

# Psychological Research Methods



Excavating Human Behaviors



# Thinking Critically with Psychological Science

## Chapter 1

# Thinking Critically with Psychological Science

## The Need for Psychological Science

- The limits of Intuition and Common Sense
- The Scientific Attitude
- The Scientific Method

# Thinking Critically ...

## Description

- The Case Study
- The Survey
- Naturalistic Observation

# Thinking Critically ...

## Correlation

- Correlation and Causation
- Illusory Correlation
- Perceiving Order in Random Events

# Thinking Critically ...

## Experimentation

- Exploring Cause and Effect
- Evaluating Therapies
- Independent and Dependent Variables

# Thinking Critically ...

## Statistical Reasoning

- Describing Data
- Making Inferences

## FAQs About Psychology

# 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)



# 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.

# Limits of Intuition

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



Taxi/ Getty Images

# 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.

# Let's do some basic math:

Solve in your head:

- Begin with 1000
- Add 40
- Add 1000
- Add 30
- Add 1000
- Add 20
- Add 1000
- Add 10
- Answer??????

- Raise your hand if the answer is 5000

**YOU ARE WRONG!!!!!!!**

- The correct answer is 4100!!!!
- Don't believe me....let's look again.
- This is an example of intuition error.

# Handout 1-2

Explaining research...

Please respond to the following...

# Hindsight Bias

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

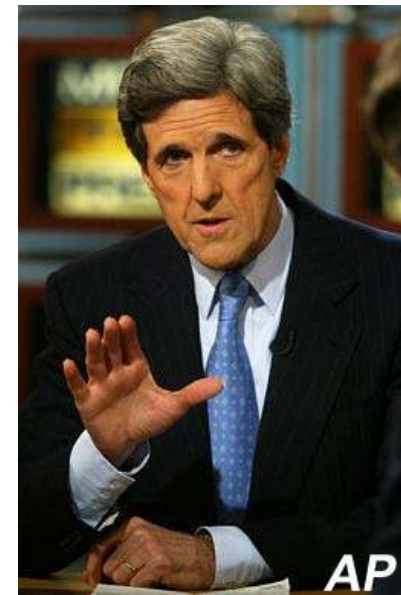
After learning the outcome of an event, many people believe they could have predicted that very outcome. We only knew the dot.com stocks would plummet after they actually did plummet.



# Hindsight Bias

- The tendency to believe, after learning the outcome, that you knew it all along.

Only after Kerry won the Iowa Primary, did people begin to say that Dean was too liberal. What would people say about Kerry if Dean won?



# Overconfidence

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

# Overconfidence

- We tend to think we know more than we do. (Based on your CURRENT knowledge)

82% of U.S. drivers consider themselves to be in the top 30% of their group in terms of safety



81% of new business owners felt they had an excellent chance of their businesses succeeding. When asked about the success of their peers, the answer was only 39%. (Now that's overconfidence!!!)



# Famous Overconfidence Quotes

- “ There is no reason for anyone to have a computer in their home>” (Ken Olson, pres. Of Digital Equip Co., 1977)
- “Heavier than air flying machines are impossible.” (Lord Kelvin, Brit mathematician, physicist, pres. Of Brit. Royal Society)
- Reagan doesn’t have the presidential look” (movie exec. When asked if he should get the lead role in pres. Movie)

# Famous Overconfidence Quotes

- “Man will never reach the moon, regardless of all future scientific advances.” Lee DeForest, inventor of the vacuum tube, 1957)

# Psychological Science

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

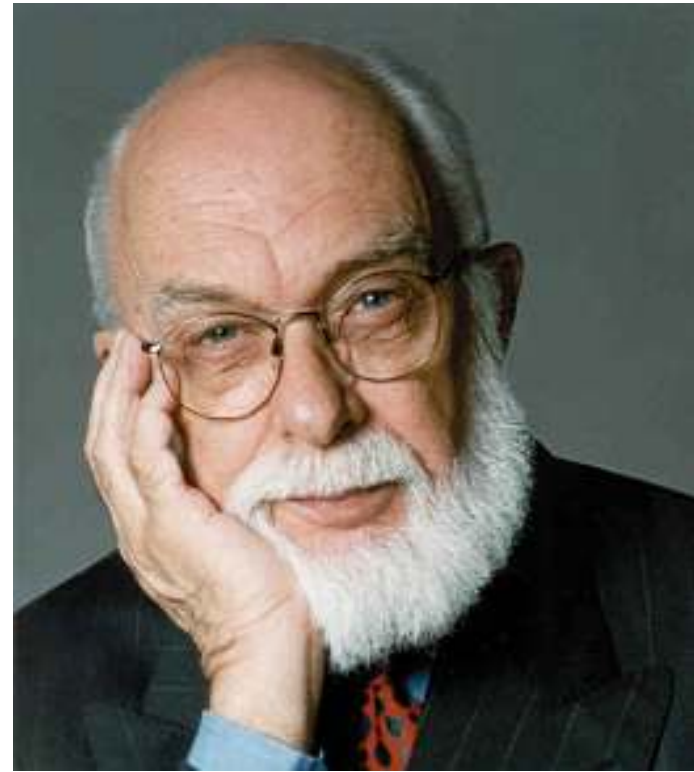
# The Scientific Attitude

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

# Critical Thinking

Critical thinking does not accept arguments and conclusions blindly.

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



Courtesy of the James Randi Education Foundation

The Amazing Randi



# Scientific Method

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

# Scientific Method



1. Observe some aspect of the universe.
2. Invent a theory that is consistent with what you have observed.
3. Use the theory to make predictions.
4. Test those predictions by experiments or further observations.
5. Modify the theory in the light of your results.
6. Go to step 3.

# Replication

- Independent researchers must be able to reproduce the results in order to verify the original findings.

# Theory

A **Theory** is an explanation that integrates principles and organizes and predicts behavior or events.

For example, low self-esteem contributes to depression.

# Hypothesis

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

People with low self-esteem are apt to feel more depressed.

# Hypothesis

- A tentative theory that has not yet been tested.
- Have operational definitions.
- Be replicable.

