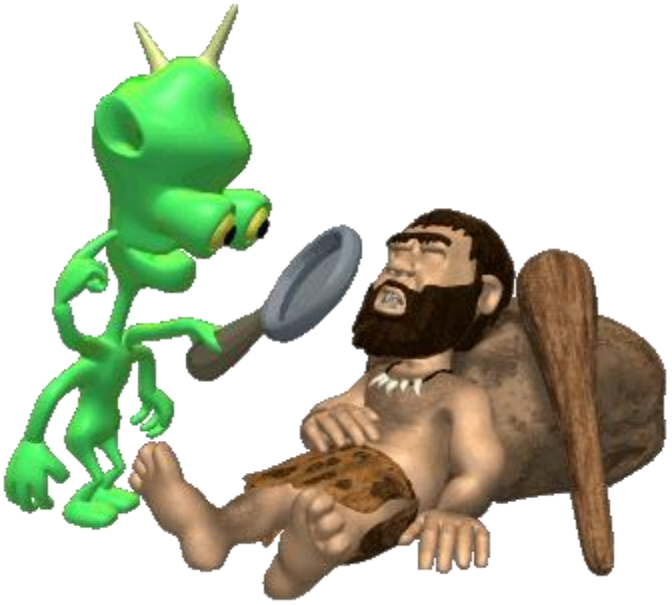
Research Methods



It is actually way more exciting than it sounds!!!!

UNIT 00: Research Methods Learning Objectives & Essential Knowledge	BOLD Vocabulary: College Board AP Exam Terms *Italicized Vocabulary*: Additional Myers 4E Textbook Terms	
TOPIC 0.1 The Scientific Attitude, Critical Thinking, and Developing Arguments		
0.1-1 Explain how psychology is a science. **0.1-2** Describe the three key elements of the scientific attitude and how they support scientific inquiry. **0.1-3** Explain how critical thinking feeds a scientific attitude, and smarter thinking for everyday life.	• *Critical Thinking*	
TOPIC 0.2 The Need for Psychological Science		
0.2-1 Explain how cognitive biases, such as hindsight bias, overconfidence, and the tendency to perceive order in random events illustrate why science-based answers are more valid than those based on common sense.	• **Hindsight bias** • **Confirmation Bias** • **Overconfidence**	

TOPIC 0.3 The Scientific Method

0.3-1 Describe how theories advance psychological science.
0.3-2 Explain how psychologists use case studies, naturalistic observations, and surveys to observe and describe behavior, and why random sampling is important.

- **Peer reviewers**
- *Theory*
- **Hypothesis**
- **Falsifiable**
- **Operational Definition**
- **Replication**
- **Case Study**
- **Meta-Analysis**
- **Naturalistic Observation**
- **Survey**
- **Social desirability bias**
- **Self-report bias**
- **Experimenter Bias**
- **Population**
- **Sample**
- **Sampling Bias**
- **Random Sample**
- **Convenience Sampling**
- **Representative Sample**

TOPIC 0.4 Research Design and Ethics in Psychology

0.4-1 Explain what it means when we say two things are correlated, and describe positive and negative correlations.
0.4-2 Explain illusory correlations and regression toward the mean.
0.4-3 Describe the characteristics of experimentation that make it possible to isolate cause and effect.

- **Experimental Methodology**
- **Non-Experimental Methodology**
- **Correlation**
- **Correlation Coefficient**
- *Variable*
- **Scatterplot**
- *Illusory Correlation*
- **Regression Toward the Mean**
- **Experiment**
- **Experimental Group**
- **Control Group**
- **Independent Variable(s)**
- **Dependent Variable(s)**
- **Random Assignment**
- **Single-Blind Procedure**
- **Double-Blind Procedure**
- **Placebo**
- **Placebo Effect**
- **Confounding Variable**
- **Experimenter Bias**
- *Validity (Also in Unit 2)*

TOPIC 0.5 Research Design and Ethics

0.5-1 Explain the process of determining which research design to use.
0.5-2 Explain the value of simplified laboratory conditions in illuminating everyday life.
0.5-3 Explain why psychologists study animals, and explain the ethical research guidelines that safeguard human and animal welfare.
0.5-4 Describe how psychologists' values influence what they study and how they apply their results.

- **Quantitative Research**
- **Qualitative Research**
- **Likert Scales**
- **Institutional Review**
- **Informed Consent**
- **Informed Assent**
- **Protect from Harm**
- **Confidentiality**
- **Research Confederates**
- **Debriefing**

TOPIC 0.6 Statistical Reasoning in Everyday Life

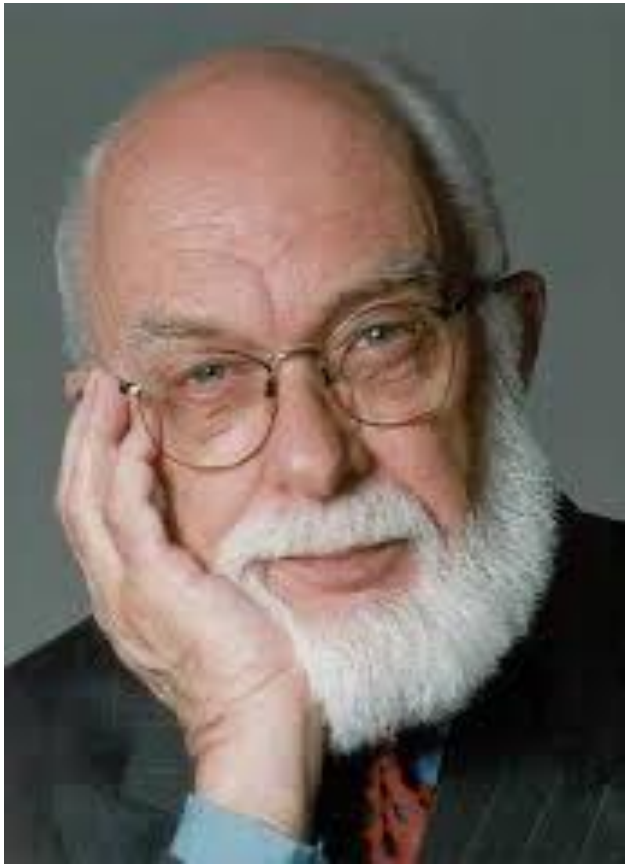
0.6-1 Describe descriptive statistics.
0.6-2 Explain how we describe data using three measures of central tendency and percentile rank.
0.6-3 Explain the relative usefulness of the two measures of variation.
0.6-4 Describe inferential statistics.
0.6-5 Explain how we determine whether an observed difference can be generalized to other populations.

- *Descriptive Statistics*
- *Histogram*
- **Measure of Central Tendency**
- **Mode**
- **Mean**
- **Median**
- **Percentile Rank**
- *Skewed Distribution*
- **Measures of Variation**
- **Range**
- **Standard Deviation**
- **Normal Curve**
- *Inferential Statistics*
- **Meta-analysis**
- **Statistical Significance**
- **Effect Size**

Module 0.1: The Scientific Attitude, Critical Thinking and Developing Arguments

Myers 4ed pages 0.3 to 0.7

- Psychology is a science
- We need to use an EVIDENCED-BASED approach to predict and even discover the causes of behavior and mental processes
- Magician James Randi used an evidence based approached using observation and experimentation to test claims that people had Extrasensory Perception (ESP) and could see "auras" or heal illnesses with their hands or could read minds.
- He proved that these people could not do these things and were lying to their followers.



Key elements of the Scientific Attitude

Curiosity: Does it work? When put to the test, can its predictions be confirmed?

Skepticism: What do you mean? How do you know? Sift reality from fantasy- don't doubt everything but don't believe everything either.

