

AP Psychology
Forest Grove High School
Mr. Tusow

Research Methods

Chapter 2

Anxiety Definition

- Without discussing your ideas, write down your personal definition of “anxiety” as if you were writing a book of psychological terms.
 - If you have internet capabilities, you can look up multiple definitions, but write a definition in your own words.

Why do we need research?

- Why? Because just asking people how/why they felt and acted the way they did can be misleading.
- Common sense isn't all it is cracked up to be.

A Demonstration

- Group B close your eyes.
- Group A: Psychologists have found that separation weakens romantic attraction. As the saying goes “out of sight, out of mind.”
 - Write down why this might be the case.

A Demonstration

- Group A close your eyes.
- Group B: Psychologists have found that separation strengthens romantic attraction. As the saying goes “absence makes the heart grow fonder.”
 - Write down why this might be the case.

A Demonstration

- Find a member of the opposite group. Discuss the question below, being sure to provide evidence.
- ***What impact does separation have on romantic relationships?***
 - When both a supposed finding and its opposite seem like common sense, we have a problem.

Hindsight Bias

- The problem we have is hindsight bias, or the feeling that because something has already happened, it is inevitable.
 - I-knew-it-all-along phenomenon



Another Demonstration...

- Consider these three anagrams:
 - WREAT □ WATER
 - ETRYN □ ENTRY
 - GRABE □ BARGE

- How many seconds do you think it would take you to unscramble each of these?
 - OCHSA □

What's the point?

- Hindsight bias and overconfidence often lead us to overestimate our intuition (common sense). Scientific inquiry can help us move from illusion back to fact.
 - We must operate in a state of curious skepticism. Always ask “What do you mean? How do you know?”

Clever Hans

- Clever Hans the horse could do simple math and spell out the answers to simple questions. He wasn't always correct, but he was most of the time.
- While a team of scientists, veterinarians, zoologists and circus trainers could not figure out how Hans was correctly answer the questions, Oskar Pfungst, a psychologist did. What did he discover?



Hans' Secret

- While Hans could not do math or correctly answer questions on his own, he was very perceptive.
- Hans was picking up on subtle body language given off by his owner who asked the questions.
- When the owner was hidden from view, suddenly Hans could not answer the questions correctly.
- How does this story relate to methodology?



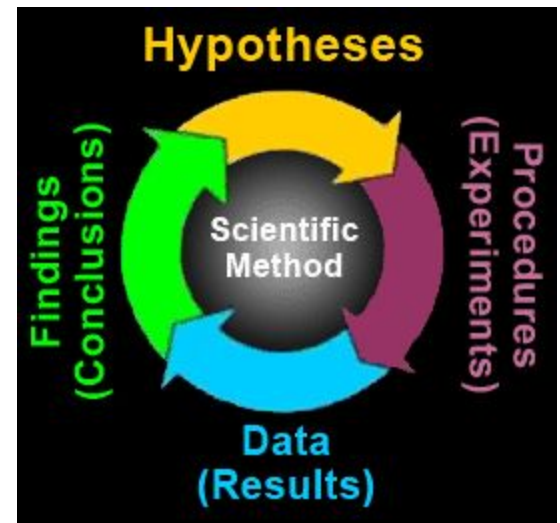
Emily Rosa

- Emily Rosa was a 4th grader in Colorado in 1998. She entered a science competition with an experiment that challenged the legitimacy of therapeutic touch (TT).
- We will use Rosa's experiment to look at scientific method.



Scientific Method/Empirical Approach

- The scientific method and empirical approach are 5 step processes for empirical investigation of a hypothesis, *under conditions designed to control biases and subjective judgments.*
 - Empirical investigation is the collecting of objective information, firsthand, by making careful measurements based on direct experience.

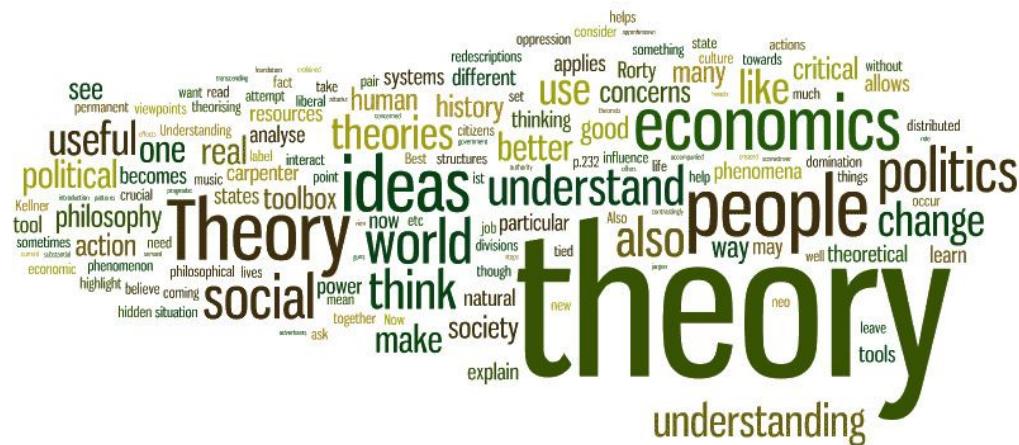


Psychology's Main Goal

- The goal of psychology is to develop explanations for behavior and mental processes...explain why we do what we do.
- A scientific **theory** is an explanation based on integrated principles that organizes observations and predicts behaviors or events.
 - “Theory” in everyday language is different than in science
 - A good theory simplifies and summarizes facts.
 - Too many facts about behavior to remember them all.
 - A good theory produces testable predictions called hypotheses

A Good Theory Summarized

- A good theory:
 - Effectively organizes a range of self-reports and observations
 - Leads to a clear hypothesis (prediction)
 - Stimulates further research or can be replicated



The 5 Steps of Scientific Method

- **1. Developing a Hypothesis:**
 - **Hypothesis:** A statement predicting the outcome of a scientific study or describing the relationship among variables in a study.
 - A hypothesis literally means a little theory.



The 5 Steps of Scientific Method

- All hypotheses must be **testable** and **falsifiable**, or shown to be either supported or incorrect.
 - **Falsifiability** is the possibility that an assertion can be shown false by an observation or experiment. That something is "falsifiable" does not mean it is false; rather, that *if* it is false, then this can be shown by observation or experiment.
- A theory cannot be considered scientific if it does not admit the possibility of being shown false.



