



# Thinking Critically with Psychological Science

## Chapter 1

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### Thinking Critically with Psychological Science

- What's wrong with intuition?
  - Lie detection
  - Eyewitness accuracy

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### Left Half of Room

- Psychologists have found that separation weakens romantic attraction.
- As the saying goes, "Out of sight, out of mind."
- Imagine why this is true?

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## Right Half of Room

- Psychologists have found that separation strengthens romantic attraction.
- As the saying goes, "Absence makes the heart grow fonder."
- Imagine why this is true?

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## Post-hoc Explanations

- Hindsight bias "I knew it all along"
  - Predicting / post-dicting chaos in Iraq after invasion.
  - Predicting / post-dicting flooding from Hurricane Katrina
  - It's a lot easier explaining why something happened after the fact than predicting what will happen before the fact ("Hindsight is 20/20")
- *This is why you don't look at the answers before you commit yourself to an answer on practice tests.*

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## Overconfidence from Hindsight Bias

Sometimes we think we know more than we actually know.

How long do you think it would take to unscramble these anagrams?

People said it would take about 10 seconds, yet on average they took about 3 minutes (Goranson, 1978).

Anagram	
WREAT	WATER
ETYRN	ENTRY
GRABE	BARGE

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Thinking Critically ...

Should we be allowed to talk on cell phones while driving?

How to answer this?

- The Case Study
- The Survey
- Naturalistic Observation
- Correlations

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Thinking Critically ...

Case Studies

- I read an article where they interviewed a lot of people who had gotten in accidents because they were talking on their cell phones. Therefore, cell phones cause accidents

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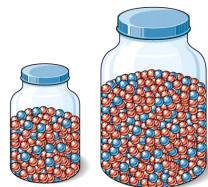
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Survey

Random Sampling

If each member of a population has an equal chance of inclusion into a sample, it is called a random sample (unbiased). If the survey sample is biased, its results are not valid.



The fastest way to know about the marble color ratio is to blindly transfer a few into a smaller jar and count them.

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## Thinking Critically ...

### Surveys

Q: Should cell phone usage be ~~forbidden~~ while driving?

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## Thinking Critically ...

### Naturalistic Observation

- My friends talk on their cell phones all the time when they drive and they haven't had any accidents.

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## Thinking Critically ...

### Correlation

- Since the invention of cell phones, there have been more automobile accidents (a positive correlation between time since invention and accidents).
- The more calls made from an automobile, the more likely it was involved in an accident (positive correlation between number of calls and number of accidents).

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## Psychological Science<sup>1</sup>

- How can we differentiate between uninformed opinions and examined conclusions?
- The science of psychology helps make these examined conclusions, which leads to our understanding of how people *feel, think, and act as they do*.

<sup>1</sup>One of the premier journals in our field is also called **Psychological Science**. It's Editor is Robert Kail, Professor of Psychological Sciences, Purdue University!

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## The Scientific Attitude

The scientific attitude is composed of **curiosity** (passion for exploration), **skepticism** (doubting and questioning) and **humility** (ability to accept responsibility when wrong).

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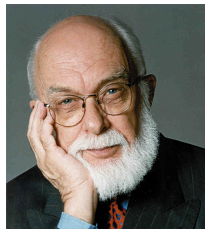
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## Critical Thinking

Critical thinking does not accept arguments and conclusions blindly.

It examines assumptions, discerns hidden values, evaluates evidence and assesses conclusions.



The Amazing Randi

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## Scientific Method

Psychologists, like all scientists, use the scientific method to construct theories that organize, summarize and simplify observations.

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## Theory

A **Theory** is an explanation that integrates principles and organizes and predicts behavior or events. From a theory, many hypotheses can be derived and tested.

Theory: Distractions impair performance on difficult tasks.

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## Hypothesis

A **Hypothesis** is a testable prediction, *often prompted by (derived from) a theory*, to enable us to accept, reject or revise the theory.

*Deductive vs Inductive*

Hypothesis: Talking on cell phones impairs driving performance.

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## Thinking Critically ...

### Experimentation

- Exploring Cause and Effect
- Experimental control: Controlling other variables while manipulating the ones of interest
- Control or comparison groups
- Random assignment
- Independent and Dependent Variables

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## Experimentation

### Exploring Cause and Effect

Like other sciences, experimentation is the backbone of psychology research. Experiments isolate causes and their effects.

Talking on cell phones (causes) impaired performance.

