

Research Methods (RES 800)

Correlational Research



What We Will Cover in This Section

- Overview.
- Pearson Correlation
 - Model.
 - Techniques.
 - Partial correlation.
 - Multiple regression.
 - Factor analysis.
- Chi Square



The Essentials of the Correlational Technique



What Correlational Statistics Do

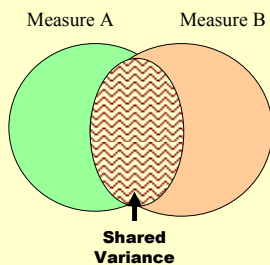
1. Assess the strength of the relationship between two or more variables.
2. Determine the direction of the relationship.
 - Positive.
 - Negative.

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Correlational Model

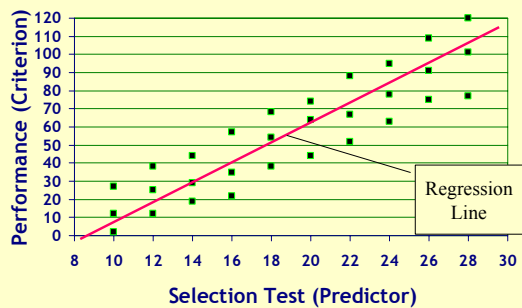


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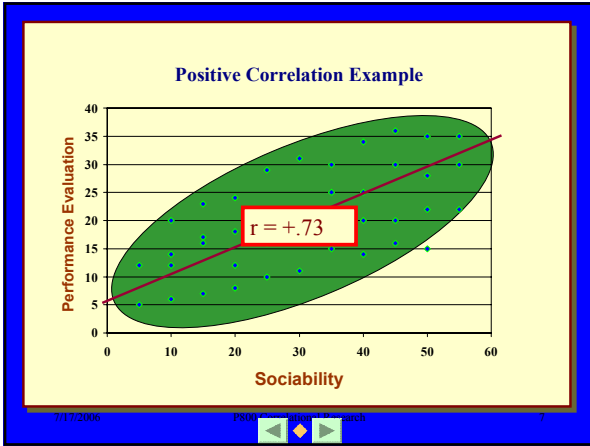
Typical scatterplot

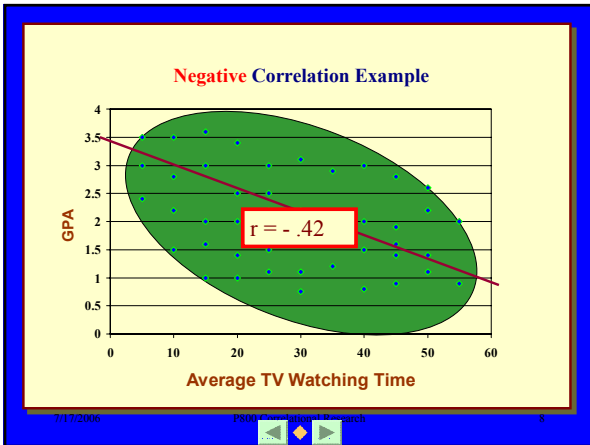


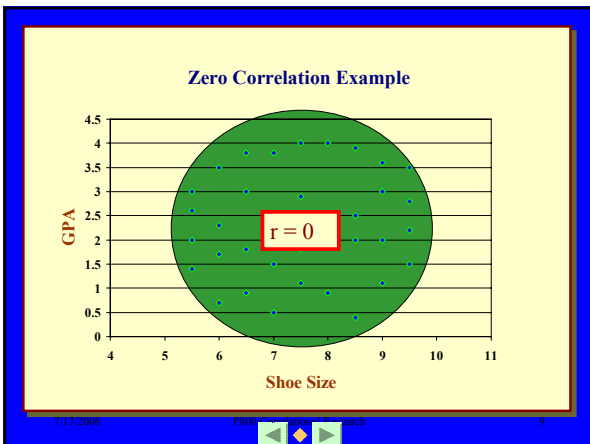
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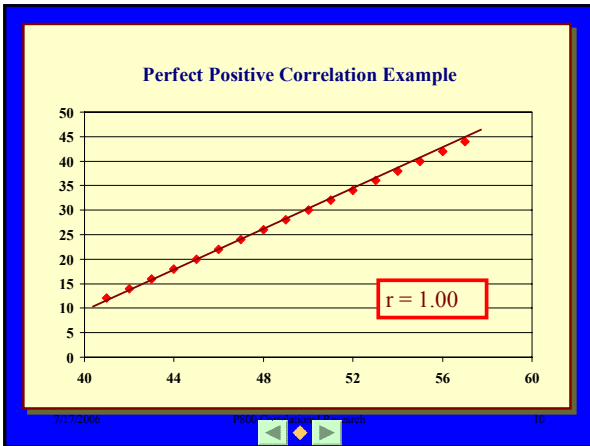
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The Correlation Coefficient

- Indicated by r .
- Ranges from -1.00 to $+1.00$
 - The number indicates the strength of the relationship.
 - The sign indicates whether the relationship is positive or negative.

