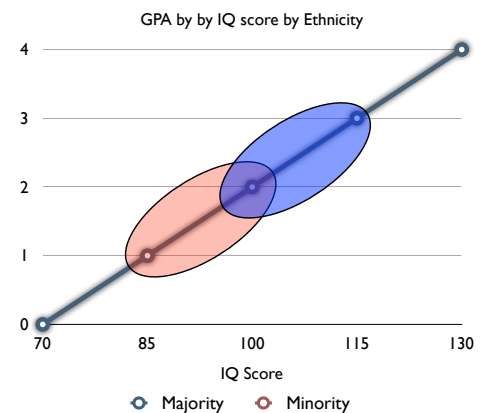
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## Same regression line

Prediction is equally accurate for both races but one race generally scores higher



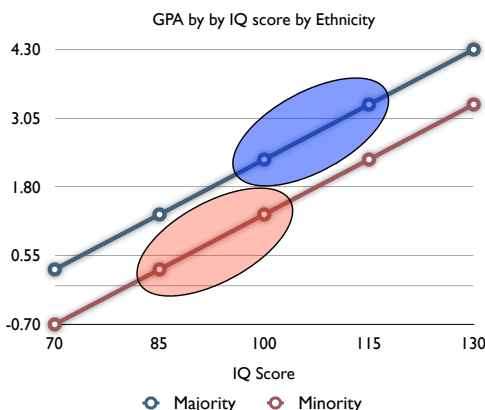
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## Parallel regression lines

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



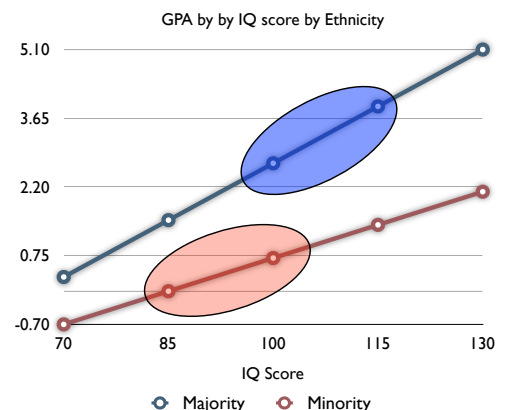
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## Different regression lines

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



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## Test Bias

- The 2nd example (parallel regression lines with different slopes) 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.

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## The Bell Curve (HM94)

- Controversial book by R Herrnstein\* and C. 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.
- \* died before publication

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## Social correlates of IQ

Measure	IQ		
	<75	90 to 110	> 125
Married by age 30	72%	81%	67%
Unemployed > 1 month/year	12%	7%	2%
Lives in Poverty	30%	6%	2%
Chronic welfare recipient	31%	8%	0%

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443

## Criticisms of The Bell Curve

- H Gardner “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.”

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444

## Criticisms of The Bell Curve

- Gardner:
- 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” (Gardner p368)

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445

## Criticisms of The Bell Curve

- M Nunley “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.”

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446

## 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?

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## 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?

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## Heritability

- Offspring are not identical to their parents -- the amount of variation in children can be expressed as a measure of variance.
- This variance can be partitioned in that which is genetically inherited ( $h^2$ ) versus the portion that remains ( $1 - h^2$ ) which is attributed to the environment.
- We can not ethically manipulate these variables in humans, so our research has to be observational, rather than experimental

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## Heritability is not 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.

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## Twin & Adoption Studies

- Twins are either Monozygotic (MZ) or Dizygotic (DZ). MZ twins have identical DNA, sharing 100% of their genes, while DZ twins are no more related than siblings, sharing 50% of their genes.
- Siblings are sometimes adopted into separate families, thus providing a nice 2x2 quasi-experimental design to look at family vs. genetics
- Actual calculation of  $h^2$  is difficult, but it can be roughly estimated as twice the difference in correlation between MZ and DZ twins.