Falsifiable Revisited

- **Falsifiability** or **refutability** is the logical possibility that an claim can be contradicted by an observation or the outcome of a physical experiment.
 - It means that if it is false, some observation or experiment will produce a reproducible result that is in conflict with it.
 - **For example** , "all men are mortal" is unfalsifiable: even if someone is observed who has not died so far, he could still die in the next instant. By contrast, "all men are immortal," is falsifiable by the presentation of just one dead man.



Immortal?

Operational Definition

- All good hypotheses need an operational definition.
 - An operational definition is a specific description of the concepts involving the conditions of the scientific study.
 - Operational definitions are stated in terms of how the concepts are to be measured and what procedures (operations) are being employed to produce them.
 - They are intended to eliminate bias.

In class example...

- With a partner, write an operational definition for the following variables:
 - Tall
 - Old
 - Happiness
 - Intelligent
 - Popularity
 - Good music

Operational Definitions

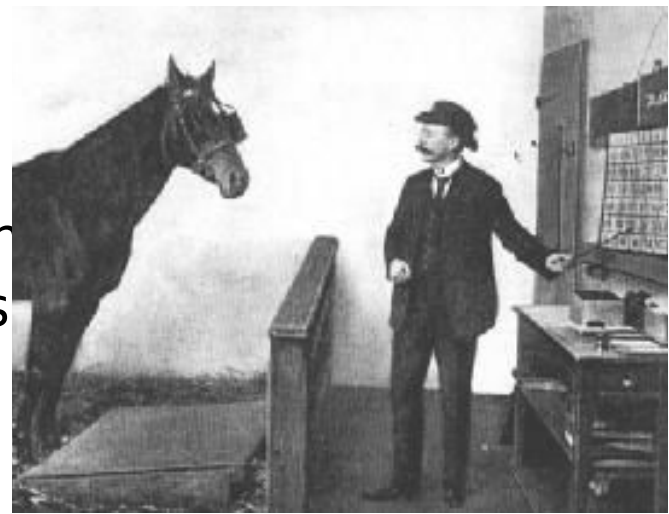
- Smile or Not?

Rosa and Pfungst's Hypotheses

- Rosa: If a TTP cannot see the which of their hands I am hovering over, they will not be able to identify the presence of my hand at any higher rate than 50%.



not see h
or spell s



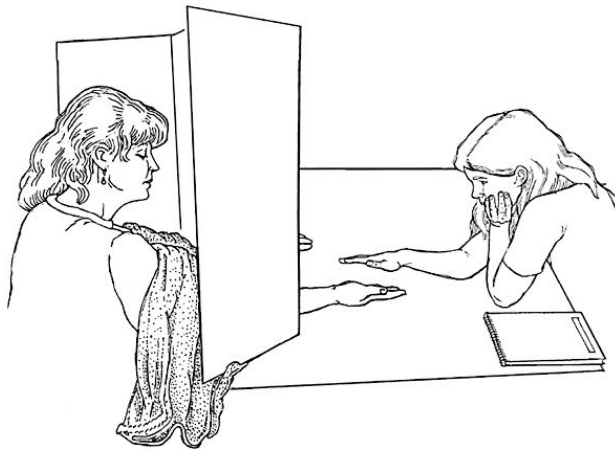
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Performing a Controlled Test

- **2. Performing a controlled test:** A hypothesis must undergo rigorous tests before it will be accepted as a legitimate theory.
- To make a test controlled, one must account for the independent variable.
 - **Independent Variable:** A stimulus condition that the experimenter changes independently of all other carefully controlled conditions in the experiment.

Independent Variable

- In Rosa's experiment, she tested 21 TT practitioners to see if they could sense which of their two hands was closest to her hand when they could not see it.
 - To do this, she made a cardboard screen with two holes in the bottom. The practitioners would put their hands through, palms up. Rosa would hold her hand, palm down a few inches from either of the practitioner's hands.



Eliminating Patterns

- For both Rosa and Hans' experiments, the presence of patterns in the experiment could have jeopardized the findings. To eliminate this Rosa and Pfungst used **random presentation**.
- Random presentation is a process by which chance alone determines the order in which the stimulus is presented.



Randomization

- In Rosa's experiment, randomization was achieved by a coin flip to determine whether she put her hand above the practitioner's left or right hand.
- In the Hans experiment, Pfungst made sure to ask math questions with random answers in which there were no predictable patterns (answers of 2,4,6...).



Gathering Objective Data

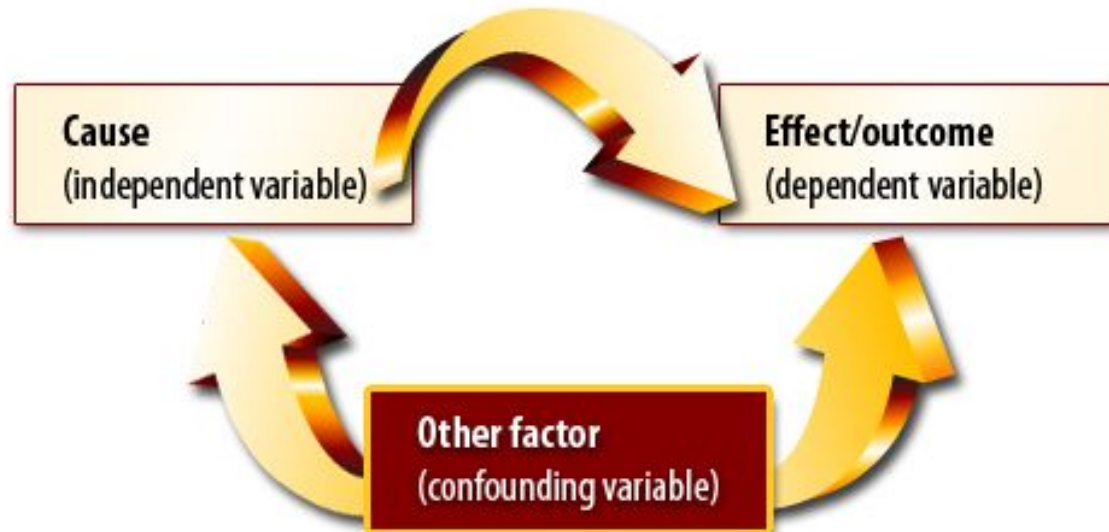
- **3. Gathering objective data:** getting information by direct observation that relies only on the independent variable and not on the experimenter's hopes. This data is called the **dependent variable**.
 - **Dependent Variable:** The measured outcome of a study, or the response of the subjects in the study.