Typical Correlation Matrix

	Social Contacts	Depression	Suicide
Social Contacts	1.00	-.54	-.49
Depression	-.54	1.00	.32
Suicide	-.49	.32	1.00

Measuring the Correlation

Coefficient	Strength
.60 to 1.00 -.60 to -1.00	Very strong
.40 to .59 -.40 to -.59	Moderate
.20 to .39 -.20 to -.39	Weak
-.19 to +.19	Very weak

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Question?

Which of the following represents the strongest correlation?

- a. .42
- b. -.61
- c. .16
- d. -.09



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Why the Correlation?

1. Determine the strength of the relationship between two or more variables.
2. Determine the direction of the relationship.
 - Positive.
 - Negative.

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Where Simple Correlations are Used

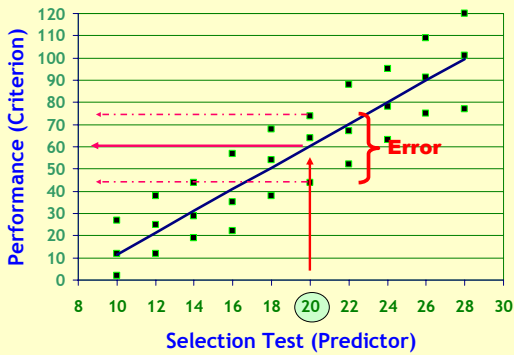
1. Predicting performance.
2. Test validation.
3. Reliability studies.
4. Theoretical studies.

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WARNING!

Cannot Conclude Causality

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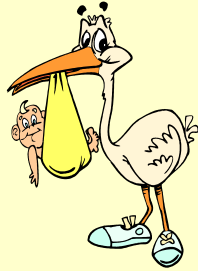
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Example

While conducting research in Helsinki, Finland a demographer found that the correlation between the number of stork nests on chimneys was positively correlated ($r = .38$) with birth rate.



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Conclusion?

- A. Storks bring babies.
- B. Male storks make babies in unfaithful human females.
- C. Babies make storks.
- D. I haven't the slightest idea.

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Factors that Affect the Correlation Coefficient

1. Measurement scales
 - Should be interval or ratio.
2. Reliability of the measures.
3. Restriction of range.
 - Usually caused by measurement problems.

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Examples...

- Restriction of Range.
- Non-continuous groups.
- Outliers

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Restriction of Range

A variable cannot take on the full range of values it would in the natural environment.

May happen when...

- There is a ceiling or floor effect.
- An extreme group is eliminated.
- Only members of an extreme group are included in the study.

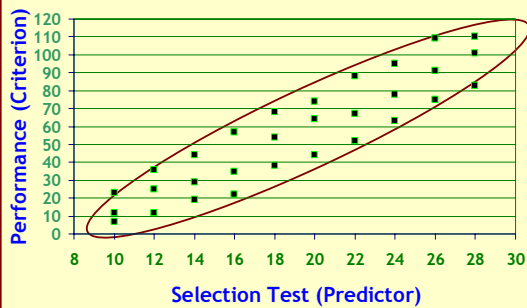
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Regression