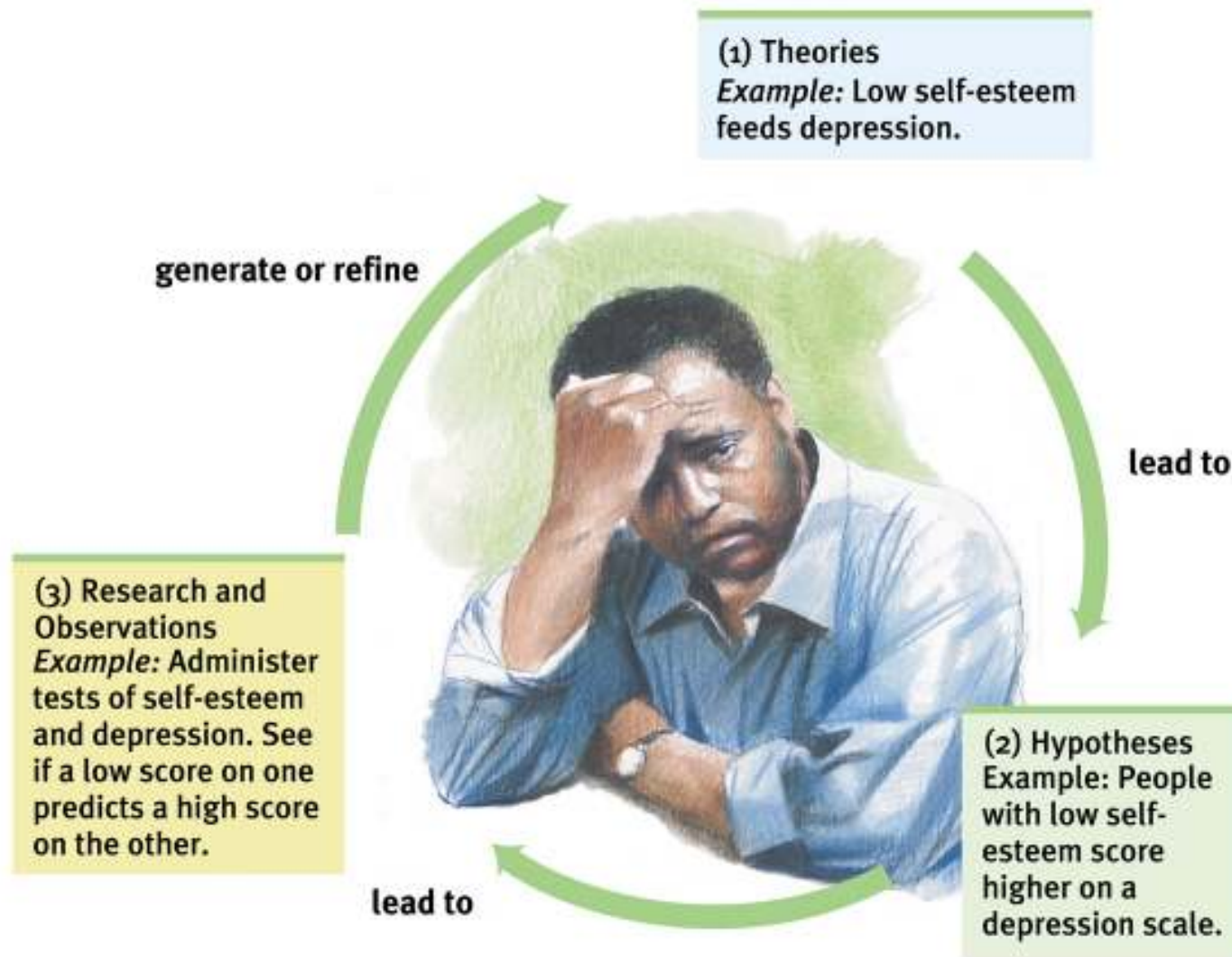
# Methods of Observation

# Research Observations

**Research** would require us to administer tests of self-esteem and depression. Individuals who score low on a self-esteem test and high on a depression test would confirm our hypothesis.



# Research Process



# Types of Research

- Descriptive
- Correlational
- Experimental



What is going on in this picture?

We cannot say exactly, but we can describe what we see.

Thus we have.....

## Descriptive Research

- Any research that observes and records.
- Does not talk about relationships, it just describes.

# Description

## Case Study

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



Susan Kuklin / Photo Researchers

Is language uniquely human?

# Case Study

## Clinical Study

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



<http://behavioralhealth.typepad.com>

# The Case Study

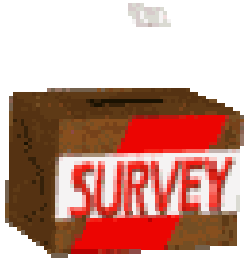
- Where one person (or situation) is observed in depth.



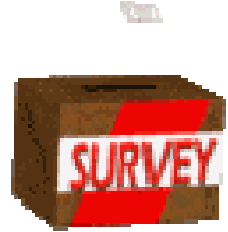
What are the strengths and weaknesses of using a tragedy like the Columbine School Shootings as a case study?

# Case Studies

<b>Advantages</b>	<b>Disadvantages</b>
<ul style="list-style-type: none"><li>• Provides a good way to generate hypotheses</li><li>• Yields data that other methods can't provide</li></ul>	<ul style="list-style-type: none"><li>• Sometimes gives incomplete information</li><li>• Can be subjective and thus may yield biased results</li><li>• Doesn't allow conclusions about cause-and-effect relationships</li></ul>



# The Survey Method



- Used in both descriptive and correlational research.
- Use Interview, mail, phone, internet etc...
- The Good- cheap, anonymous, diverse population, and easy to get **random sampling** (a sampling that represents your population you want to study).



# Survey

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



<http://www.lynnfeatherstone.org>

# Survey

## Wording Effect

Wording can change the results of a survey.