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## Exploring Cause & Effect

Many factors influence our behavior. Experiments (1) **manipulate** factors that interest us, while other factors are kept under (2) **control**.

Effects generated by manipulated factors isolate cause and effect relationships.

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## Experimentation

- Experimental control: Controlling other variables while manipulating the ones of interest
  - What do we want to manipulate?
  - What do we want to hold constant?
- Control or comparison groups
  - To what are we comparing cell phone usage?
  - There can be more than one comparison/control group.

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## *Random Assignment*

Assigning participants to experimental (cell phone) and control (??) conditions by random assignment minimizes pre-existing differences between the two groups.

## *Random Selection*

Choosing participants so that they are a random sample from the population of interest (so that they are representative and not an unusual sample).

*For experiments, random assignment is essential; random selection is less important*

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## Independent Variable

An **Independent Variable** is a factor manipulated by the experimenter. The effect of the independent variable is the focus of the study.

What would our IV be?

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## Dependent Variable

A **Dependent Variable** is a factor that may change in response to an independent variable. In psychology, it is usually a behavior or a mental process (but, could also be physiological, facial emotion, etc.).

What would our DV be?

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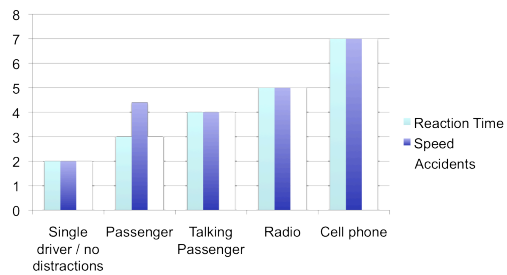
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## Depicting Results



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## Thinking Critically ...

### Statistical Reasoning

- Describing Data
- Making Inferences

### FAQs About Psychology

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## Impression of Psychology

With hopes of satisfying curiosity, many people listen to talk-radio counselors and psychics to learn about others and themselves.



Dr. Crane (radio-shrink)



Psychic (Ball gazing)

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## The Need for Psychological Science

### Intuition & Common Sense

Many people believe that intuition and common sense are enough to bring forth answers regarding human nature.

Intuition and common sense may aid queries, but they are not free of error.

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## Limits of Intuition

Personal interviewers may rely too much on their "gut feelings" when meeting with job applicants.



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**Errors of Common Sense**

Try this !

Fold a piece of paper (0.1 mm thick) 100 times. How thick will it be?

800,000,000,000,000 times the distance between the sun and the earth.

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**Hindsight Bias**

**Hindsight Bias** is the “I-knew-it-all-along” phenomenon.

After learning the outcome of an event, many people believe they could have predicted that very outcome. We only knew the dot.com stocks would plummet after they actually did plummet.

*This is why you don't look at the answers before you commit yourself to an answer on practice tests.*

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**Research Observations**

**Research** would require us to administer tests of self-esteem and depression. Individuals given failure vs success feedback would then be tested on a self-esteem test. Presumably, self-esteem would be lower for the failure group. Then, we would give participants a depression test. Presumably, those with failure feedback (through lowered self-esteem) would have higher depression scores.

This would *support* our hypothesis.

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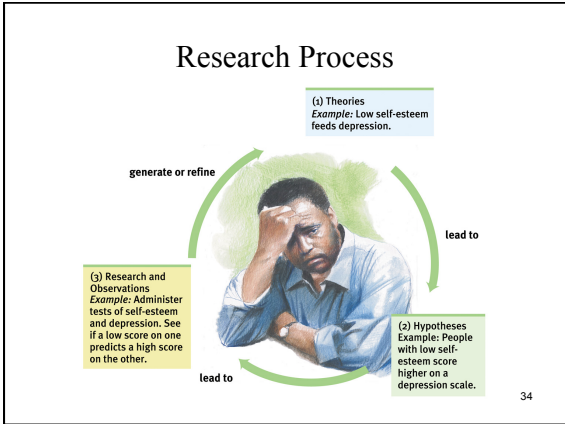
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### Description

#### Case Study

A technique in which one person is studied in depth to reveal underlying behavioral principles.

Is language uniquely human?

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### Case Study

#### Clinical Study

A clinical study is a form of case study in which the therapist investigates the problems associated with a client.

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## Survey

A technique for ascertaining the self-reported attitudes, opinions or behaviors of people usually done by questioning a representative, random sample of people.