Independent Variable vs. Dependent Variable

- **A good way to remember which is which:**
 - Independent Variable (IV) = stimulus or cause
 - Dependent Variable (DV) = response or effect
 - **Both the IV and the DV must have an operation definition. That means, you must explain what each will look like and how it will be measured.**

Confounding Variables

- **Confounding Variables:** Variables that have unwanted influence on the outcome of an experiment.
 - Or, other possible explanations for the dependent variable (result).



Validity

- One goal when designing experiments is to ensure validity.
- Validity refers to the extent to which a test measures what it is supposed to measure.
 - **Face validity** refers to the extent to which a measure appears on the surface to measure what it is suppose to measure.
 - **Criterion validity** is a way of assessing validity by comparing the results with another measure.
 - **Construct validity** is a way of assessing validity by investigating if the measure really is measuring the theoretical construct it is suppose to.

Rosa and Hans

- For Rosa's dependent variable, she recorded whether the TT practitioner said "left" or "right," and whether or not that was correct.
- For Pfungst's study of Hans, the DV was simply the horse's hoof-taping in response to each question asked, making sure to keep track of the number of correct answers given.

Analyzing the Results: Accepting or Rejecting the Hypothesis

- **4. Analyzing the results:** This step consists of looking at the data collected and seeing if it supports or disproves the hypothesis.
 - We will briefly discuss stats next class, but it is not a major part of our psychology class. No worries, this is not a math class.



Rosa's Analysis

- In Rosa's experiment, the analysis was pretty clear. By design, there was a 50% chance a practitioner could guess correctly. So in order to disprove her hypothesis, they would have to answer correctly significantly more than 50% of the time...they did not.
- She **concluded** that TT practitioners could not detect the "human energy field."



Pfungst's Analysis



- For Hans's the chance level of simply guessing the correct response was near zero, so any consistent level of correct responses would support the hypothesis that Hans could do math.
- That hypothesis was rejected, however, as Hans was unable to correctly answer any questions in the absence of his owner.

Publishing, Criticizing and Replicating the Results

- **5. Publishing, criticizing and replicating the results:** The last step of the scientific method is to have the results withstand the criticism and scrutiny of the science community.
 - Critics check each others' work by replicating the study, sometimes under slightly different circumstances to see if the same results can be duplicated.
- **Replicate:** To do a study over to see if the same results are obtained. To control for bias, the replication is most often done by someone other than the original researcher.



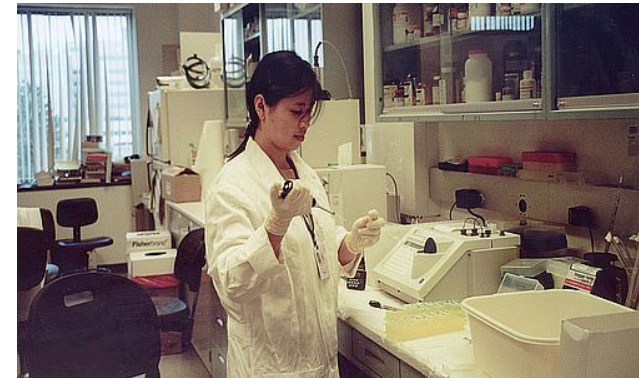
Operational Definition Practice

- Using the definition of “anxiety” that you wrote earlier, you will be working in a group to operational define a study on anxiety.

Identifying Variables Homework

Methods of Research

- **Experimental Method:** A kind of research in which the researcher controls and manipulates the conditions including the IV.
 - Experiments seek to isolate cause and effect.
- Experimental method must account for independent variables, dependent variables and confounding or extraneous variables.
 - No single experiment is conclusive



The Challenges of Experiments

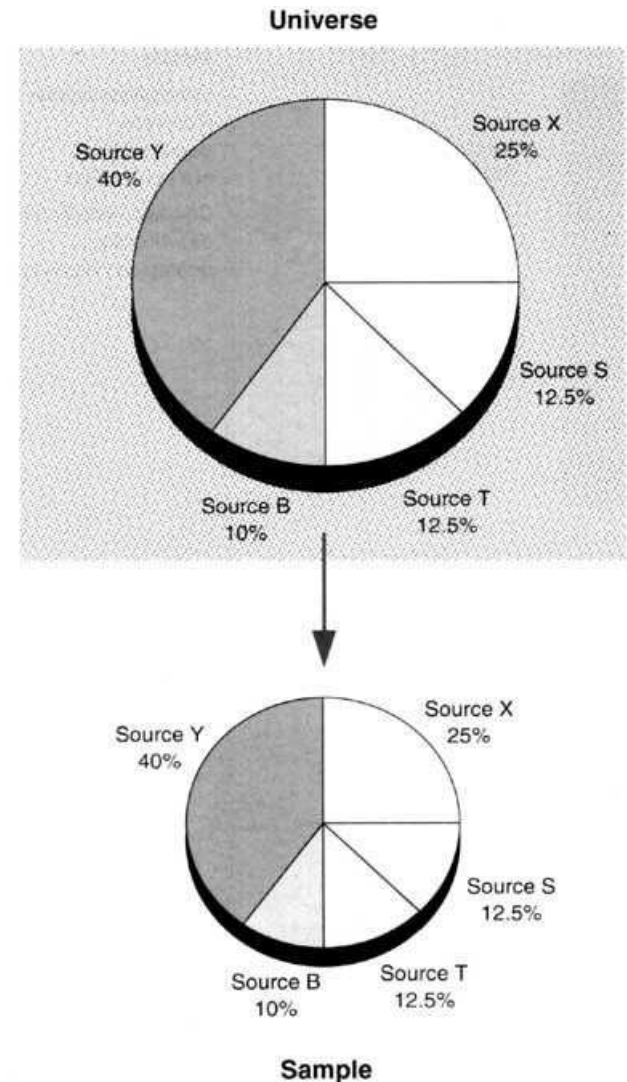
- There are many challenges with conducting experiments. First one has to make sure that all groups being tested have the same conditions. These are called **experiment controls**.
 - Controls are used to eliminate confounding variables.
 - This is different than the **control group**.