Humility: Explore further when you find the unexpected! Be willing to be surprised. People and animals don't always behave as our ideas would predict

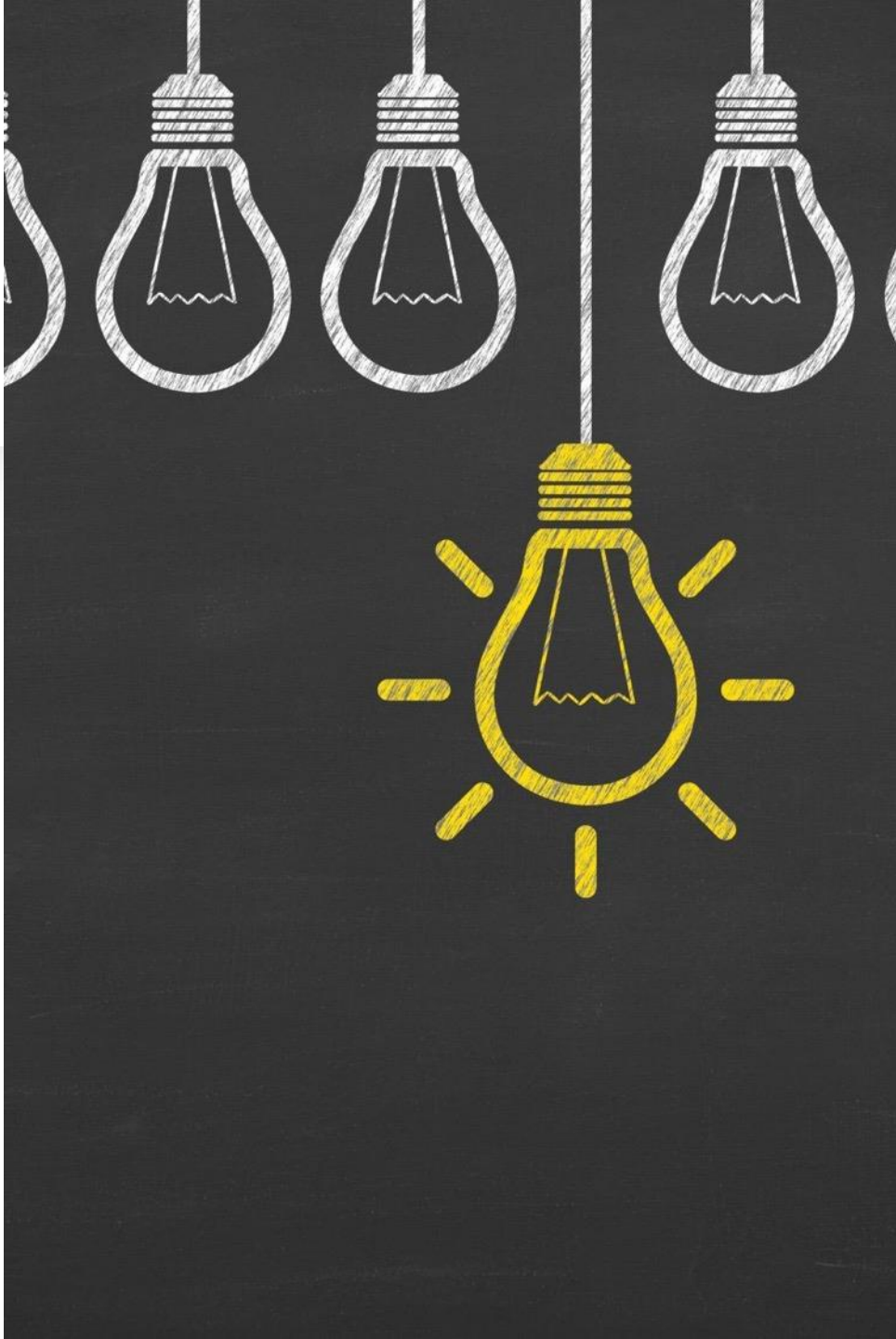
Why is the "rat always right"?

Facts speak for themselves

Researchers have to accept the results of the study even if the hypothesis has been proven wrong.

Critical Thinking is Essential in Psychology!

- Critical thinking puts ideas to the test by examining assumptions, appraising the source, discerning hidden biases, evaluating evidence and assessing conclusions.



Module 0.2 The Need for Psychological Science

Myers 4ed pages 0.9 to 0.15

- THREE PROBLEMS WITH OUR CRITICAL THINKING SKILLS:

  1. Hindsight Bias

  2. Overconfidence

  3. Perceiving Order in Random Events

When our natural thinking style fails us:

Hindsight bias:
"I knew it all along."

Perceiving order in random events:
"The dice must be fixed because you rolled three sixes in a row."

Overconfidence error:
"I am sure I am correct."

Problem #1:Errors in Our Thinking Process

HINDSIGHT BIAS
"I KNEW IT ALL ALONG"

Hindsight Bias

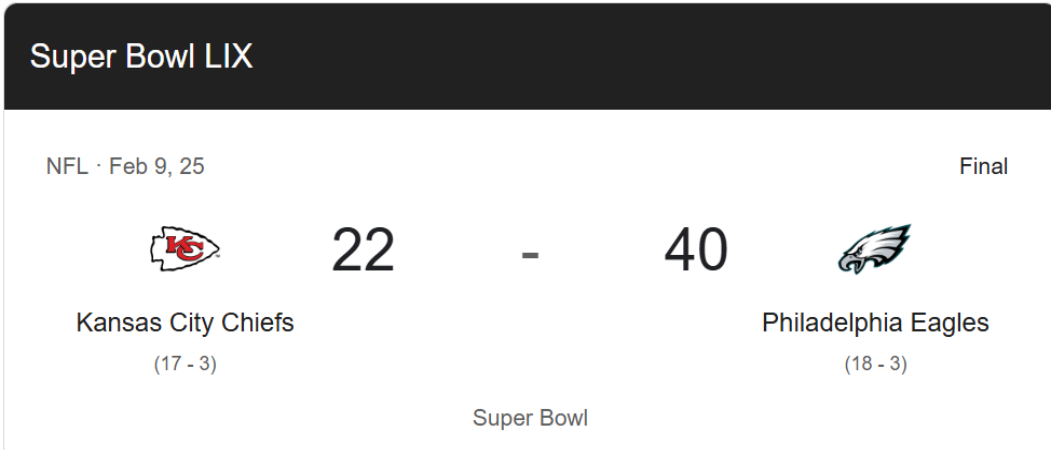
- People have a tendency upon hearing about research or an event to think that they knew it all along
- After an event occurs, it is relatively easy to explain why it happened.
- The goal of scientific research is to PREDICT what will happen in advance.

Hindsight Bias

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

Monday Morning Quarterbacking!!!

After the Eagles won the 2025 Superbowl….my friend said she knew Eagles were going to win!!! Did she really?



Problem #2
Errors in Our Thinking Process

OVERCONFIDENCE ERRORS

Believing we are faster, smarter, more skilled than we are!

Overconfidence Error 1: *Performance*

- We are much too certain in our judgments.
- We overestimate our performance, our rate of work, our skills, and our degree of self-control.

Test for this: "how long do you think it takes you to…" (e.g. "just finish this one thing I'm doing on the computer before I get to work")?

And your unscrambling speed?

HEGOUN ERSEGA

Overconfidence Error 2: *Accuracy*

- We overestimate the accuracy of our knowledge. People are much more certain than they are accurate.
- Overconfidence is a problem in eyewitness testimony.
- Overconfidence is also a problem on tests. **If you feel confident that you know a concept, try explaining it to someone else.**
- **That's why you should NOT rely solely on Student Guided Notes for an "open-note" exam.**

Problem #3
Errors in Our Thinking Process

PERCEIVING ORDER WHERE THERE IS NONE!

The universe can be random!