© iStockphoto.com/John D. Sullivan

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## Survey

### False Consensus Effect

A tendency to overestimate the extent to which others share our beliefs and behaviors.

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## Naturalistic Observation

Observing and recording the behavior of animals in the wild and recording self-seating patterns in a multiracial school lunch room constitute naturalistic observation.



© iStockphoto.com/John D. Sullivan

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## Descriptive Methods

### Summary

Case studies, surveys, and naturalistic observation describe behaviors.

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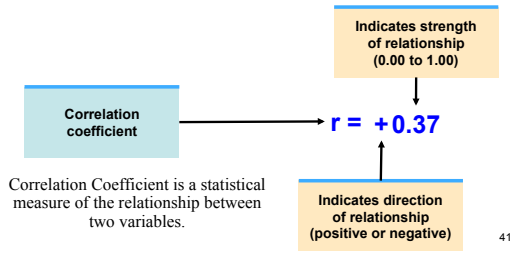
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## Correlation

When one trait or behavior accompanies another, we say the two correlate.



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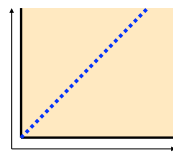
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## Scatterplots



Perfect positive correlation (+1.00)

**Scatterplot** is a graph comprised of points that are generated by values of two variables. The slope of the points depicts the direction, while the amount of scatter depicts the strength of the relationship.

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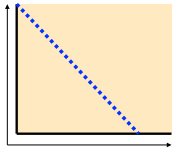
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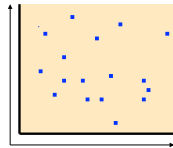
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## Scatterplots



Perfect negative correlation (-1.00)



No relationship (0.00)

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

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## Data

Data showing height and temperament in people.

HEIGHT AND TEMPERAMENT OF 20 MEN		
Subject	Height in Inches	Temperament
1	80	75
2	63	66
3	61	60
4	79	90
5	74	60
6	69	42
7	62	42
8	75	60
9	77	81
10	60	39

HEIGHT AND TEMPERAMENT OF 20 MEN		
Subject	Height in Inches	Temperament
11	64	48
12	76	69
13	74	72
14	66	57
15	73	63
16	70	75
17	63	30
18	71	57
19	68	84
20	70	39

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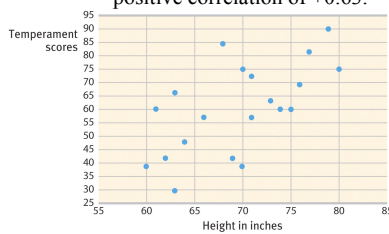
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## Scatterplot

The Scatterplot below shows the relationship between height and temperament in people. There is a moderate positive correlation of +0.63.



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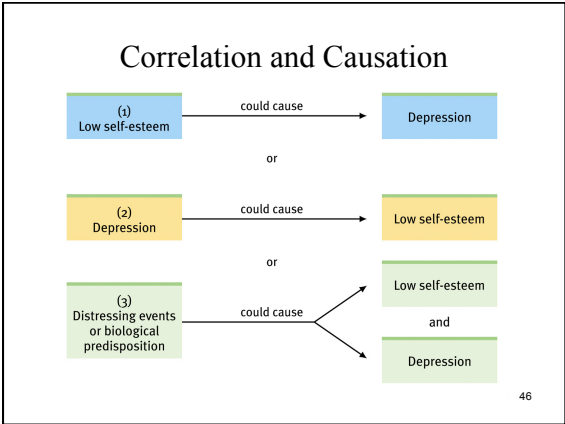
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### Illusory Correlation

The perception of a relationship where no relationship actually exists. Parents conceive children after adoption.

	Conceive	Do not conceive	
Adopt	Confirming evidence	Disconfirming evidence	 <small>Michael Newman/istockphoto.com</small>
Do not adopt	Disconfirming evidence	Confirming evidence	

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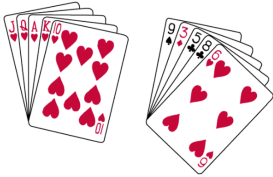
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### Order in Random Events

Given random data, we look for order and meaningful patterns.



Your chances of being dealt either of these hands is precisely the same: 1 in 2,598,960.

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## Order in Random Events

Given large numbers of random outcomes, a few are likely to express order.



Angelo and Maria Gallina won two California lottery games on the same day.