Q: Should cigarette ads and pornography be allowed on television? (not allowed vs. forbid)

# Survey

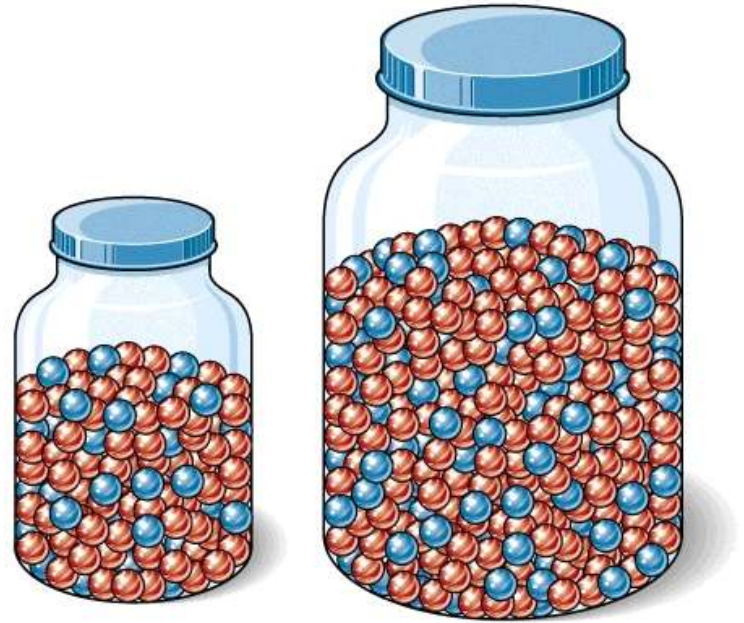
## False Consensus Effect

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

# 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.

# Survey Method: The Bad

- Low Response Rate
- People Lie or just misinterpret themselves.
- Wording Effects



How accurate would a survey be about the frequency of diarrhea?

# Surveys

## Advantages

- Yields a lot of information
- Provides a good way to generate hypotheses
- Can provide information about many people since it's cheap and easy to do

## Disadvantages

- Provides information about behavior that can't be observed directly
- Relies on self-report data, which can be misleading
- Doesn't allow conclusions about cause-and-effect relationships

# Naturalistic Observation

- Observing and recording behavior in natural environment.
- No control- just an observer.



What are the benefits and detriments of Naturalistic Observation?

# 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.



Courtesy of Gilda Morelli



# Naturalistic Observations

## Advantages

- Can be useful for generating hypotheses
- Provides information about behavior in the natural environment

## Disadvantages

- Sometimes yields biased results
- May be difficult to do unobtrusively
- Doesn't allow conclusions about cause-and-effect relationships

# Descriptive Methods

## Summary

Case studies, surveys, and naturalistic observation **describe behaviors.**

# Correlational Research

- Detects relationships between variables.
- Does NOT say that one variable causes another.



There is a positive correlation between ice cream and murder rates. Does that mean that ice cream causes murder?

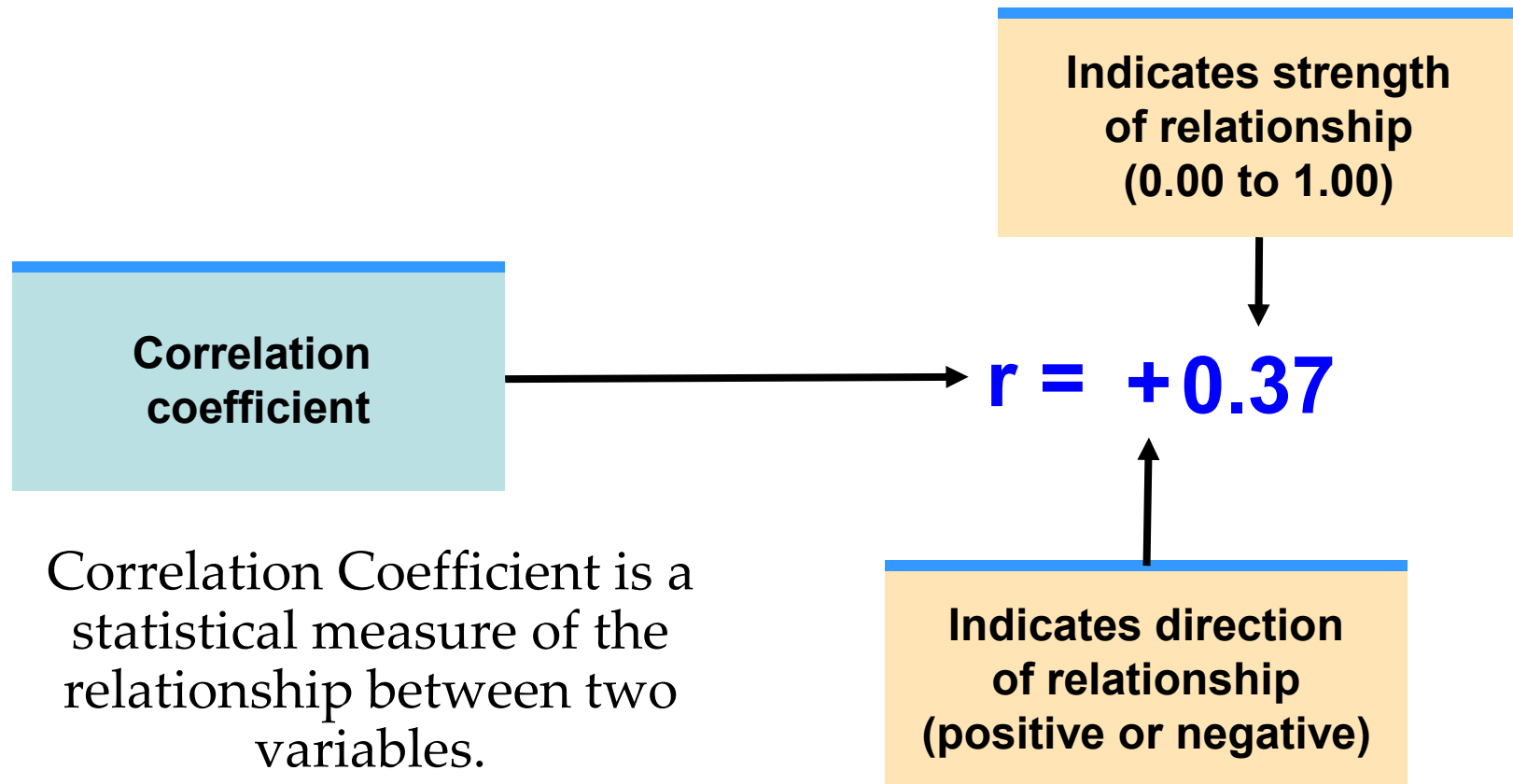


Measured using a *correlation coefficient*.