Representative Sample

- For an experiment to be valid, one has to make sure the subjects are drawn from a population which consists of everyone who fits the description of your test group. This is called a representative sample.
 - Does the group you are testing resemble the group you are drawing conclusions about?

Representative Sample

- **Representative Sample:** A sample obtained in such a way that it reflects the distribution of important variables in the larger population in which the researcher are interested-variables such as age, SES, ethnicity, education....

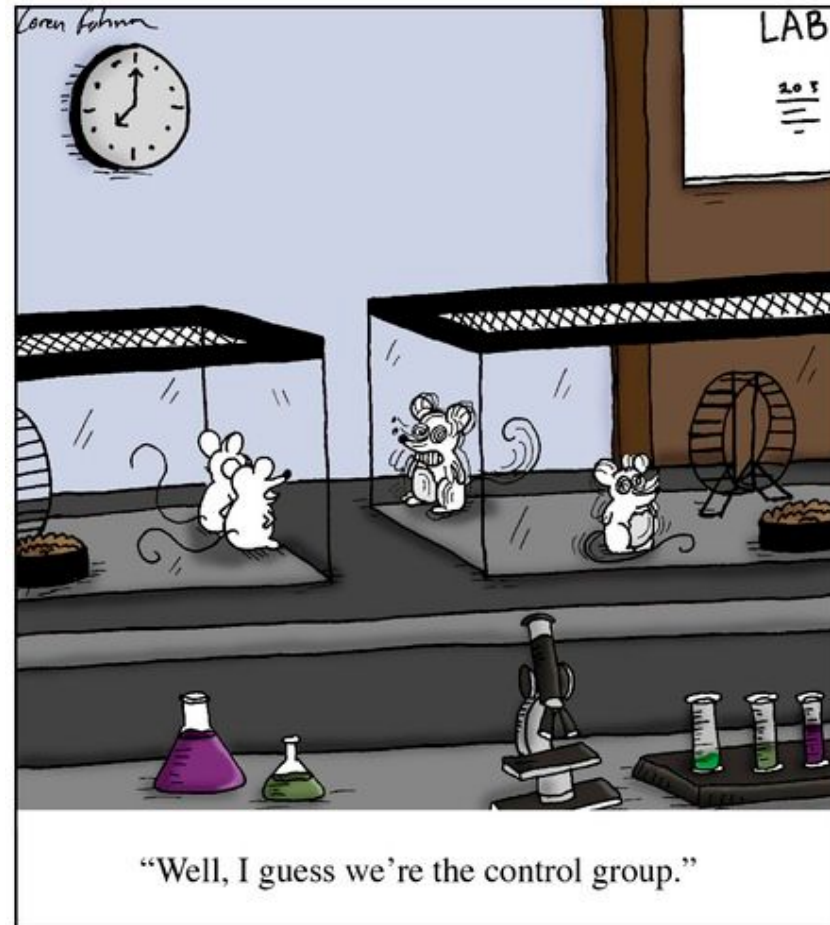


Random Assignment

- Third, once a population has been randomly selected for participation, we must put them into participant groups: Control group and experiment group.
- Like selection for the experiment, placement into groups should be done randomly, meaning that each participant has an equal likelihood to be in either the control or the experiment group.
 - Why would random assignment be important?

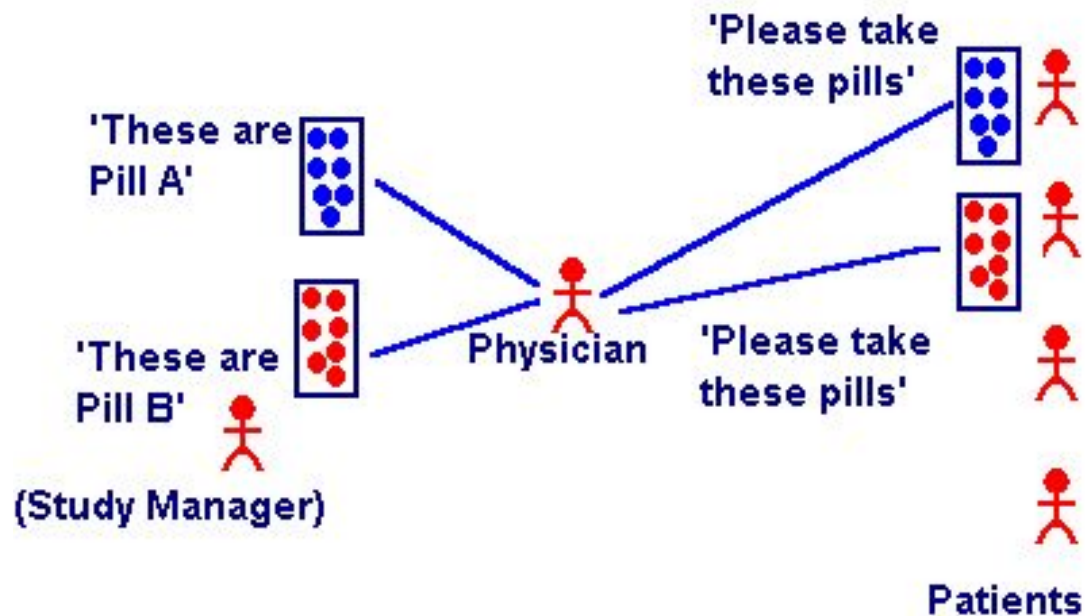
Control Group vs. Experiment Group

- Control group: the group that is *NOT* exposed to the treatment.
- Experiment group: the group in the experiment that *IS* exposed to the treatment.



Increasing Reliability

- **Double Blind Study:** An experiment where both the subject and the person administering the experiment do not know the nature of the independent variable being administered.



M&M Experiment

Experiment Check List

- ❑ Experiments start with a testable prediction: hypotheses
- ❑ Experiments aim to manipulate an IV
- ❑ Experiments measure the DV
- ❑ Experiments have at least two groups:
 - ❑ control and experimental
- ❑ Experiments test the effect of the IV on the DV
- ❑ Representative sampling is a must
- ❑ Random selection is a must
- ❑ Random assignment is a must

Non-Experiment Designs/ Quasi Experiments

- Sometimes we are unable to do experiments for ethical or practical reasons. In this case we must do another kind of research.
- **-Ex post facto:** Research in which we choose subjects based on a pre-existing condition.
 - Ex: Cancer research.