Perceiving order in random events:

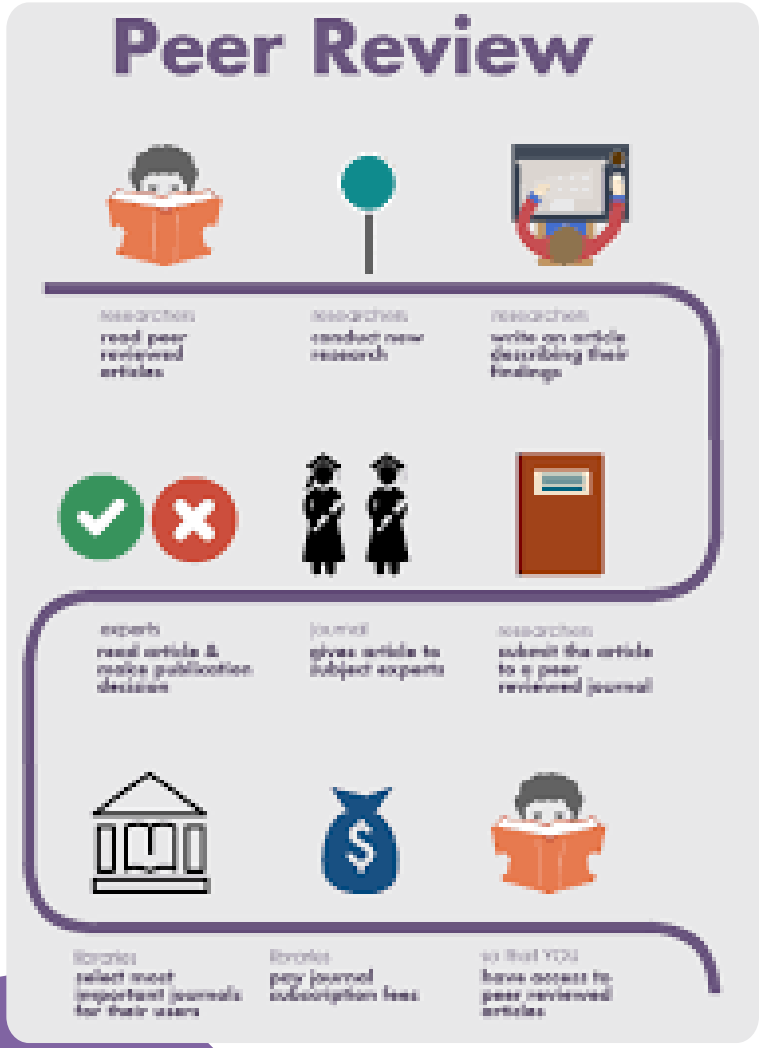
Example: The coin tosses that "look wrong" if there are five heads in a row.

Danger: thinking you can make a prediction from a random series. If a coin toss lands heads five times in a row, it does not increase the likelihood that the next toss will be tails

Why this error happens: because we have the wrong idea about what randomness looks like.

Another type of this error: reacting to coincidence as if it has meaning

If one poker player at a table got pocket aces twice in a row, is the game rigged?



Module 03: The Scientific Method

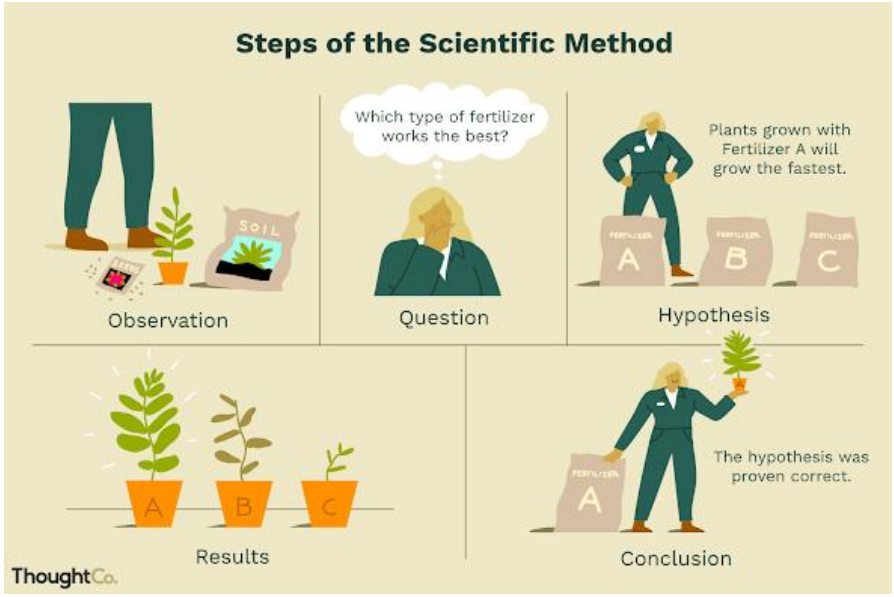
Myers 4ed pages 0.14 to 21

- The Scientific Method: Use observations and analysis
- Welcome hunches and plausible sounding theories and them to the test
- **PEER REVIEWERS:** scientific experts who evaluate a research articles' theory, originality and accuracy.

First, you need a THEORY

- **Theory**: to explain behaviors or events by offering ideas that organize observations.

The goal is to generate some testable hypothesis with the hope of collecting data that will support the theory.



Theory: the big picture

A **theory**, in the language of science, is a *set of principles, built on observations and other verifiable facts, that explains some phenomenon and predicts its future behavior.*

Example of a theory:

"All ADHD symptoms are a reaction to eating sugar."

"Watching violent shows causes aggression"

"Eating cookies improves memory"

Second, you need a HYPOTHESIS

- **Hypothesis:** a testable prediction that is often implied by a theory.
  - Such predictions specify which results would support the theory and which results would disconfirm it.

- **Falsifiability**: the possibility that an idea, hypothesis or theory can be disproven by further observation or further experimentation (this concept is related to the Null Hypothesis~ the Null Hypothesis is no longer in CED).

Falsifiability

- **What makes a theory/hypothesis falsifiable?**
  - Its conclusions can either be **verified OR refuted** by subsequent studies.
  - A common criticism of some psychological perspectives, like the psychodynamic perspective, is that the theories supporting it are not falsifiable.

Hypothesis

- Expresses a relationship between two variables.
- A variable is anything that can vary among participants in a study.
- When students participate in class, it leads to better grades than not participating.

Hypotheses: informed predictions

A **hypothesis** is a *testable prediction consistent with our theory.*

"Testable" means that the hypothesis is stated in a way that we could make observations to find out if it is true.

What would be a prediction from the "All ADHD is about sugar" theory?

One hypothesis: "If a kid gets sugar, the kid will act more distracted, impulsive, and hyper."

To test the "All" part of the theory: "ADHD symptoms will continue for some kids even after sugar is removed from the diet." <--- if that happens then it is falsifiable.

Third, we need an Operational Definition

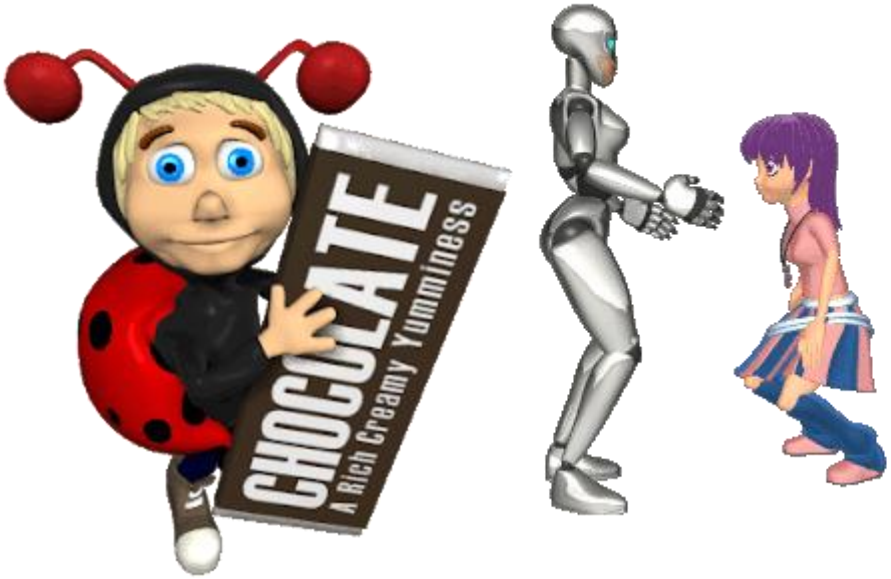
- **Operational Definitions** are just "definitions";
- HUH? That's not very helpful . . . .
- Here's what mean: they precisely explain what you are manipulating **and/or** measuring in your research.
  - The more precise, the better the explanation
  - THINK TO YOURSELF—Can someone else repeat (replicate) what I just defined?