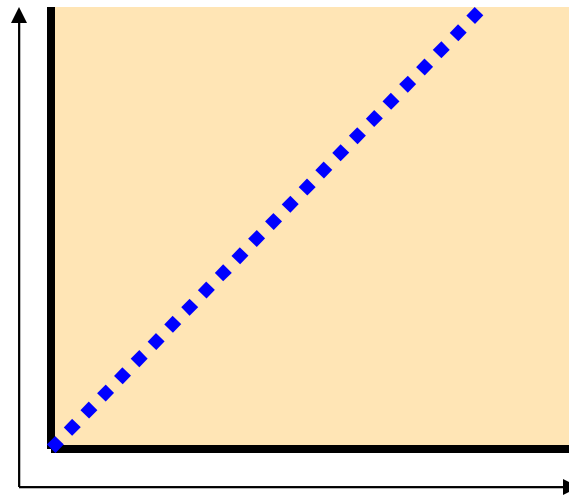
- A statistical measure of the extent to which two factors relate to one another

# Correlation

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



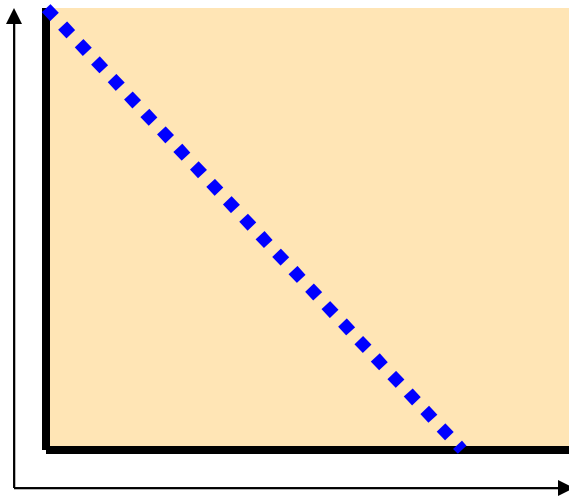
# Scatterplots



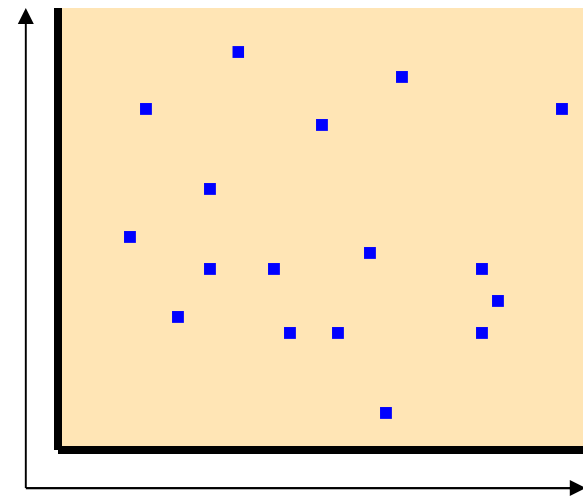
Perfect positive  
correlation (+1.00)

**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.

# 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.

# Data

Data showing height and temperament in people.

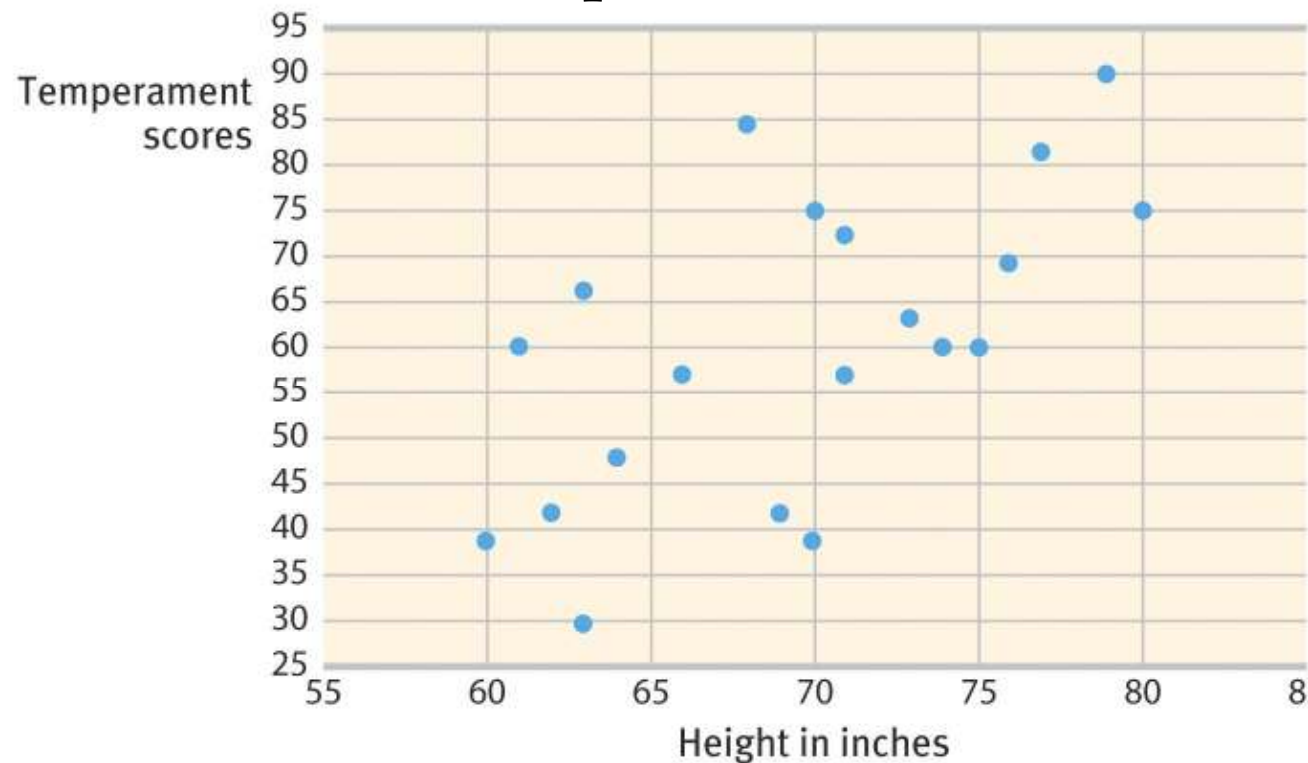
HEIGHT AND TEMPERAMENT OF 20 MEN		
Subject	Height in Inches	Temperament
1	80	75
2	63	66
3	61	60
4	79	90
5	74	60
6	69	42
7	62	42
8	75	60
9	77	81
10	60	39