Case Studies

- Case studies are observational techniques that study one person/group in depth with the hope of revealing universal principles.
 - Case studies often suggest further directions for studies, but can be misleading if the person being studied is atypical.
 - Numbers can be numbing, but the plural of anecdote isn't evidence...just because we get some facts, we cannot necessarily generalize.

Naturalistic Observation

- **Naturalistic observations** are a method where subjects are observed in their natural environment.
 - Like all descriptive studies, naturalistic observations do not explain behavior, they describe behavior.
- *Why would it be important for subjects to not know they are being observed?*



Longitudinal Study

- In a **longitudinal study**, one group or subject is studied for an extended period of time to observe changes in the long term.
- + Same subjects for the entire study
- - Time and expense

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Longitudinal
Research



Cross-Sectional Studies and Cohort-Sequential Studies

- These studies are designed to cut down on time and expense.
 - **Cross-sectional studies** look at a cross section of the population and studies them at one point in time.
 - Ex: No child left behind
 - **Cohort-sequential studies** look at a cross section of population and then studies them over a short period of time.

Correlation Studies

- A correlation study is one where researchers try to show the relationship (or correlation) between two variables.
- Correlation studies are largely based in statistics.
 - It is important to remember that correlation does not necessarily mean causation.

Surveys

- A **survey** is a research technique using self reported attitudes or behaviors of a specific group
 - Usually by asking questions a random representative of the group.
- What are some dangers of using a survey?



Surveys and Wording

- Even subtle changes in the order or wording of questions can have a huge impact on results.
 - “not allowing” vs. “forbidden”
 - “aid to the needy” vs. “welfare”
 - “affirmative action” vs. “preferential treatment”
 - “revenue enhancers” vs. “taxes”

Ethics in Research

- Each university or group doing research must have an Institutional Review Board which is responsible for making sure research is preformed in an ethical manner.
- The APA says deception is to be avoided whenever possible. However, when deception must be used, the subjects are to be debriefed as soon as possible after the study.

Using Data for Analysis

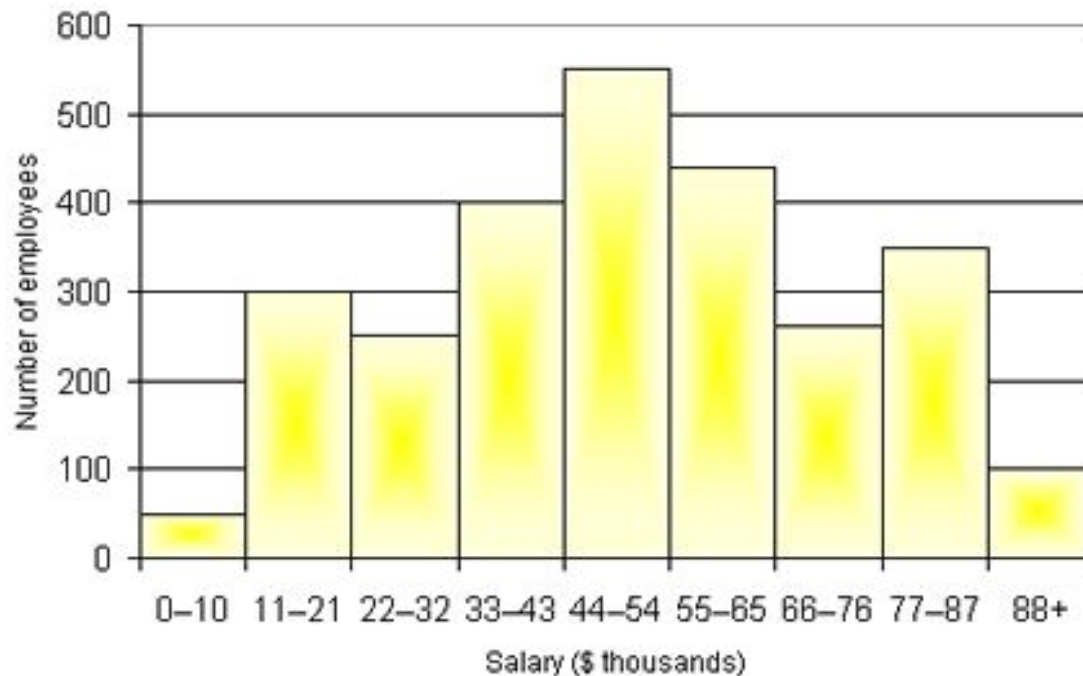
- **Frequency Distribution:** A summary chart which shows how frequently each of the various scores in a set of data occur.

	Battery life, minutes	Frequency (f)	Relative frequency	Percent frequency
	360–369	2	0.07	7
	370–379	3	0.10	10
	380–389	5	0.17	17
	390–399	7	0.23	23
	400–409	5	0.17	17
	410–419	4	0.13	13
	420–429	3	0.10	10
	430–439	1	0.03	3

Table: Life of AA batteries, in minutes

Using Data for Analysis

- **Histogram:** A bar graph depicting a frequency distribution. The height of the bars indicates the frequency of a group of scores.



Mean, Median, Mode

- **Mean** (average): The measure of central tendency most often used to describe a set of data.
 - To calculate mean, simply add all the scores and divide by the number of scores.
 - *While the mean is easy to calculate, it has a big downside. It can easily be influenced by extreme scores.*

Mean, Median, Mode

- **Median:** A measure of central tendency represented by the score that separates the upper half of the scores in a distribution from the lower half.
 - The big advantage of this is the median is not effected by extreme scores.
- **Mode:** A measure of central tendency which represents the score that occurs most often.