Operational Definitions

- Explain what you mean in your hypothesis.
- How will the variables be measured in "real life" terms.
- How you operationalize the variables will tell us if the study is valid and reliable.

Let's say your hypothesis is that chocolate causes violent behavior.

- What do you mean by chocolate?
- What do you mean by violent behavior?



More on Operational Definitions

- Why do we need to do this?
- Because if other researchers need to replicate your study, they know exactly how you did it.
- How do we define someone with ADHD? Or as violent? Or SMILING?
- What will we do to with the variables to test the hypothesis?

Operational Definitions

BAM! VERY IMPORTANT SLIDE!

VERY IMPORTANT:

On the A.A.Q. you will always be asked the Operational Definition of a Variable (and it's typically the Dependent Variable).

You need to precisely identify (1) what they using to measure that variable such as a survey or response and (2) how they are "counting" or quantifying it, such as the number of correct responses or the level of the rating scale being used.

- Anxiety: The "score" on the Hamiliton Anxiety Rating Scale
- Obedience: The "level" of shocks a participant administered using an electric zap machine
- Memory: The number of correctly remembered words on a memory test out of 20 words.

Variable	Operational definition	Value
Intelligence	Score on the Verbal SAT test (a standardized test)	550
Age	Response to questionnaire (a self-report measure)	21
Intelligence	Speed of repairing engine (a behavioral definition)	2 hrs
Intelligence	Number of hairs on left thumb (a stupid definition)	7

Operational Definitions ~ it's like baking a cake!

- Seriously! Operational Definitions are like the instructions to baking a cake!
- If you want to recreate your grandma's chocolate cake, you need to the precise measurements and directions for each step
  - If the recipe calls for 2 cups of flour, you will not use more or less.
  - If the recipe tells you to melt the butter before adding it, you will not add the butter cold!

But how do we know our research is testable?

Do we have a "good" operational definition?

- How do we know what distracted, hyper and impulsive looks like to describe ADHD behaviors?

OPERATIONAL DEFINITIONS! Use in an ANY RESEARCH METHOD

How do we explain or measure our variables?

It's basically a definition of your variables to explain to others exactly what you did in your research.

This is what makes psychology a SCIENCE-- because its empirically driven and it's a science because of the WAY we study it.

Operational Definitions are a way that allow us to measure and observe our thoughts and emotions.

VERY IMPORTANT SLIDE!

EMPIRICISM:

Measurable and Observable

VALIDITY:

Good operational definitions will also give validity to results of your research because it should be replicable! (Others can replicate your research and get similar results)

The final step in the scientific method: ***replication***

Replicating research means trying it again using the same operational definitions of the concepts and procedures.

You could introduce a small change in the study, e.g. trying the ADHD/sugar test on college students instead of elementary students.

Metacognition Brain Break! (Thinking about your thinking!)

Discuss with a partner:

REPLICATION & OPERATIONAL DEFINITION

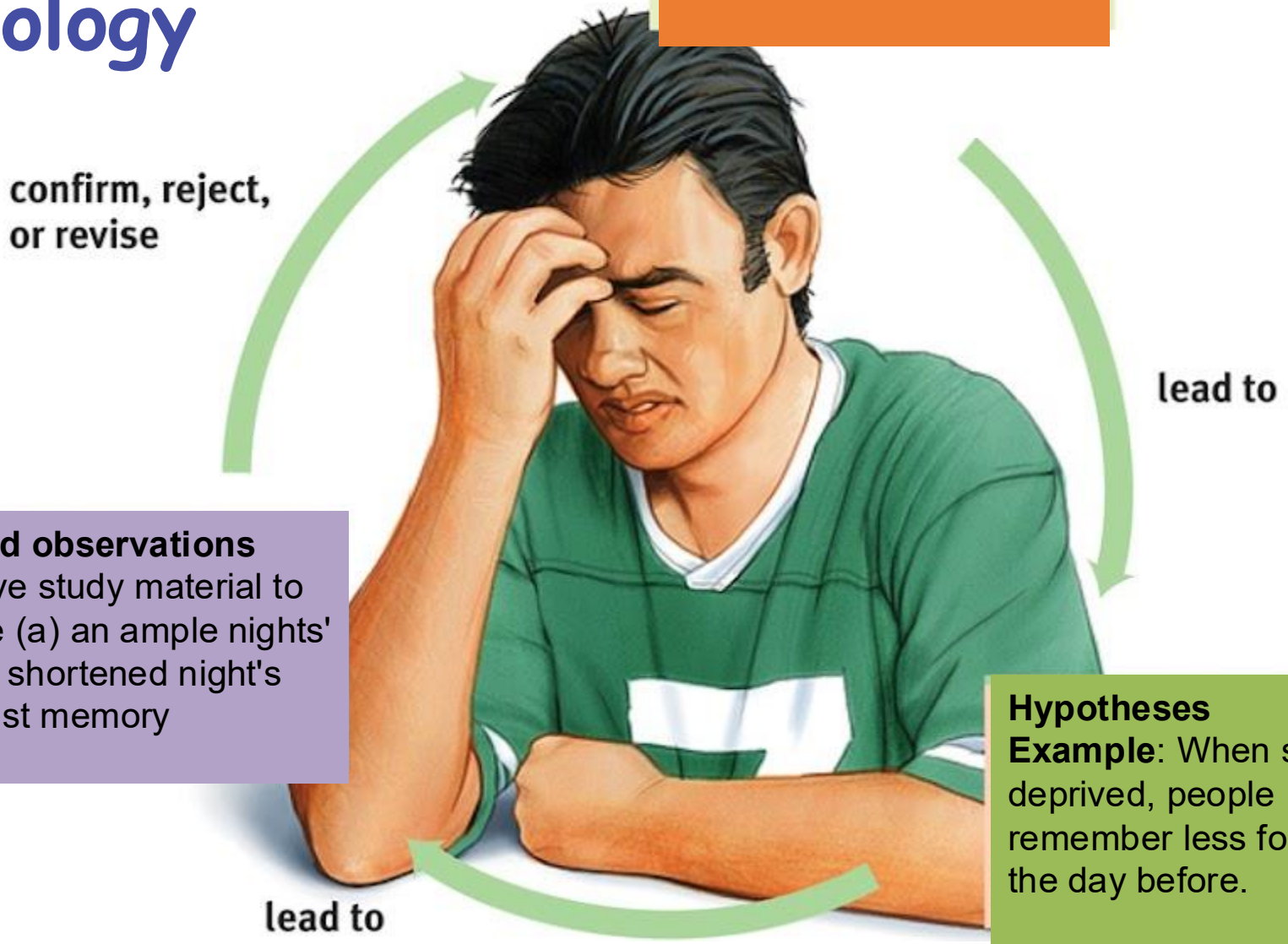
Identify how these two terms are the same, yet how they also differ.

The goal is to not only define but apply the term in relation to another term.

Can you to apply it to a situation or to another term?

Research Process as a science in Psychology

Theories Example:
Sleep boosts memory



Research and observations
Example: Give study material to people before (a) an ample nights' sleep or (b) a shortened night's sleep, then test memory

Hypotheses
Example: When sleep deprived, people remember less form the day before.

The Survey: A Tool or Technique to used collect research data

- **Definition:** A technique to gather information about many people's thoughts or behaviors through self-report rather than observation.
- Keys to getting useful information:
  - Be careful about the **wording** of questions
  - Only question **randomly sampled** people

Wording or Framing effects the results you get from a survey can be changed by your word selection.

Example:

Q: Do you support welfare programs?