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



# Scatterplot

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



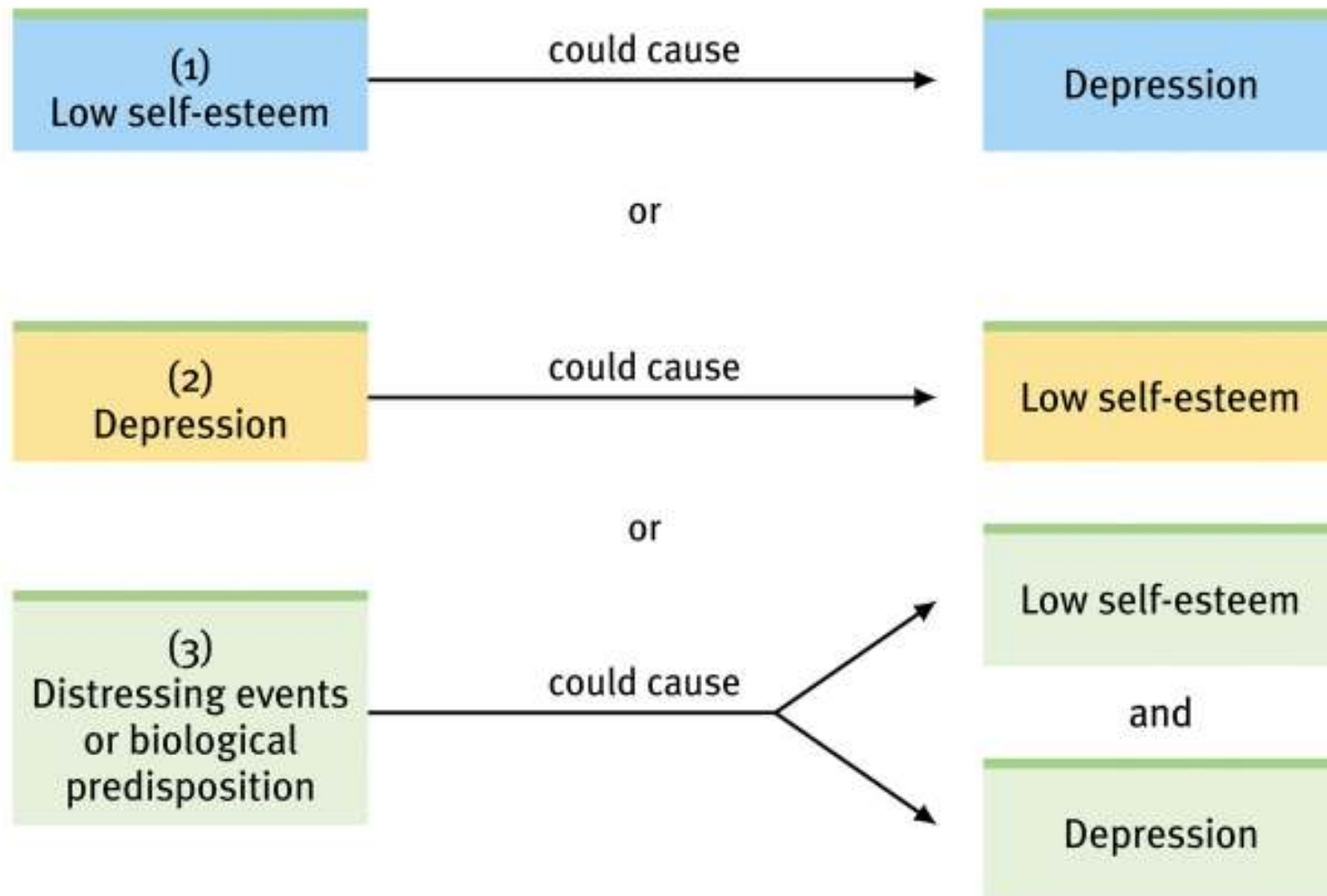
# Practice with Correlations

- WKST – scatterplots and correlation coefficients
-

# The Challenger Disaster

- <http://www.youtube.com/watch?v=AfnvFnzs91s>

# Correlation and Causation



# Illusory Correlation

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

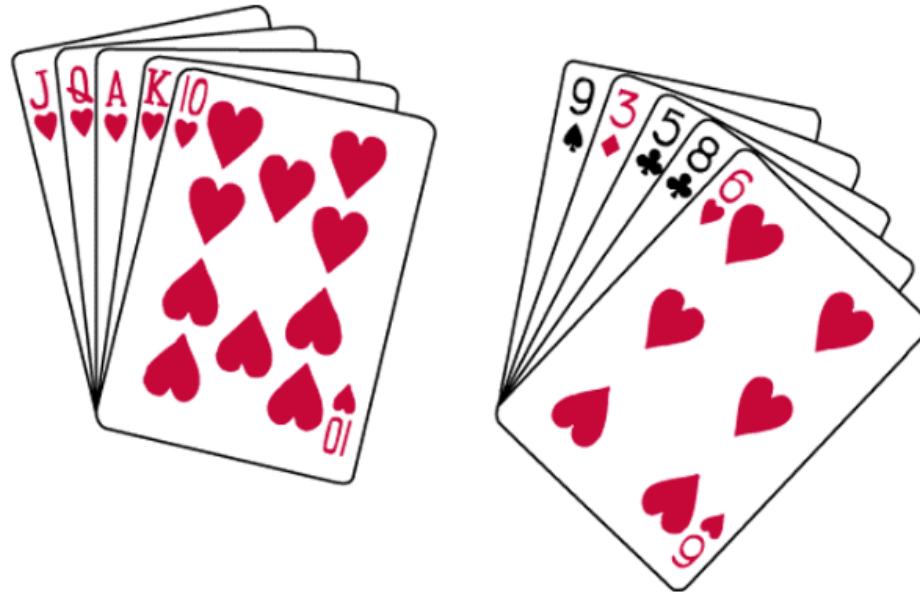
	Conceive	Do not conceive
Adopt	Confirming evidence	Disconfirming evidence
Do not adopt	Disconfirming evidence	Confirming evidence



Michael Newman Jr./ Photo Edit

# 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.

# Order in Random Events

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



Jerry Telfer/ San Francisco Chronicle

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

# Experimental Research

- Explores cause and effect relationships.