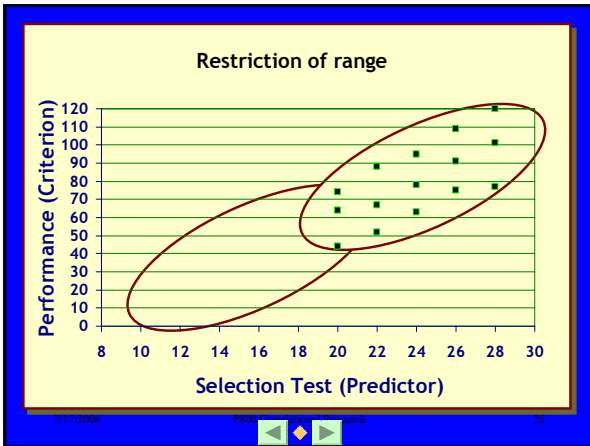


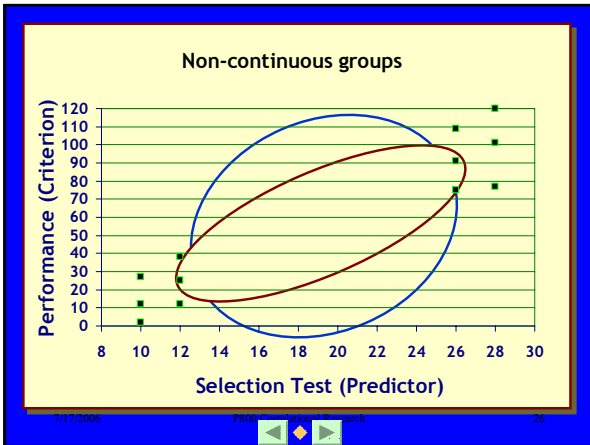
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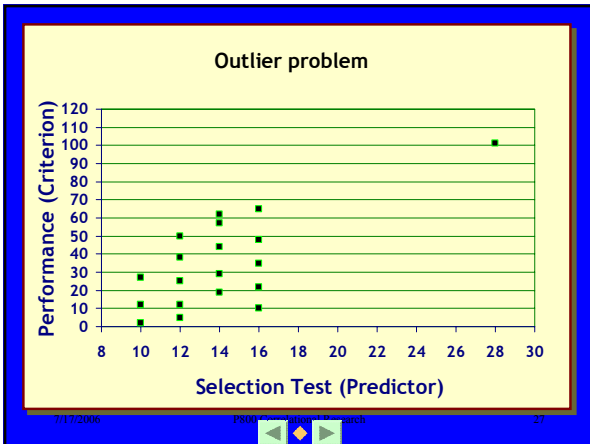
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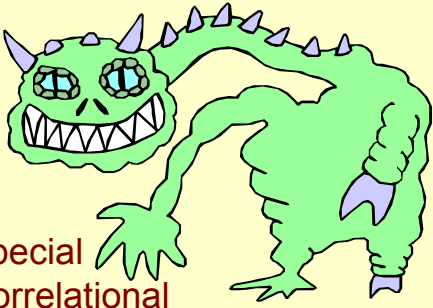
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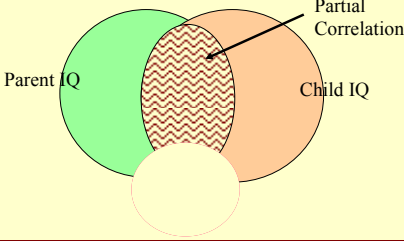




Special
Correlational
Techniques

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Partial Correlation



Parent IQ

Child IQ

Partial Correlation

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Multiple Regression

How can we find the best mathematical combination of depression score and number of social contacts to predict suicidal tendencies.

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Multiple Regression

Multiple Predictors



Single Criterion

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Typical Correlation Matrix

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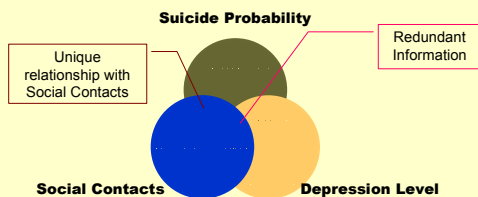
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Problem



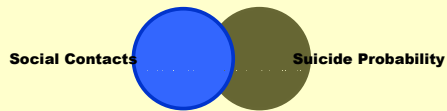
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Solution: Step 1.

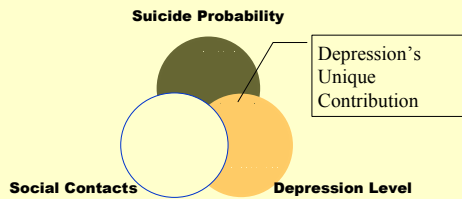


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Solution: Step 2



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Multiple Regression Coefficient

1. Indicated by R .
2. Is always positive.
3. Interpreted the same as r .
4. Same limitations for the first-order relationships.
5. Still cannot conclude causality.

