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Introduction to Psychology

Research Methods in Psychology

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27 Slides

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The Scientific Approach

- Three criteria must be met for something to be considered scientific:
  1. Systematic Empiricism: must rely on observation and measurement to draw conclusions about the world
  2. Public Verification: others must be able to repeat and verify what you find
  3. Solvable Problems: scientific investigations deal only with questions that are answerable given current knowledge and research techniques

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The Scientific Method

- The scientific method consists of several steps that must be followed to insure that your analyses are truly scientific
  1. **Observation**
     - Scientists are astute observers of the world around them and are very curious about what is going on
  2. **Question**
     - The scientist then raises questions about what (s)he sees going on.
  3. **Using a good theory, come up with a reasonable hypothesis (**a testable prediction or explanation for what one has observed.
     - Theory: an integrated set of principles that organizes, explains, and predicts phenomena.
  4. **Collect Data** (experiments, correlational studies, etc)
  5. **Evaluate Data** (usually with statistics)
  6. **Draw conclusions** (if necessary, refine the theory)

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Approaches to Psychological Research

- Psychology is about behavior – which varies from person to person, across situations, and across time.
- Psychologists depend on many different research techniques when studying questions about behavior.
- Three main research approaches
  1. Descriptive – *e.g.*, Case Study
  2. Correlational
  3. Experimental

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Descriptive Approaches

- Case Study
  - Psychologists study, in great detail, one or more individuals with some rare characteristic to gain an in-depth understanding
  - Too few subjects to be able to generalize

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Descriptive Approaches

- Naturalistic Observation
  - The observation of ongoing behavior as it naturally occurs without any intrusion from the researcher
  - Does not explain behavior, only describes it

Using naturalistic observation, Jane Goodall discovered that gorillas, like humans, are capable of making an using tools to suit their needs.

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The Correlational Approach

- Correlational research is used to describe the relationship between two or more naturally occurring variables.
  - Is age related to political conservativism?
  - Are highly extraverted people less afraid of rejection than less extraverted people?
  - Is depression correlated with loneliness?
  - Is I.Q. related to G.P.A.?
- The goal is only to determine if two variables are related, **not** to determine if one causes the other

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The Correlational Approach

- Steps in correlational research:
  - First, you measure 2 variables (X and Y)
  - Then, you make a *scatterplot*
  - Finally, compute the correlation coefficient (***r***)

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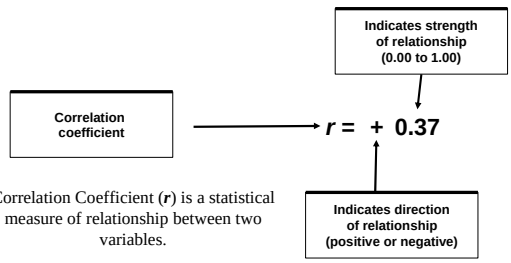
The Correlation Coefficient



Correlation Coefficient (***r***) is a statistical measure of relationship between two variables.

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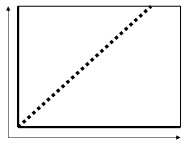
Scatterplots



Perfect positive
correlation (+1.00)

Scatterplot is a graph that consists of points generated by values of two variables for each person. The slope of points depicts the direction, and the amount of scatter the strength of relationship.

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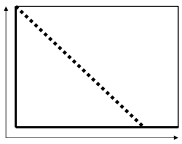
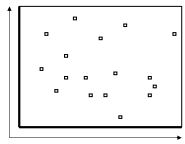
Scatterplots



Perfect negative
correlation (-1.00)



No relationship (0.00)

Scatterplot on the left shows a negative correlation, and the one on the right shows no relationship between the two variables.

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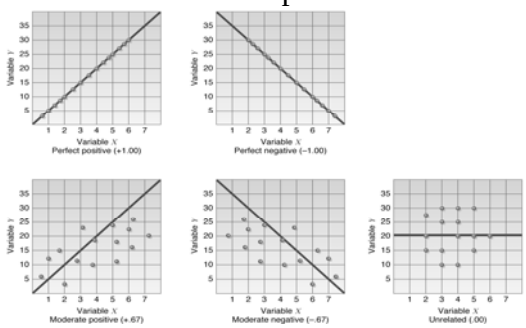
Scatterplots



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The Correlational Approach

- Strengths
  1. Helps you establish if two variables are related
  2. More meaningful interpretation of data than just a description of behavior
- Weaknesses
  1. **Correlation is not causation** – just because two variables are related doesn't mean one causes the other
  2. Third variable problem

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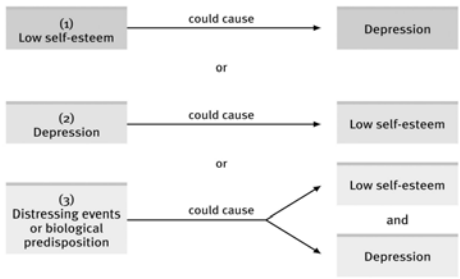
Correlation and Causation



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Experimental Approach

- Experiment
  - You manipulate some aspect of a situation to see if it produces a certain outcome
  - Subjects are **randomly assigned** to certain conditions that you have manipulated
  - Seek to determine if a causal relationship exists between manipulations (**Independent Variable**) and outcome measure (**Dependent Variable**)

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Correlations vs. Experiments

Correlations	Experiments
Is playing aggressive video games *related to* aggressive behavior?	Does playing aggressive video games cause aggressive behavior?
Is high blood pressure *associated with* stress?	Does stress cause high blood pressure?
Is memory ability *correlated with* caffeine intake?	Does caffeine intake affect memory ability?
Is eating sugar *related to* childhood hyperactivity?	Does eating sugar increase hyperactivity in children?