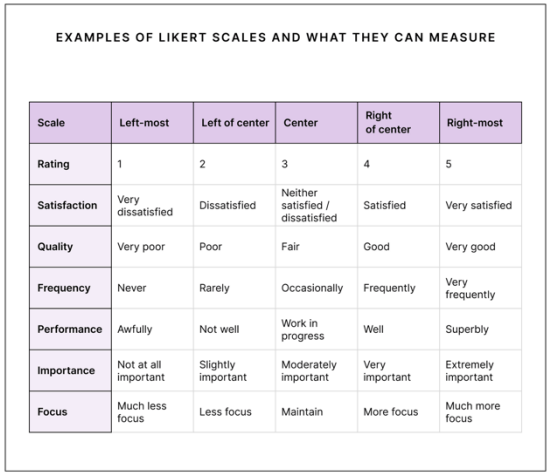
Q: Do you support aid for those in need?

The survey: asking questions can be tricky!

- Even small changes in the word order or the choice of words used can make a big difference:

- Sometimes use a "Likert Scale" in which respondents to rate the degree to which they agree or disagree with a statement

MORE APPROVAL	LESS APPROVAL
Aid to those in need	Welfare
Undocumented workers	Illegal aliens
Gun safety laws	Gun control laws
Revenue enhancers	Taxes
Enhanced interrogation	Torture
Pre-owned	used



EXAMPLES OF LIKERT SCALES AND WHAT THEY CAN MEASURE

Scale	Left-most	Left of center	Center	Right of center	Right-most
Rating	1	2	3	4	5
Satisfaction	Very dissatisfied	Dissatisfied	Neither satisfied / dissatisfied	Satisfied	Very satisfied
Quality	Very poor	Poor	Fair	Good	Very good
Frequency	Never	Rarely	Occasionally	Frequently	Very frequently
Performance	Awfully	Not well	Work in progress	Well	Superbly
Importance	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Focus	Much less focus	Less focus	Maintain	More focus	Much more focus

A Likert Scale measuring your happiness this past week at school.

What is the operational definition?

How we phrase questions in a SURVEY can also impact:

- Social desirability bias: bias from people responding in ways they presume a researcher expects or wishes.
- Self-report bias: bias when people report their behavior inaccurately

Survey Technique

- Most common technique used to collect in psychology

- **Measures correlation <u>OR</u> can be used to measure the dependent variable in an experiment**

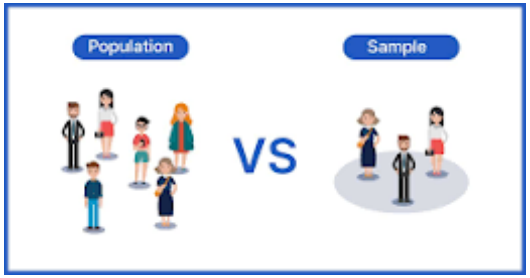
- Cheap and fast

- Low response rate AND

- Need a good random sample ("an accurate snapshot of your population") otherwise have a sampling bias! (Newspaper example- Dewey defeats Truman)

PROPER SAMPLING & THE POPULATION

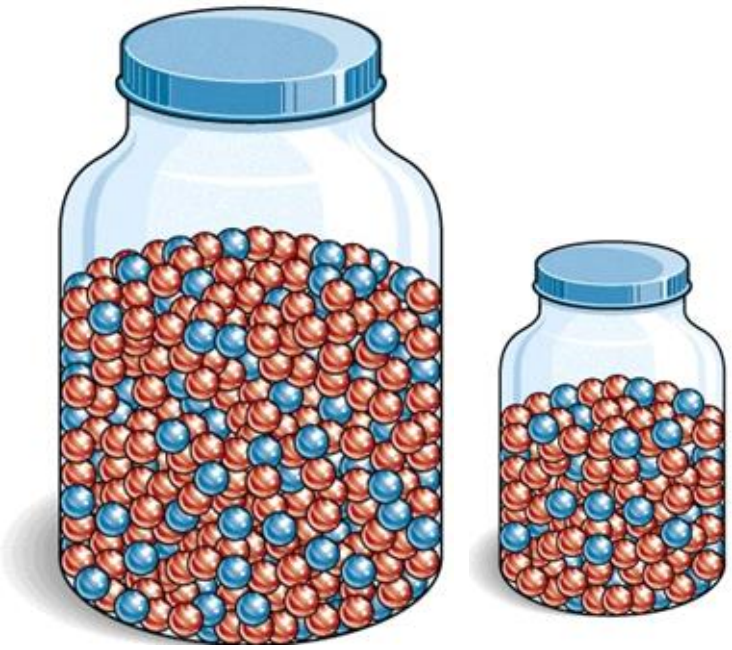
- Before we can investigate our hypothesis, we need to decide who or what group to study.
- Sampling is the process by which participants are selected for the research.



- You must identify the POPULATION from which the sample will be selected.
- The goal is to select a sample that is representative of a larger population. (Too time consuming and expensive to research a large population like a study on "men").

Why take a sample?

- If you want to find out something about men, you can't interview every single man on earth.
- Sampling saves time. You can find the ratio of colors in this jar by making sure they are well mixed (randomized) and then taking a sample.



population ***sample***

Random sampling *is a technique for making sure that every individual in a population has an* ***equal chance*** *of being in your sample.*

"Random" means that your selection of participants is driven only by chance, not by any characteristic.

RANDOM SAMPLE or aka RANDOM SELECTION

- In order to ensure that the sample is representative of the population you are studying, you need to select your participants at random.
- Not good to stand in front of the library on Wednesday mornings and "randomly" approach people to participate. Why not?
- Best methods are having a computer randomly select people from the population a table of random numbers or picking names out of hat.

Representative and/or Stratified Sample

- To increase the likelihood that a sample will actually represent a larger population, use a stratified sample.
- Example: if you are thinking that different racial groups will respond different, you can make each race in your sample in the same proportion that occurs in your overall population.
- If have 1,000 students with 500 Caucasian, 300 African American and 200 Latinos, how would I stratify the sample if only using 100 students in my study?
- 50 Caucasian, 30 African American & 20 Latinos

Sampling bias:

* what is it
* how to avoid it

BAM! VERY IMPORTANT SLIDE!

Sampling bias is a flawed sampling process that produces an unrepresentative sample of a population

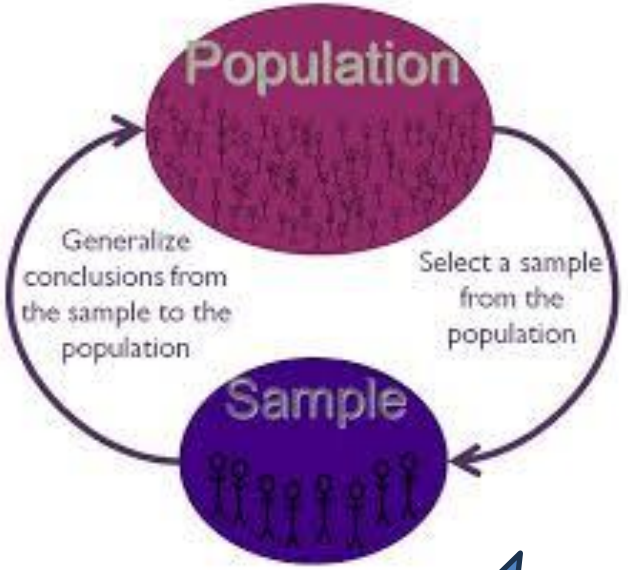
We WANT a representative sample of the population so we can generalize our findings of the sample back to the population

This is all about being able to GENERALIZE the results from your study (sample) back to the population

NOTE: The AAQ will ALWAYS ask you if you can "generalize" the results of the study. LOOK AT WHETHER THE SAMPLE ACCURATELY REFLECTS THE POPULATION THEY ARE STUDYING

Generalization & Random Sample

- Points to remember:
  - Identify the population being studied
  - Seek a random sample in which *every person* in that entire population has an ***equal chance*** of being included in the sample (this creates a representative sample)
  - Large representative samples are better than small ones
  - The best basis for generalizing results of a study is from a REPRESENTATIVE, RANDOM SAMPLE!