Eating too many bananas causes



Constipation





# Steps in Designing an Experiment

1. Hypothesis
2. Pick Population: Random Selection then Random Assignment.
3. Operationalize the Variables
4. Identify Independent and Dependent Variables.
5. Look for Extraneous Variables
6. Type of Experiment: Blind, Double Blind etc..
7. Gather Data
8. Analyze Results

# Experimental Vocabulary

- **Independent Variable:** factor that is manipulated
- **Dependent Variable:** factor that is measured
- **Extraneous Variables:** factors that effect DV, that are not IV.
- **Experimental Group:** Group exposed to IV
- **Control Group:** Group not exposed to IV
- **Placebo:** inert substance that is in place of IV in Control Group

# Experimentation

## Exploring Cause and Effect

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

# 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.

# Independent Variable

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

For example, when examining the effects of breast feeding upon intelligence, breast feeding is the independent variable.

# 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.

For example, in our study on the effect of breast feeding upon intelligence, intelligence is the dependent variable.

# Experiment Procedures

## 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.

# Experiment Procedures

## Random Assignment

Assigning participants to experimental (Breast-fed) and control (formula-fed) conditions by random assignment minimizes pre-existing differences between the two groups.



# Experimentation

A summary of steps during experimentation.

**Random assignment**  
(controlling for other variables  
such as parental intelligence  
and environment)



Condition	Independent variable	Dependent variable
Experimental	Breast milk	Intelligence score, age 8
Control	Formula	Intelligence score, age 8

# Comparison

Below is a comparison of different research methods.

<b>COMPARING RESEARCH METHODS</b>				
<b>Research Method</b>	<b>Basic Purpose</b>	<b>How Conducted</b>	<b>What Is Manipulated</b>	<b>Weaknesses</b>
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 association, 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

# Common Pitfalls of Research

- Hawthorne Effect – you change your behavior b/c you are being watched
- Experimenter Bias
- Volunteer Bias
- Non-Random Sampling
- Demand Characteristics (Situational Bias)
- Confounding Variables
- Confusing Correlation for Causation
- Placebo Effect – experimental results caused by expectation of participant getting inert substance

TABLE 1.2

COMPARING RESEARCH METHODS

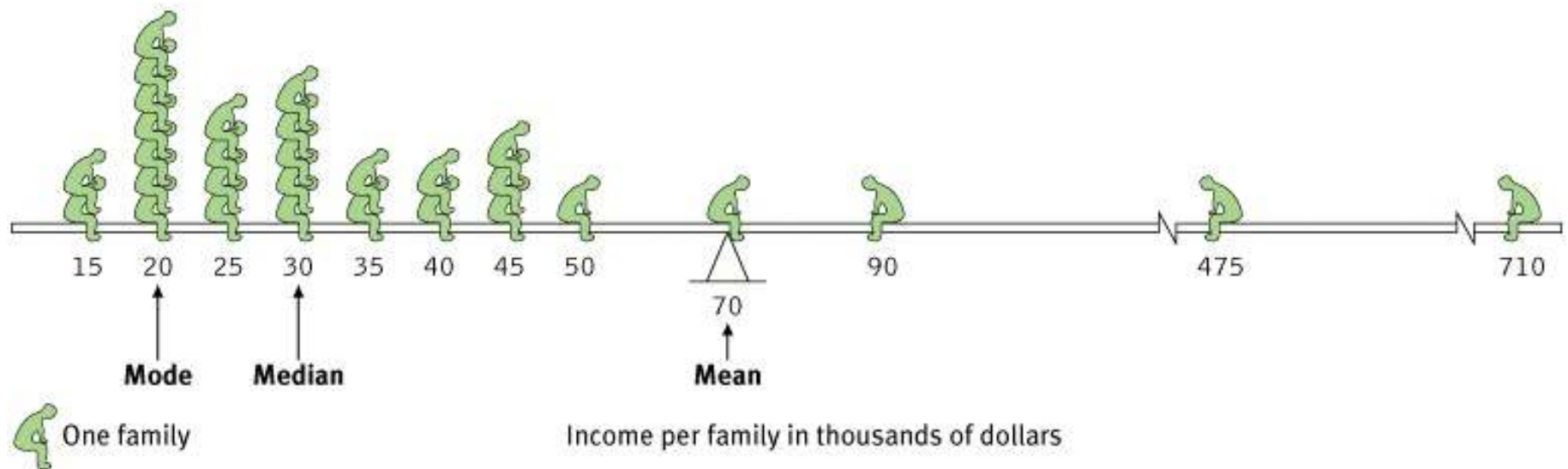
<b>Research Method</b>	<b>Basic Purpose</b>	<b>How Conducted</b>	<b>What Is Manipulated</b>
<b>Descriptive</b>	To observe and record behavior	Case studies, surveys, and naturalistic observations	Nothing
<b>Correlational</b>	To detect naturally occurring relationships; to assess how well one variable predicts another	Computing statistical association, sometimes among survey responses	Nothing
<b>Experimental</b>	To explore cause and effect	Manipulating one or more factors and using random assignment to eliminate preexisting differences among subjects	The independent variable(s)

# Analyze Results

- *Use measures of central tendency* (mean, median and mode).
- *Use measures of variation* (range and standard deviation).

