

Synthesis / Review

1642

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Synthesis / Review

- Correlation & Variance
- Race, Ethnicity, DNA & Variance
- IQ tests
- Claims and analysis of “The Bell Curve”
- Societal / Social issues

1645

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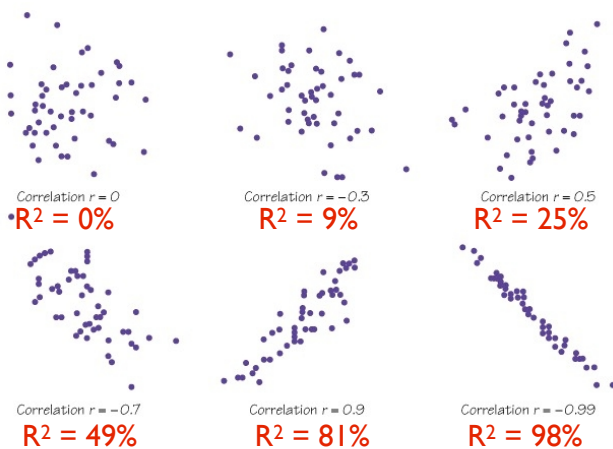
Review : correlation / variance

- Correlation expresses the strength of relationship between two variables
- but correlation is not causation

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Correlations



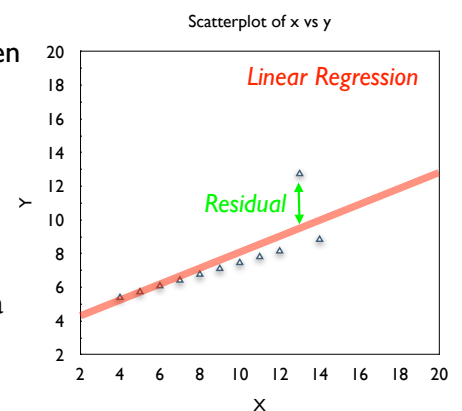
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Residuals in Linear Regression

Residual is difference between actual Y and predicted Y' ($Y - Y'$)

Graphically it is equal to how far away (vertically) a point is from the linear regression line



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Variance Pie Chart

- Explained
- Unexplained

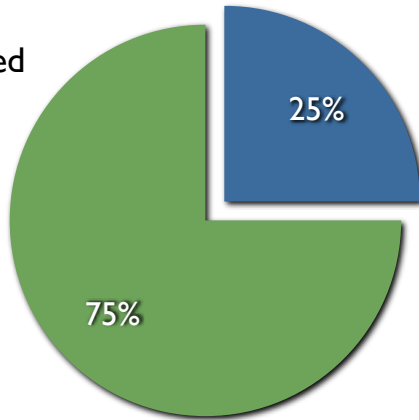
Example:

$$r = 0.50$$

$$r^2 = 0.25$$

a *Large* effect size.

25% explained
75% unexplained



1650

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IQ testing

- IQ tests
 - Reliable? Yes. ($R > 0.90$)
 - Valid? Answer depends on context
- To determine validity
 - What is the Construct?
 - What are the Criterion(s)?

1651

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Race vs. DNA

- Ethnicity is a sociocultural construct
- Race is hard to define biologically
- DNA variation among humans exists, but...
 - is about 0.1% (humans are 99.9% similar genetically)
 - 85% of variance is *within* population groups
 - 15% of variance is *between* population groups
- ∴ the genetic variation *within* groups is much larger than the difference *between* them

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IQ testing

- Binet -- developed IQ test to identify low-functioning children to help.
- Assumptions:
 - Ranking or Normal / High functioning pupils?
 - Hereditary (Genetic?)
 - Mutable?

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Stanford-Binet Test

- Louis Terman (American) developed Binet's test at Stanford.
- Applied a *hereditarian* framework
 - assumes IQ is
 - genetic
 - immutable
 - good for ranking individuals and groups

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The Bell Curve (1994)

- Herrnstein & Murray -- as criticized by Gould
- Intelligence can be quantified as a single number
- IQ can rank people (or groups) in linear order and is the *cause* of social problems (crime, disease, poverty...)
- Intelligence is genetic
- Intelligence is immutable

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Intelligence : IQ as Single Number?

- Pro:
 - common “g” factor ($R^2 > 80\%$)
 - IQ tests give single result
 - high correlations between IQ and “success”
 - Factor analysis : “objective”
- Con:
 - “g” has been over-estimated ($R^2 < 40\%$)
 - IQ tests have multiple subtests
 - IQ measures only 3 of 8 Multiple Intelligences
 - Factor analysis : subjective

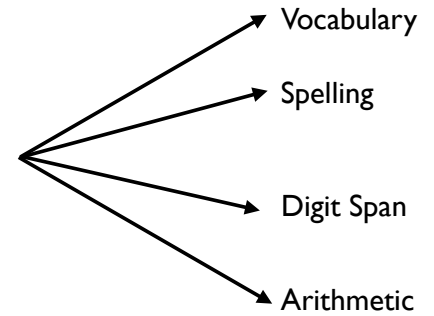
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Factor Analysis

Four Tests,
showing high
correlations

What are the
Factors?