Mean, Median, Mode

- The weekly salaries of six employees at McDonalds are \$140, \$220, \$90, \$180, \$140, \$200.
 - For these six salaries, find:
 - (a) the mean
 - (b) the median
 - (c) the mode

Mean, Median, Mode

■ Answers

Mean: $\frac{90 + 140 + 140 + 180 + 200 + 220}{6} = \$ 161.67$

Median: 90, 140, 140, 180, 200, 220

The two numbers that fall in the middle need to be averaged.

$$\frac{140 + 180}{2} = \$160$$

Mode: 90, 140, 140, 180, 200, 220

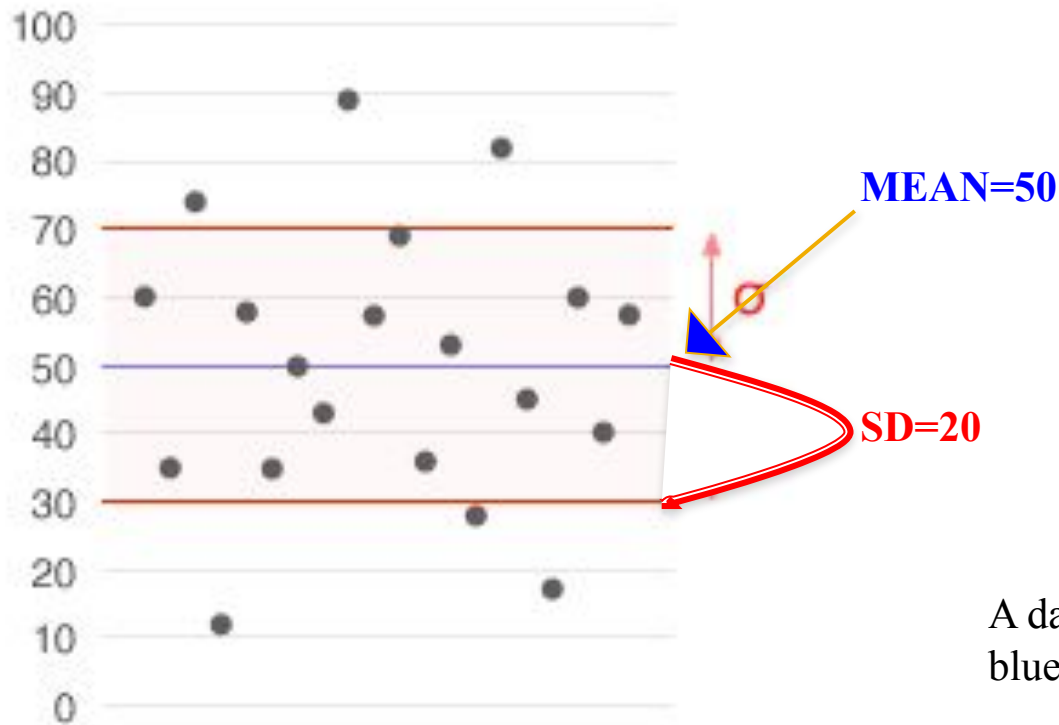
The number that appears the most is **\$140**

Standard Deviation

- **Standard Deviation (SD):** A measure of variability that indicates the average distance between the scores and their mean.
 - *A low standard deviation* indicates that the data points tend to be very close to the mean, whereas *high standard deviation* indicates that the data are spread out over a large range of values.

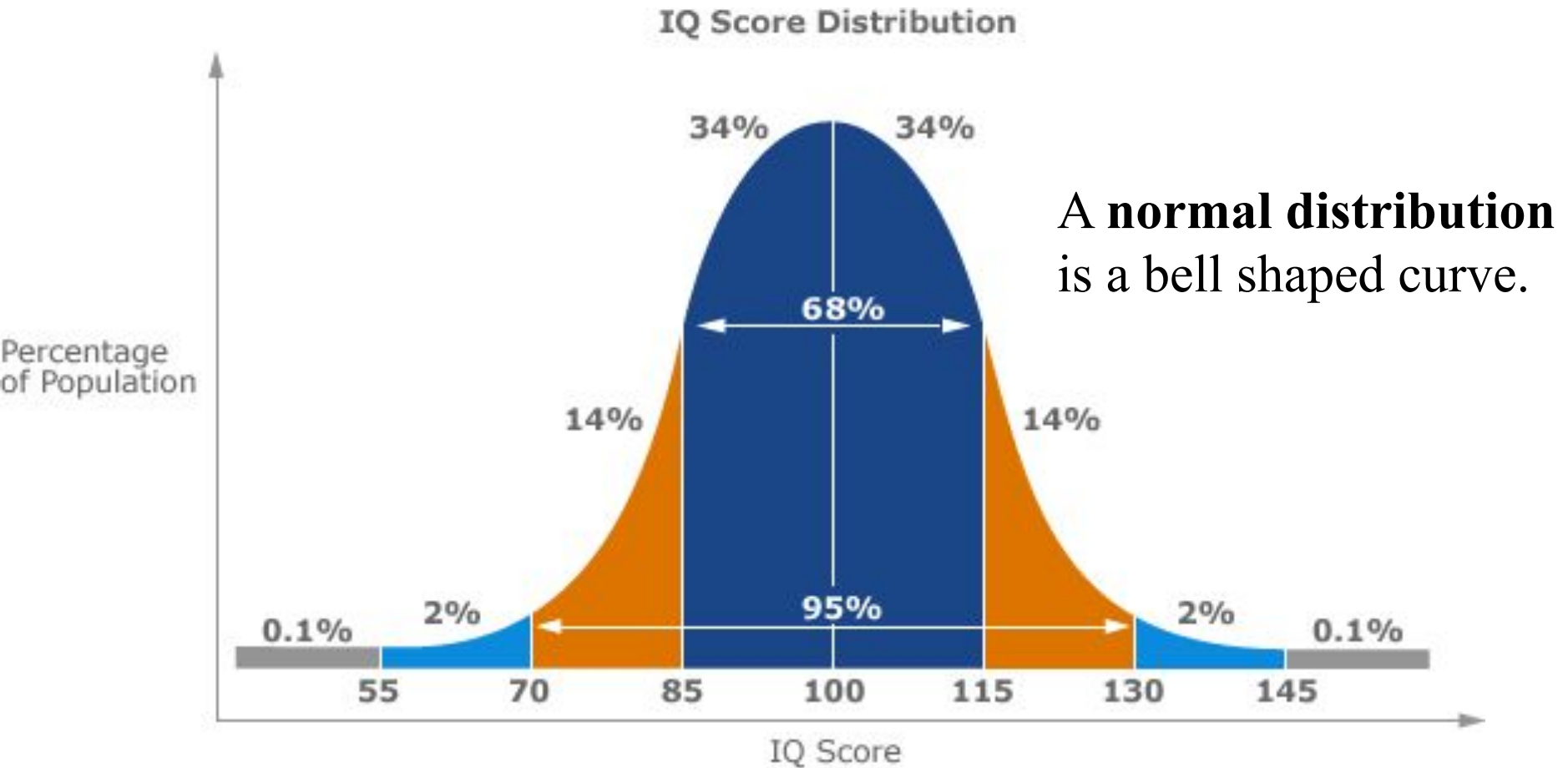
Normal Distribution

- The standard deviation and mean together tell us a lot about the distribution of scores.