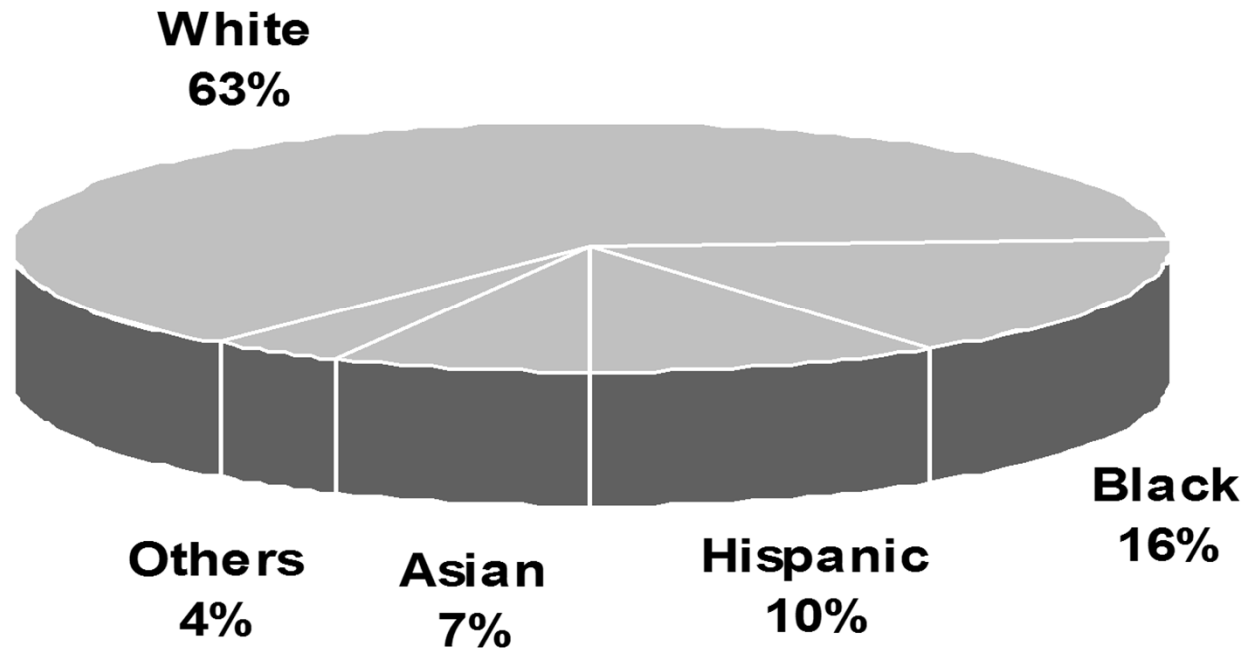
# A Skewed Distribution

Are the results positively or negatively skewed?



# Statistical Reasoning

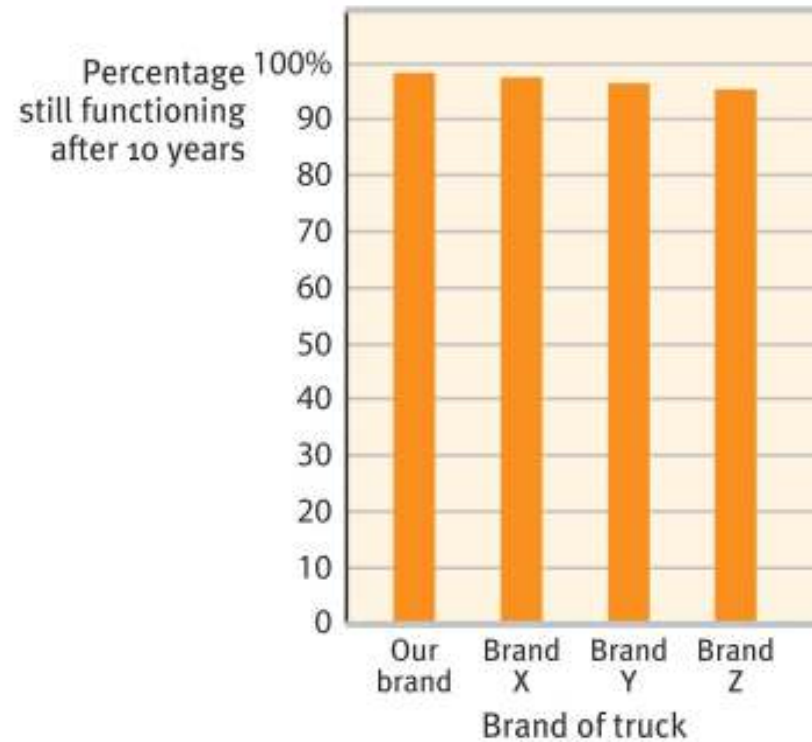
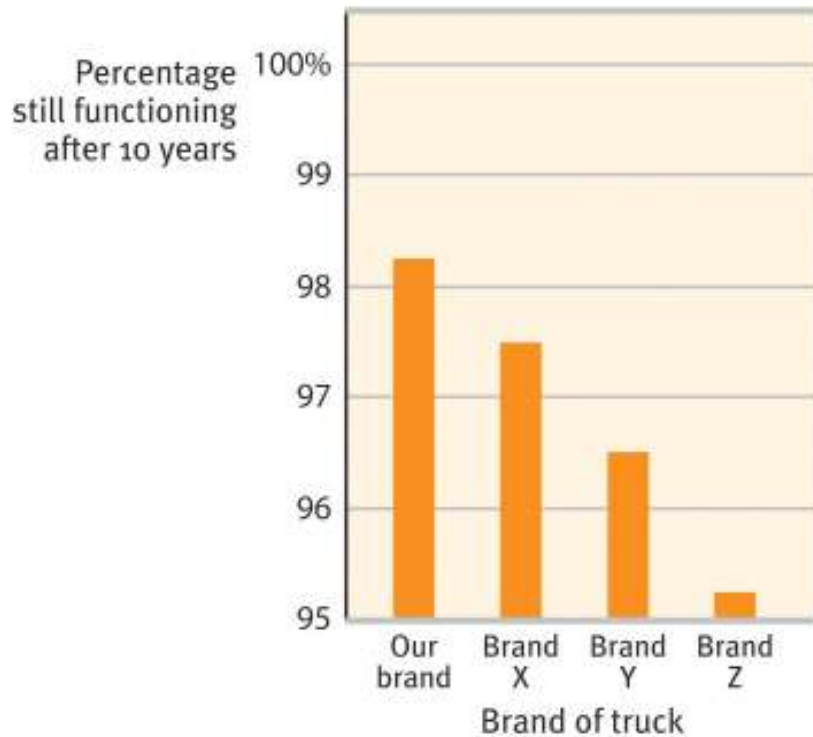
Statistical procedures analyze and interpret data allowing us to see what the unaided eye misses.