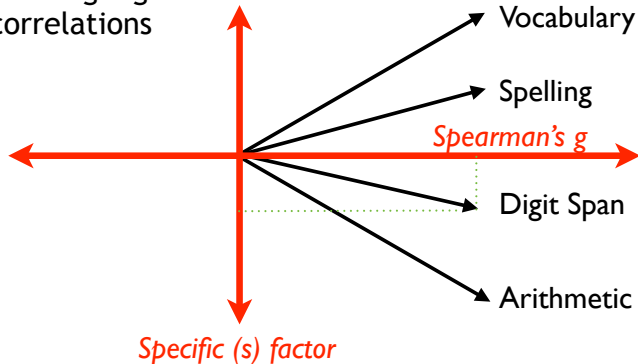


1657

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Factor Analysis

Four Tests,
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correlations

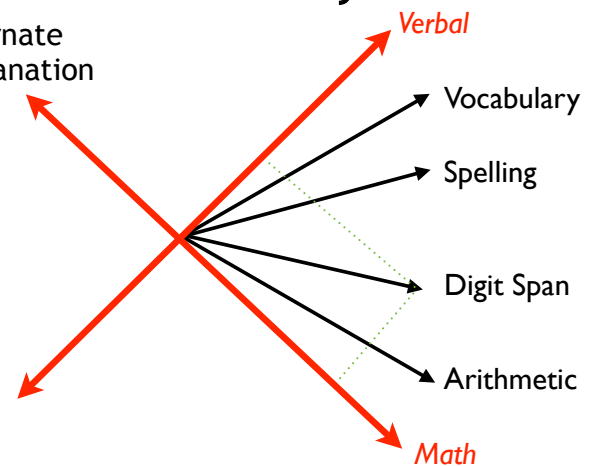


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Factor Analysis

Alternate
explanation



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Factor Analysis

- Patterns within correlation matrix
- Compute *Factors* which account for maximum variance
- Factors: How many? Naming them?

Correlation Matrix

Measure	Factor 1	Factor 2
Vocabulary	0.75	0.17
Spelling	0.87	0.05
Digit Span	-0.02	0.65
Arithmetic	0.10	0.91

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Intelligence : Rank Groups

- Pro:
 - genetic factor within groups is high
 - cross-group factor “must be” genetic
- Con:
 - logical fallacy
 - height of villagers vs. city dwellers
 - even if group differences are genetic, R^2 (% of variance explained) is low
 - can’t predict individual behavior

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IQ is Genetic / Immutable

- Pro:
 - biological: cross-species genetic differences
 - genetic disorders (e.g. Down's syndrome)
 - test score differences between "Whites" & "Blacks"
- Con:
 - Flynn Effect : 30+ points in last 100 years, 15+ in last 50
 - Kendler (2015) - IQ of adopted siblings changed up to 12 points based on education of adopting parents

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Real-world Issues

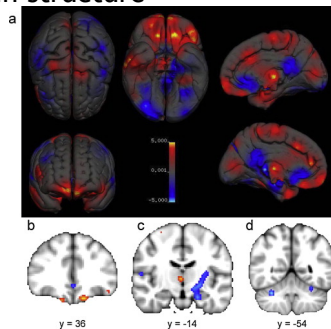
- IQ & Death Penalty
- Cuts to Childcare Spending
- College Enrollment & SAT scores
- Gender, IQ, and perceived IQ

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A meta-analysis of sex differences in human brain structure

They started with a set of MRIs that measured the volume of gray matter in the brains of 112 men and 169 women ages 18 to 79. On these scans, they examined 116 separate regions and zeroed in on the 10 that showed the greatest difference between men and women.



Using results from 570 participants in the Maryland Adolescent Development in Context Study, they found that only 1.8% of them scored consistently male or consistently female, compared with 59% who showed "substantial variability."

1670

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No Dimorphism?

- Recent research (2021) says effect of sex/ gender on brain organization is less than 1%
- Only real difference is overall size (~10%)

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Dump the "dimorphism": Comprehensive synthesis of human brain studies reveals few male-female differences beyond size

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1071

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Summary

- For 1000s of years, it was widely accepted that men were smarter than women.
 - denied opportunities -> lack of success
 - yet intelligence testing suggests this simply isn't true
- For 1000s of years, it was widely accepted that race _____ was superior to race _____.
 - denied opportunities -> lack of success

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