Very Important Slide! Every AAQ will ask whether the results of the study can be "generalized"

More on Generalization & the Random Sample

- For generalizability you are making the argument that the data you have found in your sample could be representative of a larger population.
- For example, if your study only sampled college aged male students, it would be difficult to say you could find the same results in an older population.
- Without a random sample the results are not generalizable regardless of what else you do.

- Random sampling is all about generalizability to the target population
- Generalizability can apply to all types of research (Non-experimental and experimental) in relation to the sample.
- Generalizability can relate to whole population as well as smaller subgroups of population. A result can generalize to millennials but not to the population as a whole (which contains gen x, gen z, baby boomers, etc.)

TYPES OF NON-EXPERIMENTAL RESEARCH

Also known as:

DESCRIPTIVE RESEARCH

- The case study: in-depth analyses of individuals or groups
- Naturalistic observation: recording the natural behavior of many individuals
- Meta-analysis: Summarizes previous studies on a topic.
- Correlations: a linear relationship between two variables

- NOTE: There is NO manipulation of variables- that's for an experiment

Different Research Methods

Non-Experimental Designs versus Experimental Designs

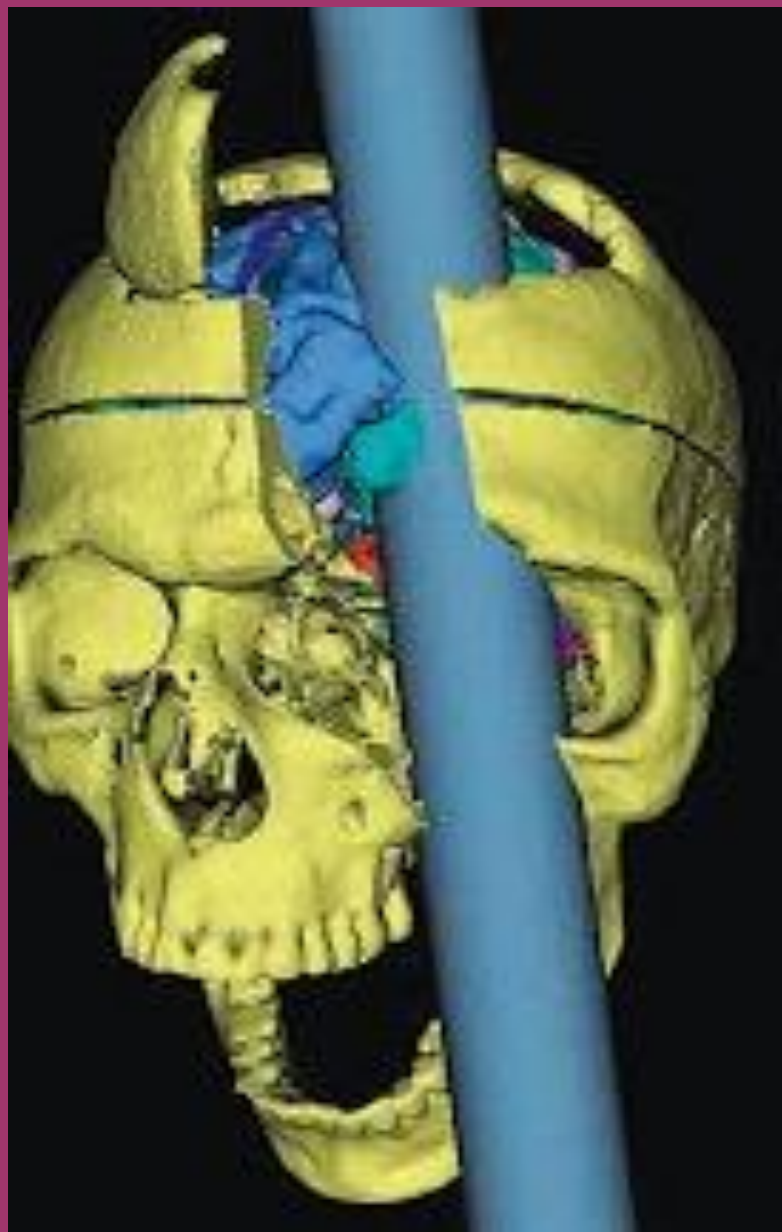
Non-experimental Designs	Correlation	Case Study	Naturalistic Observation	Meta-analysis
To describe data and maybe make predictions about future behavior	A linear relationship between two variables Positive-direct relationship Negative- inverse relationship	In-depth investigation of an individual or small group. Can include structured interviews (qualitative)	Watching behavior in authentic environments Data collected in afield-setting without manipulation of a variable	Summarizes previous studies on a topic. Could summarize multiple correlational studies or multiple experimental studies

Experimental Designs	The Experiment!
To show a cause and effect	Involves the manipulation of an **independent variable** and random assignment to groups or comparison of equivalents groups

Important note on the Survey	The survey is NOT considered a design method. Rather is is considered a technique used to collect data. For example, you can use a survey for a correlational design to compare two variables OR you can use a survey in an experiment as your dependent variable

1. Case Study: Phineas Gage

- *Examining one individual in depth to describe behavior*
- ***Benefit:*** can be a source of ideas about human nature in general
- ***Example:*** cases of brain damage have suggested the function of different parts of the brain (e.g. Phineas Gage)
- ***Danger:*** overgeneralization from one example; "he got better after tapping his head so tapping must be the key to health!"
- Point to remember: to find general truths, we must employ other research methods.



2. Naturalistic Observation

- **Observing "natural" behavior** means *just watching (and taking notes), and not trying to change anything.*
- This method can be used to study more than one individual, and to find truths that apply to a broader population.
- Does NOT explain behavior, <u>only describes it.</u>

Thanks to "big data" that can be harvested from phone apps, social media and online searches, scientists can now use millions of people data (anonymously) to research all kinds of information such as people moods during the day of the week and time of the day based on positive and negative words in tweets. Page 0-17

Metacognition Brain Break! (Thinking about your thinking!)

Discuss with a partner:

CASE STUDY & NATURALISTIC OBSERVATION

Identify how these two terms are the same, yet how they also differ.

The goal is to not only define but apply the term in relation to another term.

Can you to apply it to a situation or to another term?

3. Meta-analysis

- Meta Analysis refers to a research strategy where instead of conducting new research with participants, the researchers examine the results of several previous studies.
- This is done with the purpose of gaining greater confidence in the results because of the larger pool of participants, as long as steps are taken to avoid errors that may have existed in the original studies.

3. Meta-analysis

- Summarizes previous studies on a topic.
- Could summarize multiple previously conducted studies such as
  - Look at results from multiple correlational studies or
  - Look at results from multiple experimental studies or
  - Even look at combining results from multiple correlational studies AND experimental studies.

What is a meta-analysis?

Combining the results of individual studies with statistical methods

Can 8-month-old infants extract isolated word forms from natural speech?