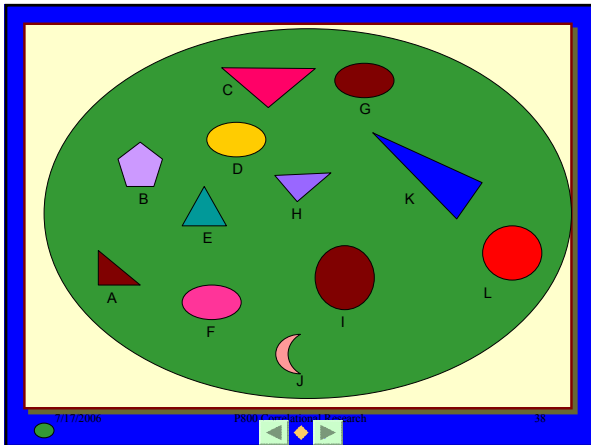
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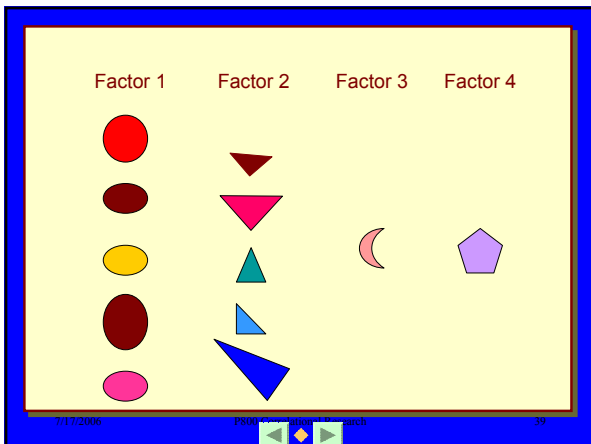
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Factor Analysis

Statistical techniques for identifying interrelationships between items with the goal of identifying items that group or cluster together.





Uses of Factor Analysis

1. Data reduction.
2. Scale development.

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Another Measure of Association Chi Square (χ^2)



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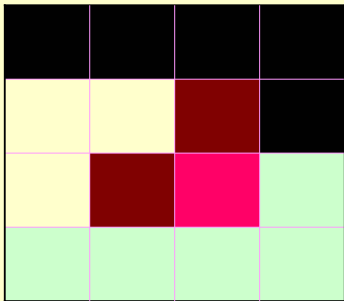
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Question

Does it appear that the colors are randomly distributed among the cells in this matrix?



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Chi-square Example #1

Dr. Pari Metric did a survey of 100 graduate students to determine which classes they liked best. Metric asked the students to indicate which of four classes they liked best: Statistics, Methods, Testing, and Recess.

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Results

	Methods	Statistics	Testing	Recess
f_e	25	25	25	25
f_o	40	30	20	10

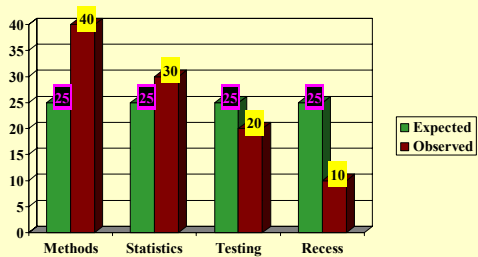
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Results Visually



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Chi-Square Evaluation

$$\chi^2 = 20, p < .05$$

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Chi-Square (χ^2): Goodness of Fit

- Two or more groups.
 - Groups are grouped categorically (Nominal scales).
- Null hypothesis
- Alternative hypothesis.

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Chi-Square: Example #2

The noted statistician, Dr. Polly Nomial, had been conducting a number of tutoring sessions but did not know if participants were passing their classes. Dr. Nomial collected data on 60 students. These data are summarized on the following irresistible page.

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Chi-Square ($r \times c$) Example

The noted statistician, Dr. Polly Nomial, wanted to repeat Anne Nova's study but was interested if there was an effect on the basis of gender. So she asked a sample of students to select their preference for academic activity then broke the group into male and female respondents.

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Nomial's Data

	Statistics	Experimental	Testing	Recess	Total
Male	25	10	10	5	50
Female	20	10	5	5	40
	45	20	15	10	90

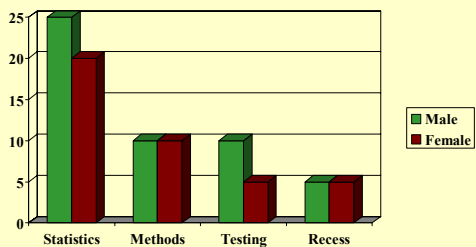
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Visual Representation



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Chi-square (χ^2)

- Two or more independent samples compared on some variable having two or more categories.
 - Examples.
 - School dropouts by ethnic group.
 - Gender of rider by order of finish in a horse race.
- The larger the Chi Square, the larger the relationship.

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The End

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