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## Double-blind Procedure

In evaluating drug therapies, patients and experimenter's assistants should remain unaware of which patients had the real treatment and which patients had the placebo treatment.

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## Comparison

Below is a comparison of different research methods.

COMPARING RESEARCH METHODS				
Research Method	Basic Purpose	How Conducted	What Is Manipulated	Weaknesses
Descriptive	To observe and record behavior	Do case studies, surveys, or naturalistic observations	Nothing	No control of variables; single cases may be misleading
Correlational	To detect naturally occurring relationships; to assess how well one variable predicts another	Compute statistical associations, sometimes among survey responses	Nothing	Does not specify cause and effect
Experimental	To explore cause and effect	Manipulate one or more factors; use random assignment	The independent variable(s)	Sometimes not feasible; results may not generalize to other contexts; not ethical to manipulate certain variables

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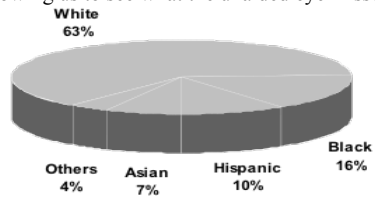
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## Statistical Reasoning

Statistical procedures analyze and interpret data allowing us to see what the unaided eye misses.



Composition of ethnicity in urban locales

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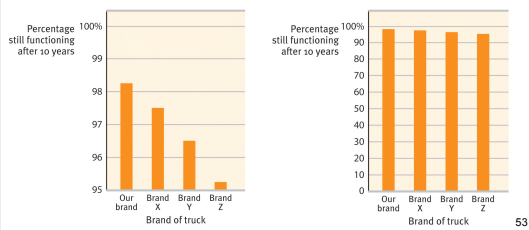
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## Describing Data

A meaningful description of data is important in research. Misrepresentation may lead to incorrect conclusions.



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## Example 1

- Individuals primed with "old people concepts" are more likely to walk slower than those who are not primed with "old people concepts."
- *Independent variable*
  - Operationally define "old people concepts"
- *Dependent variable*
  - Operationally define "walking speed."

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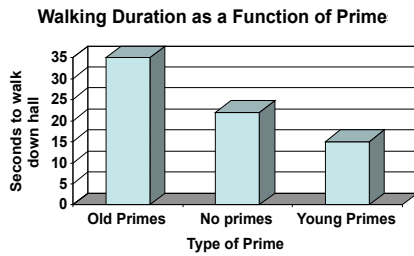
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## Example 1: Graph



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## Announcements

- Exam 1: next Thursday, Jan. 29, in class during class time
- Study Session for Exam 1: Wednesday, Jan. 28, at 6:30pm in EE129
- Study Guide for Exam 1 will be available today on the class webpage (under announcements)

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## Example 2

- Temperature (among a few other concepts like size and distance) is a fundamental facet of human understanding and perception. It permeates everything.
- People primed with warm will construe a more favorable person perception of a stranger than if they are primed with cold
- Independent variable
  - Operationally define "warm" and "cold"
- Dependent variable
  - Operationally define "person perception."



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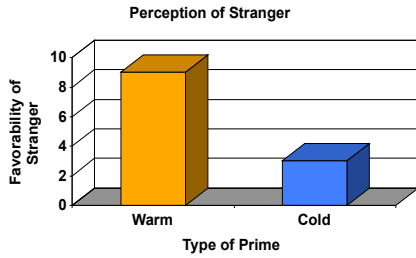
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## Example 2: Graph



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## Measures of Central Tendency

**Mode:** The most frequently occurring score in a distribution.

**Mean:** The arithmetic average of scores in a distribution obtained by adding the scores and then dividing by the number of scores that were added together.

**Median:** The middle score in a rank-ordered distribution.

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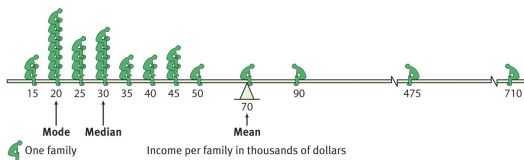
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## Measures of Central Tendency

### A Skewed Distribution



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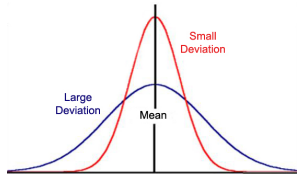
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## Measures of Variation