How to Conduct a Meta Analysis

Define the Research Question

Search for Relevant Studies

Screen Studies for Inclusion

Extract Data

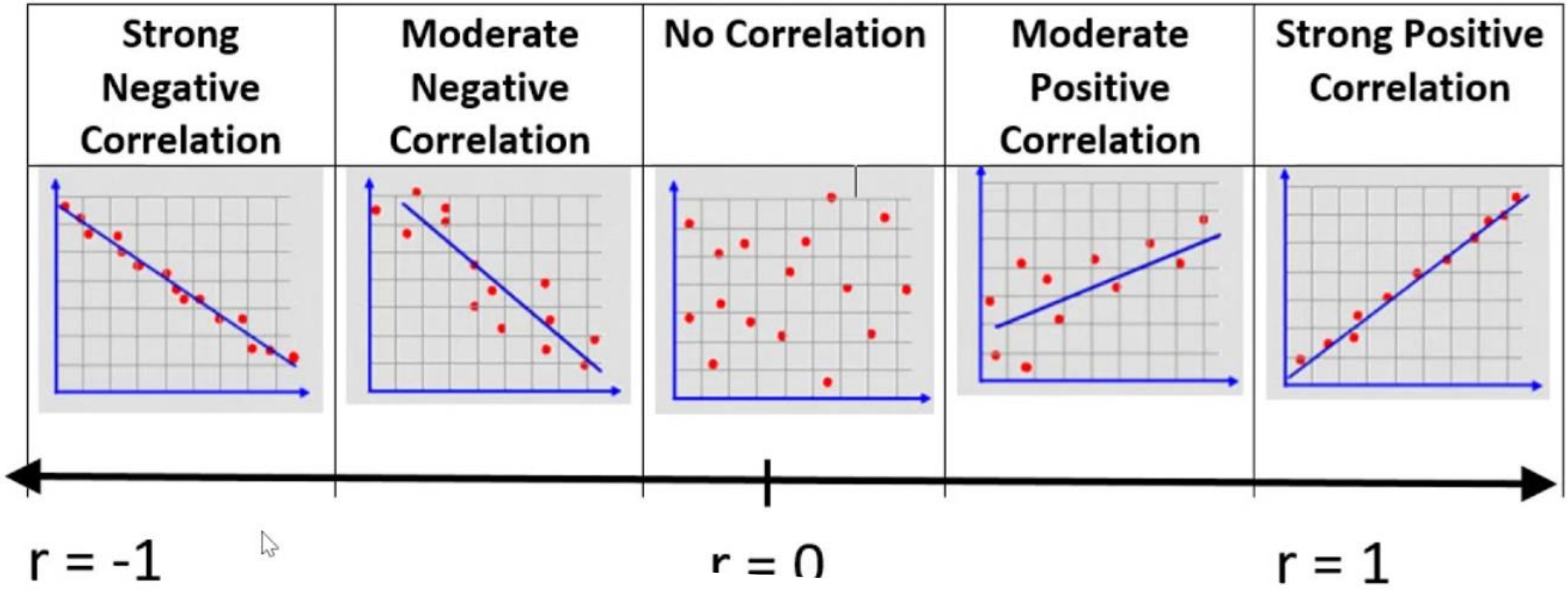
Analyze Data

Interpret Results

QuestionPro

4. CORRELATIONS

- **A correlation** measures the relationship between two variables.
- They can be **positive or negative or none** (no correlation).
- Positive correlation means the presence of one things predicts the *presence* of the other.
- Negative correlation means the presence of one things predicts the *absence* of the other
- No correlations means no relationship between to the two variables
- Correlation coefficient is the statistical index of the relationship between two variables expresses a "r" value



The Correlation Coefficient- it's a number scale from 1- to +1 (with 0 in the middle)

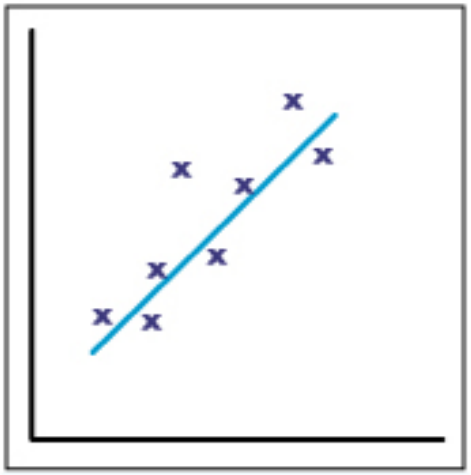
The closer the correlation number moves to either -1 or +1, the "stronger the correlation".

The closer the correlation number moves to 0, the weaker the correlation.

O is NO correlation

More on correlations...

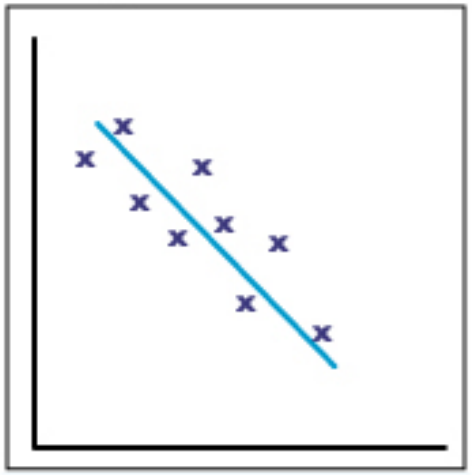
Positive correlation



The points lie close to a straight line, which has a positive gradient.

This shows that as one variable **increases** the other **increases**.

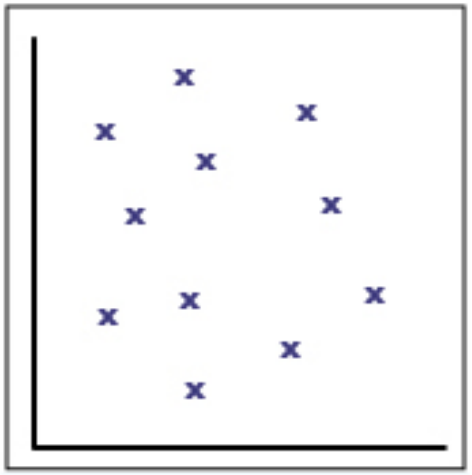
Negative correlation



The points lie close to a straight line, which has a negative gradient.

This shows that as one variable **increases**, the other **decreases**.

No correlation

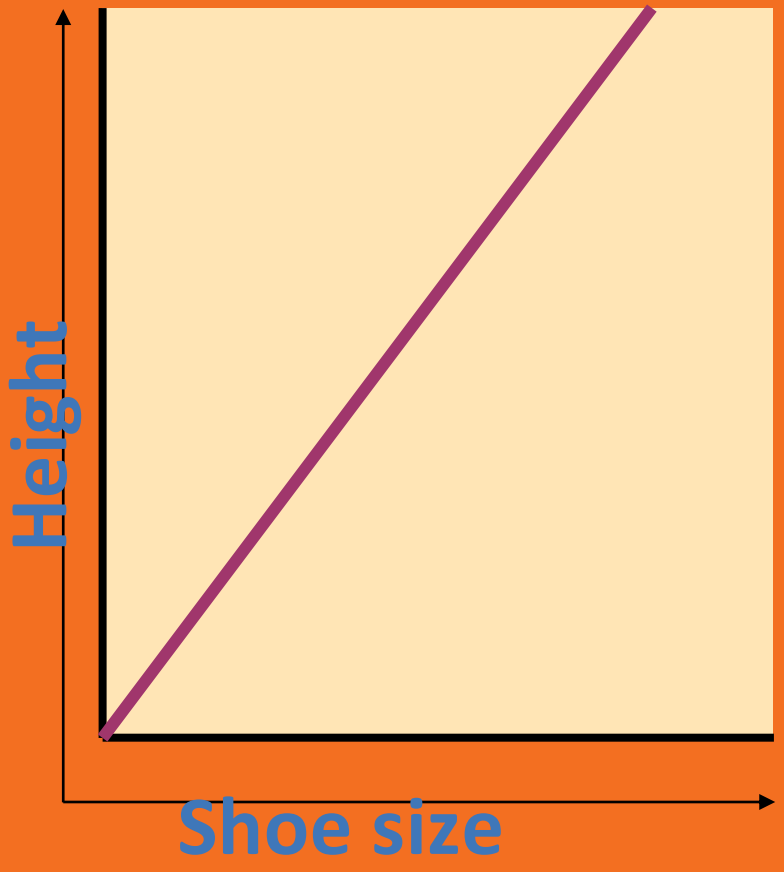


There is no pattern to the points.