Composition of ethnicity in urban locales

# Describing Data

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





# Measures of Central Tendency

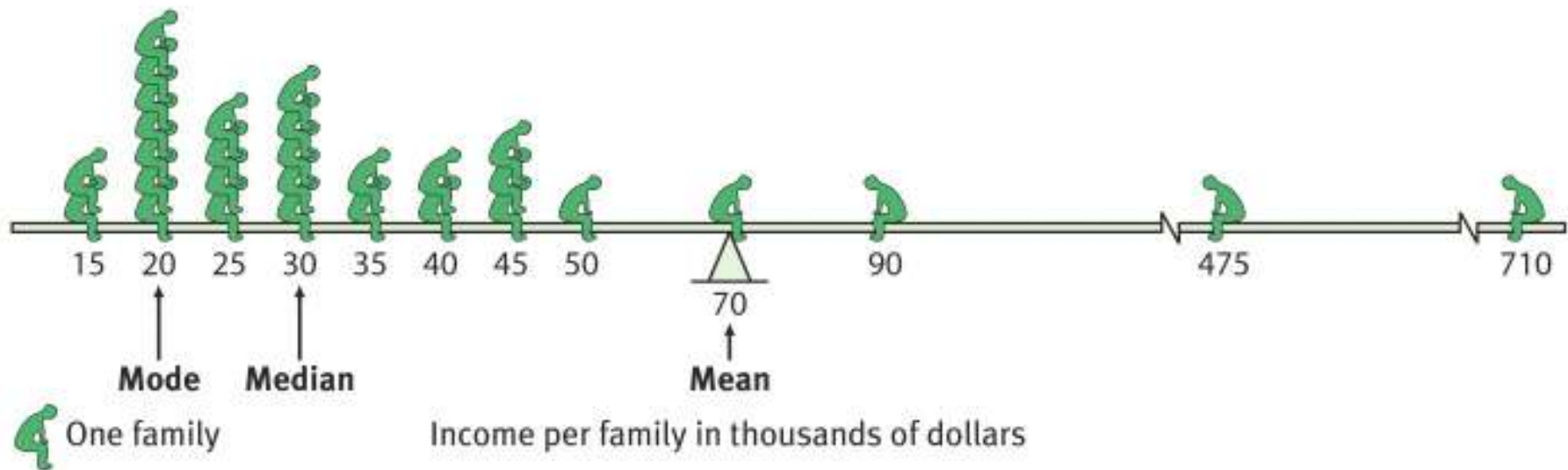
**Mode:** The most frequently occurring score in a distribution.

**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.

# Measures of Central Tendency

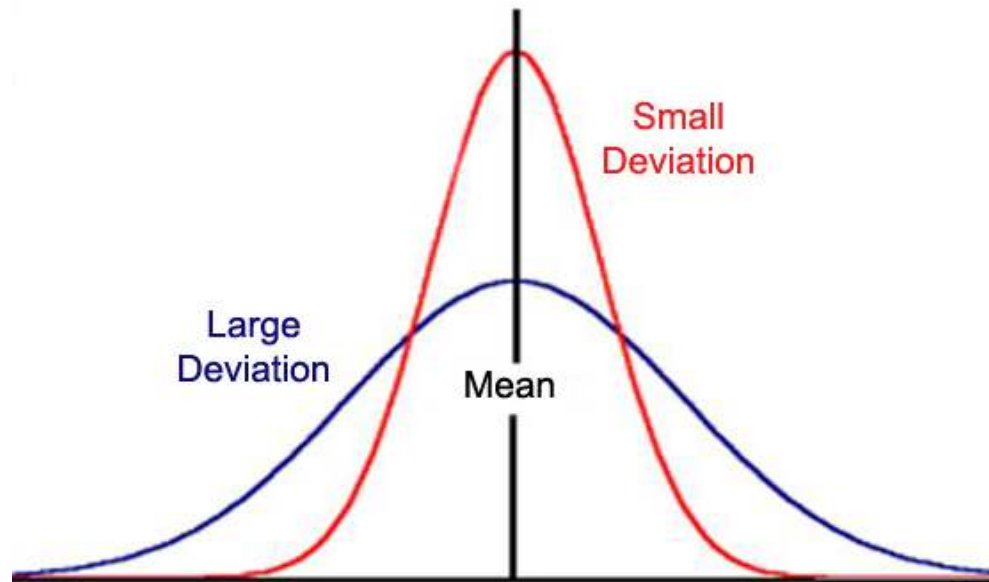
## A Skewed Distribution



# 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.



# 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) <sup>2</sup> = 204	

Mean =  $640 \div 8 = 80$

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) <sup>2</sup> = 2000	

Mean =  $640 \div 8 = 80$

Standard deviation =

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

# Making Inferences

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

# Making Inferences

When is an Observed Difference Reliable?

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

# 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.

# FAQ

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

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



# FAQ

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

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



Ami Vitale/ Getty Images

# FAQ

**Q3.** Does behavior vary with gender?

**Ans:** Yes. Biology determines our sex, and culture further bends the genders. However, in many ways woman and man are similarly human.

# FAQ

**Q4.** Why do psychologists study animals?

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



D. Shapiro, © Wildlife Conservation Society

# FAQ

**Q5.** Is it ethical to experiment on animals?

**Ans:** Yes. 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.

# FAQ

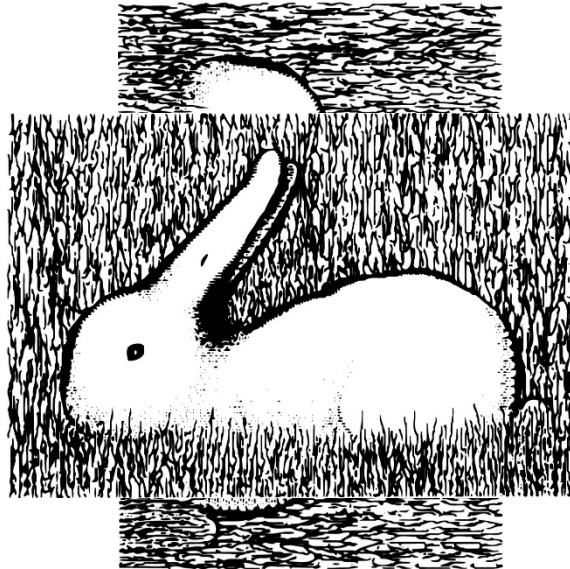
**Q6.** Is it ethical to experiment on people?

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

# FAQ

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

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



© Roger Shepard

# FAQ

**Q8.** Is psychology potentially dangerous?

**Ans:** 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.