**Range:** The difference between the highest and lowest scores in a distribution.

**Standard Deviation:** 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 doing.

Test Scores in Class A			Test Scores in Class B		
Score	Deviation From the Mean	Squared Deviation	Score	Deviation From the Mean	Squared Deviation
72	-8	64	60	-20	400
74	-6	36	60	-20	400
77	-3	9	70	-10	100
79	-1	1	70	-10	100
80	+0	0	80	+0	0
84	+4	16	90	+10	100
85	+5	25	100	+20	400
87	+7	49	100	+20	400
<b>Total = 640</b>		<b>Sum of (deviations)<sup>2</sup> = 204</b>	<b>Total = 640</b>		<b>Sum of (deviations)<sup>2</sup> = 2000</b>
<b>Mean = 640 ÷ 8 = 80</b>			<b>Mean = 640 ÷ 8 = 80</b>		
<b>Standard deviation =</b> $\sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}} = \sqrt{\frac{204}{8}} = 5.0$			<b>Standard deviation =</b> $\sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}} = \sqrt{\frac{2000}{8}} = 15.8$		

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## Example 3

- Students get better grades if they sit near the front of the classroom
- Independent variable
- Predictor variable
- Dependent variable

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### Example 4

- Hypothesis: People are more likely to wash their hands in a public bathroom if other people are in the bathroom.
- Why might this be the case (rationale)?
- How would you test this? (method)

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### Making Inferences

A statistical statement of how frequently an obtained result occurred by experimental manipulation or by chance.

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### Making Inferences

When is an Observed Difference Reliable?

- Representative samples are better than biased samples.
- Less variable observations are more reliable than more variable ones.
- More cases are better than fewer cases.

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## Making Inferences

When is a Difference Significant?

When sample averages are reliable and the difference between them is relatively large, we say the difference has statistical significance.

For psychologists this difference is measured through alpha level set at 5 percent.

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## FAQ

**Q1.** Can laboratory experiments illuminate everyday life?

**Answer:** Artificial laboratory conditions are created to study behavior in simplistic terms. The goal is to find underlying principles that govern behavior.

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## FAQ

**Q2.** Does behavior depend on one's culture?

**Answer:** Even when specific attitudes and behaviors vary across cultures, as they often do, the underlying processes are much the same.



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## FAQ

Q3. Does behavior vary with gender?

**Answer:** Yes. Biology determines our sex, and culture further bends the genders. However, in many ways females and males are similarly human.

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## FAQ

Q4. Why do psychologists study animals?

**Answer:** Studying animals gives us the understanding of many behaviors that may have common biology across animals and humans.

And, there are more animals in the world than people, and their behavior is interesting in and of itself.



D. Shapiro, © Wildlife Conservation Society

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## FAQ

Q5. Is it ethical to experiment on animals?

**Answer:** To gain insights to devastating and fatal diseases. All researchers who deal with animal research are required to follow ethical guidelines in caring for these animals.

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## FAQ

**Q6.** Is it ethical to experiment on people?

**Answer:** Experiments that do not involve any kind of physical or psychological harm beyond normal levels encountered in daily life may be carried out.

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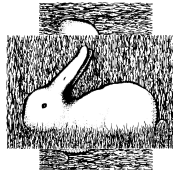
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## FAQ

**Q7.** Is psychology free of value judgments?

**Answer:** No. Psychology emerges from people who subscribe to a set of values and judgments.



© Roger Shepard

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## FAQ

**Q8.** Is psychology potentially dangerous?

**Answer:** It can be, but it is not. The purpose of psychology is to help humanity with problems such as war, hunger, prejudice, crime, family dysfunction, etc.

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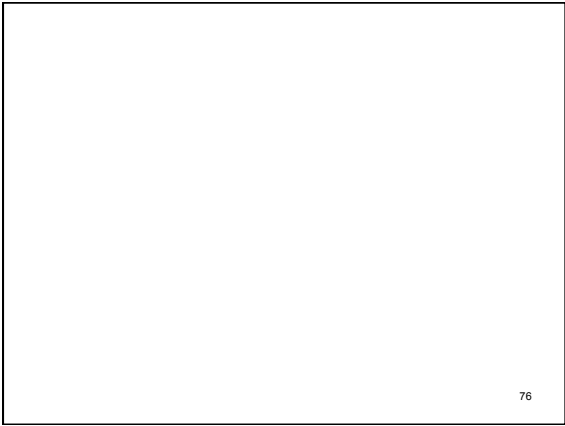
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