A data set with a mean of 50 (shown in blue) and a standard deviation of 20.

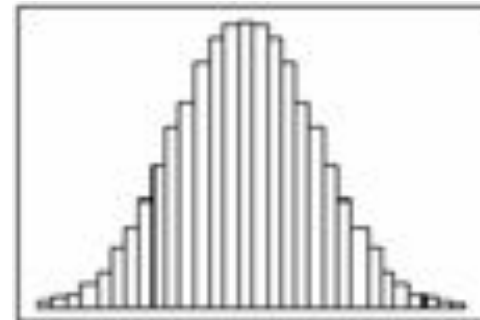
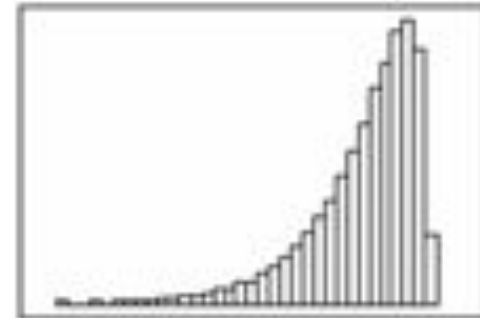
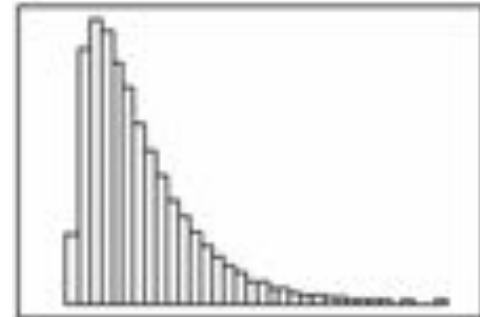
Normal Distribution



A standard deviation of 15 accounts for about 68% of responses.

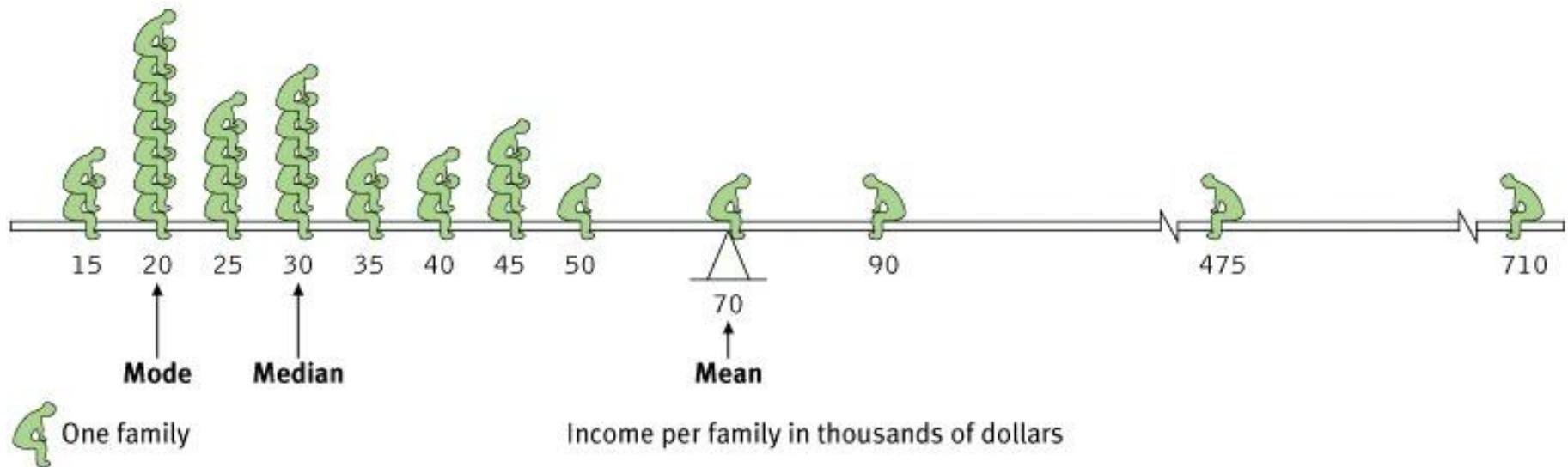
Skewed Distribution

- A distribution is skewed if one of its tails is longer than the other.
 - The first distribution shown has a **positive skew**. This means that it has a long tail in the positive direction.
 - The second distribution has a **negative skew** since it has a long tail in the negative direction.
 - Finally, the third distribution is symmetric and has no skew (**normal distribution**).



A Skewed Distribution

- Are the results positively or negatively skewed?

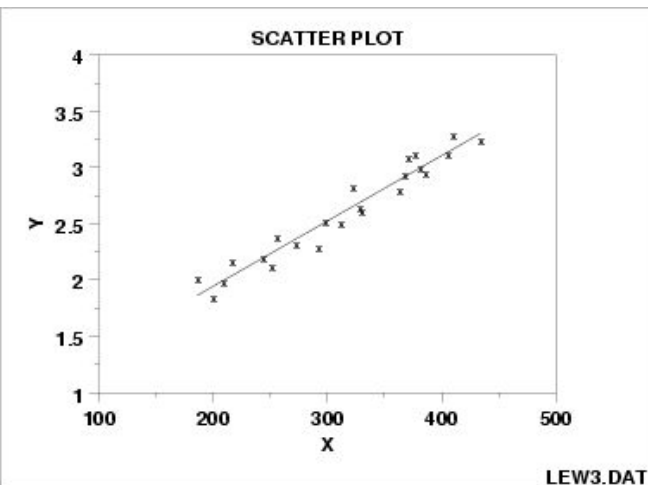


Correlation: Negative and Positive

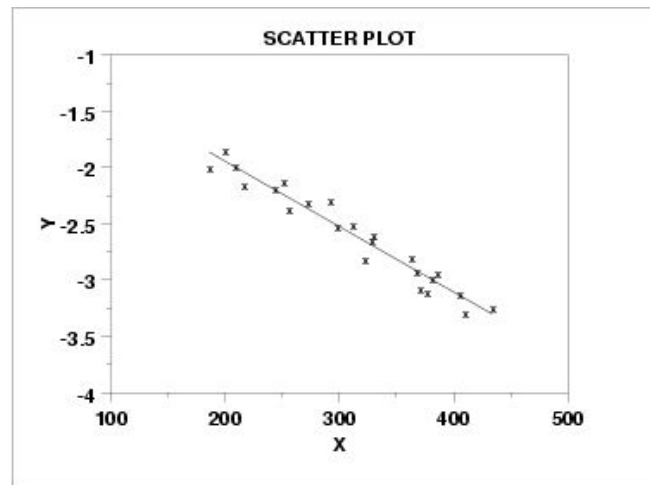
- **Correlation:** A relationship between two variables in which changes in one variable are reflected in the changes in the other variable.
 - **Correlation Coefficient:** A number between -1 and $+1$ expressing the degree of relationship between two variables.