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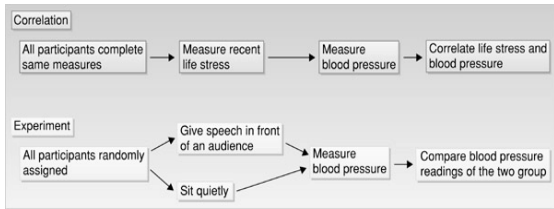
Correlational vs. Experimental Studies



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Experimental Approach

What do we need to know about experiments?

1. **Independent Variable**
   - The situational aspect that is being manipulated
   - The variable whose effect is being studied
2. **Dependent Variable**
   - The outcome that is presumed to change in response to the manipulations of the independent variable
   - In psychology, it is usually a behavior or mental process
   - It is directly observed

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Experiment: An Example

- A researcher know which of two treatments (Cognitive Behavioral Therapy vs. Medication) is more effective for treating depression. There will be a total of 60 subjects (*i.e.*, people who participate in experiments).

CBT	Medication	No treatment	
n = 20	n = 20	n = 20	← **Control Group**

Subjects are assigned to one of these treatment conditions for six weeks. Their level of depression was measured before and after treatment. The question of interest was *which group of subjects would show the biggest drop in depression?*

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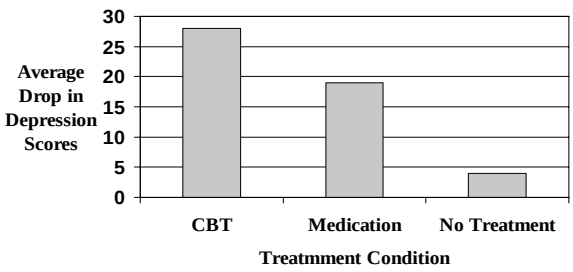
Average Drop in Depression Depending on Treatment Condition



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Experimental Approach

What else do we need to know about experiments?

- Experimental condition
- Control condition
- Random assignment
- Double-blind study

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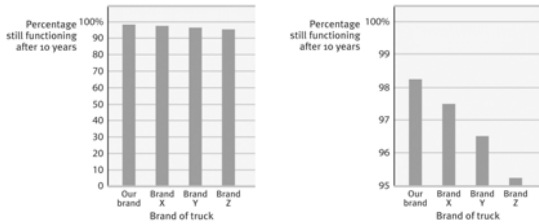
Organizing and Describing Data

Meaningful description of data is important in research. Misrepresentation can lead to incorrect conclusions.



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Measures of Central Tendency

- When you have a distribution of scores, measures of *central tendency* give you an idea as to where most of the scores lie
  - **Mean**: The arithmetic average of scores in a distribution obtained by adding the scores and then dividing by their number
  - **Median**: The middle score in a distribution of scores
  - **Mode**: The most frequently occurring score in a distribution

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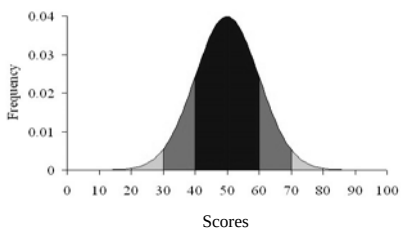
Normal Distribution

- When a distribution of scores is normally distributed, the mean, median, and mode will generally be close together.



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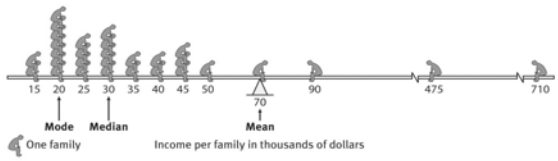
Measures of Central Tendency

A Skewed Distribution



In this case, the mean does <u>not</u> give an accurate depiction of where most of the data points lie.

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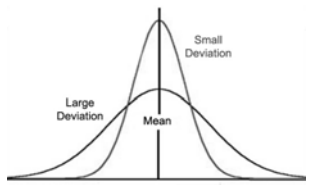
Measures of Variation

<u>Range</u>: The difference between the highest and lowest scores in a distribution.

<u>Standard Deviation</u>: A computed measure of how much scores vary around the mean.



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Standard Deviation

STANDARD DEVIATION IS MUCH MORE INFORMATIVE THAN MEAN ALONE

Note that the test scores in Class A and Class B have the same mean (80), but very different standard deviations, which tell us more about how the students in each class are really faring.

Test Scores in Class A

Score	Deviation From the Mean	Squared Deviation
72	−8	64
74	−6	36
77	−3	9
79	−1	1
82	+2	4
84	+4	16
85	+5	25
87	+7	49
Total = 640	Sum of (deviations)² =	204

Mean = 640 ÷ 8 = 80

Standard deviation =

$$\sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}} = \sqrt{\frac{204}{8}} = 5.0$$

Test Scores in Class B

Score	Deviation From the Mean	Squared Deviation
60	−20	400
60	−20	400
70	−10	100
70	−10	100
90	+10	100
90	+10	100
100	+20	400
100	+20	400
Total = 640	Sum of (deviations)² =	2000

Mean = 640 ÷ 8 = 80

Standard deviation =

$$\sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}} = \sqrt{\frac{2000}{8}} = 15.8$$