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451

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## Twin & Adoption Studies

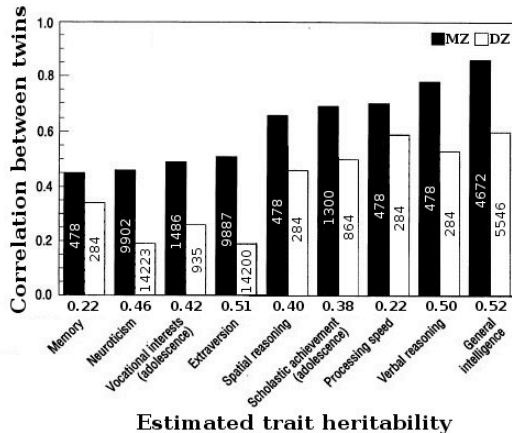
	MZ Twins	DZ Twins
Reared together	100% genes + environment	50% genes + environment
reared apart	100% genes 0% environment	50% genes + 0% environment

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452

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## Heritability from Twin Studies



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453

## Twin Studies Criticism

- Generalizability : % of women having DZ twins varies with age, may run in families
- Poor model / statistics : In-utero environment : MZ twins adopted and raised apart still share the same environment for 9 months. Delvin et al (1997) estimates this as high as 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 h

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454

## 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

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455

## The Flynn Effect

- If IQ (g) is primarily influenced by genetics not environment, then IQ must be stable
- Yet, looking over time, we see that
  - IQ test scores on the whole are rising about 3 pts/decade
  - The gap between ethnic groups is declining
- The changes are too fast to be genetic
- Thus, something else is happening.
- Environmental causes? complexity of experience, nutrition, healthcare, parents literacy, family structure...

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456

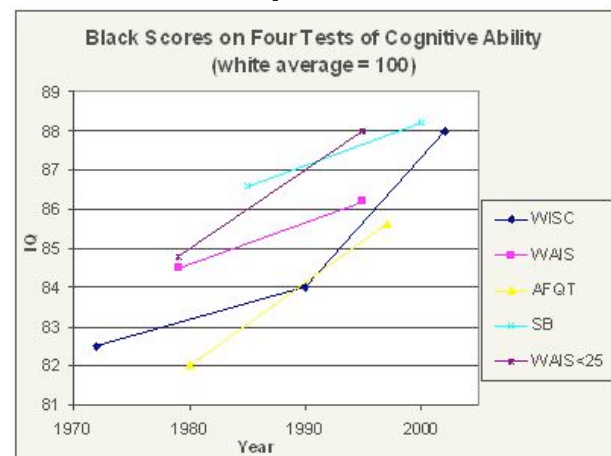
## The Flynn Effect

- IQ tests are re-normed over time
- Using today's IQ tests (mean = 100) the mean in 1932 would have been 80.

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457

## The Flynn Effect



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458

## Recap of Results: IQ & Ethnicity

- Gender differences on IQ tests are small (less than .2 SD) (but still controversial)
- Ethnic differences are fairly large (1.0 SD)
- Explanations:
  - Test bias? some found, but doesn't explain it
  - Genetic differences? yes, but recent results suggest this % has been vastly over-estimated.
  - Environmental differences? yes, explains a great deal, and explains recent reductions (e.g. Flynn effect)

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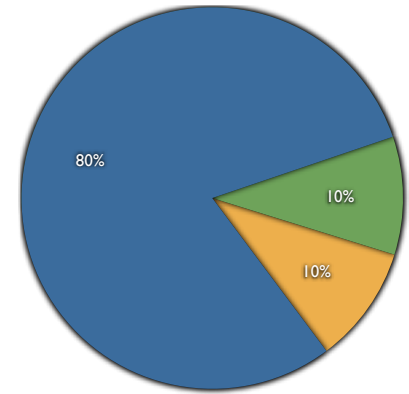
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## Explaining Variance

- Genetics
- Environment
- Unexplained

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



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460

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## Conclusions

- Gender differences on IQ tests are small (less than .2 SD) but still controversial
- Ethnic differences are fairly large (1.0 SD)
- Explanations:
  - Test bias? some found, but doesn't explain most of difference
  - Genetic differences? yes, but recent results suggest this % has been vastly over-estimated.
  - Environmental differences? yes, explains a great deal, and explains recent reductions (e.g. Flynn effect)

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461

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## Conclusions 2

- There is enough disagreement in the evidence, methods, and interpretations that it's possible for any argument to find logical evidence to support it.
- One wonders if perhaps the interpretation serves as somewhat of a "projective" test? Given ambiguous information, one tends to project one's inner emotions & beliefs on the situation.

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462

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