Comparing Correlation Coefficients

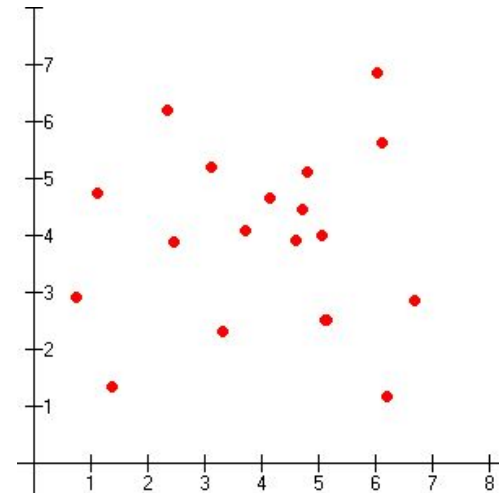
- If the correlation coefficient is a positive number, there is a positive correlation (connection) between the variables.
 - Height and weight—the taller a person is, *usually* means they weigh more too
- If the correlation coefficient is a negative number, there is a negative correlation (connection) between variables.
 - Education and years in jail—people who have more years of education *tend* to have fewer years in jail
- If the correlation coefficient is 0, there is no correlation between variables.



Positive Correlation



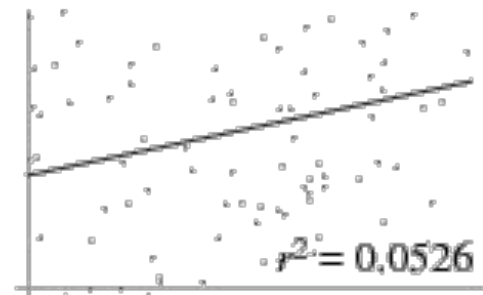
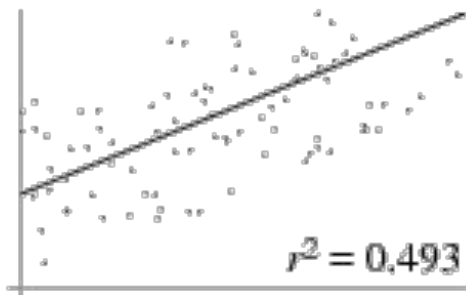
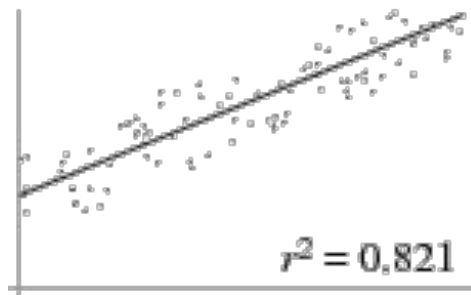
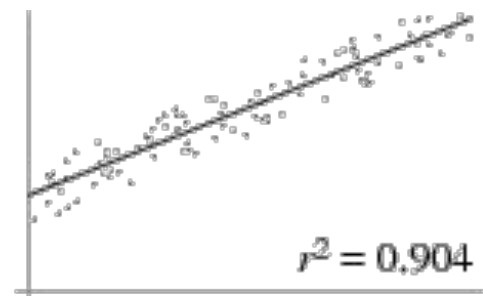
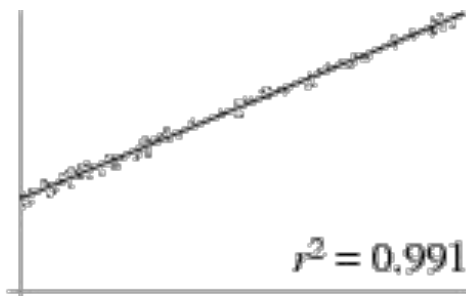
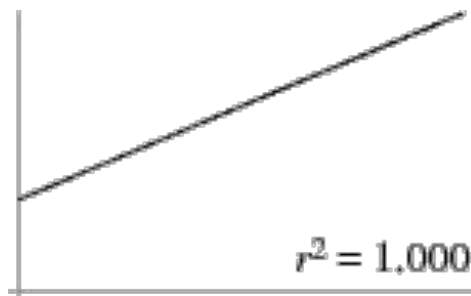
Negative Correlation



No Correlation

Positive Correlation Coefficients

- Positive correlation coefficients indicate a stronger connection as they get closer to 1.



Correlation Practice

- For each studies below, identify if there is a positive or negative correlation:
 - The more young children watch TV, the less they read (Kaiser, 2002)
 - The more sexual content sees on TV, the more likely they are to to have sex (Collins et al. 2004)
 - The longer children are breast-fed, the greater their later academic achievements (Horwood & Ferguson. 1998)
 - The more often adolescents eat breakfast, the lower their body mass (Timlin et al. 2008)
 - Answers: negative, positive, positive, negative

Illusory Correlation

- Correlation coefficients are important because they allow us to see relationships between variables and prevent us from “seeing” relationships that do not exist.
 - Illusory Correlation: believing there is a relationship between two things, when none exists
 - We are likely to notice instances that confirm our beliefs
 - Ex. getting chilled wet causes people to “catch a cold”

Comparing Research Methods

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

FRQ #1

- Imagine you are a sports psychologist interested in the usefulness of a new visualization technique that has been developed for Olympic divers. You have decided to conduct an experiment to determine if the technique is effective. Discuss the importance of each of the following in regard to the experiment you are designing:
 - **Population**
 - **Sample**
 - **Hypothesis**
 - **Independent variable**
 - **Dependent variable**

- **Operational definitions**