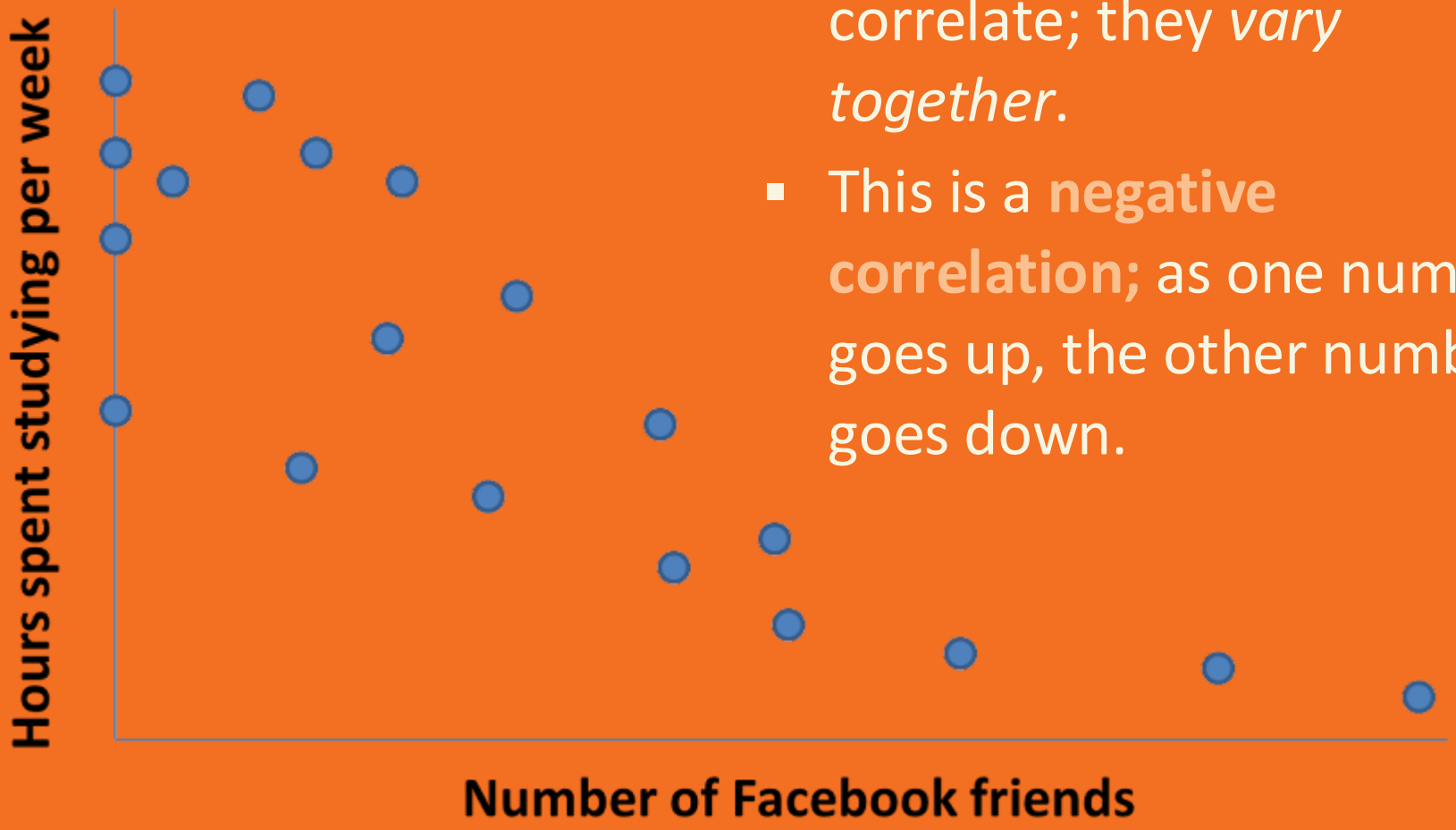
This shows that there is **no connection** between the two variables.

Finding Correlations: Scatterplots

- Place a dot on the graph for each person, corresponding to the numbers for their height and shoe size.
- In this imaginary example, height correlates with shoe size; as height goes up, shoe size goes up. (Positive).
- **The line of best fit** or **regression line** is the line drawn through the scatter plot that minimizes the distance of all points from the line



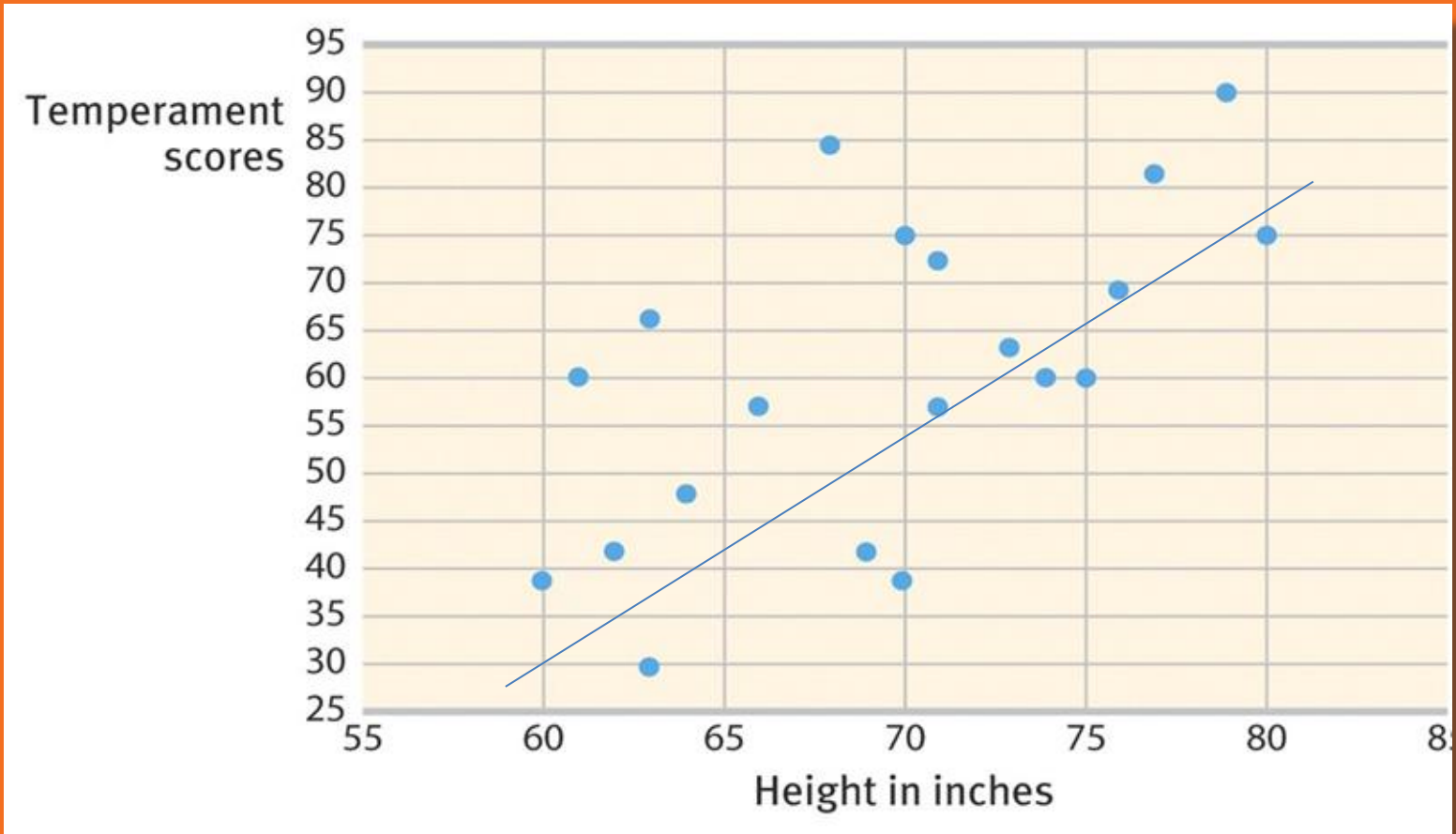
[Fictional] Negative Correlation: Facebook and Studying



- These are two factors which correlate; they *vary together*.
- This is a **negative correlation;** as one number goes up, the other number goes down.

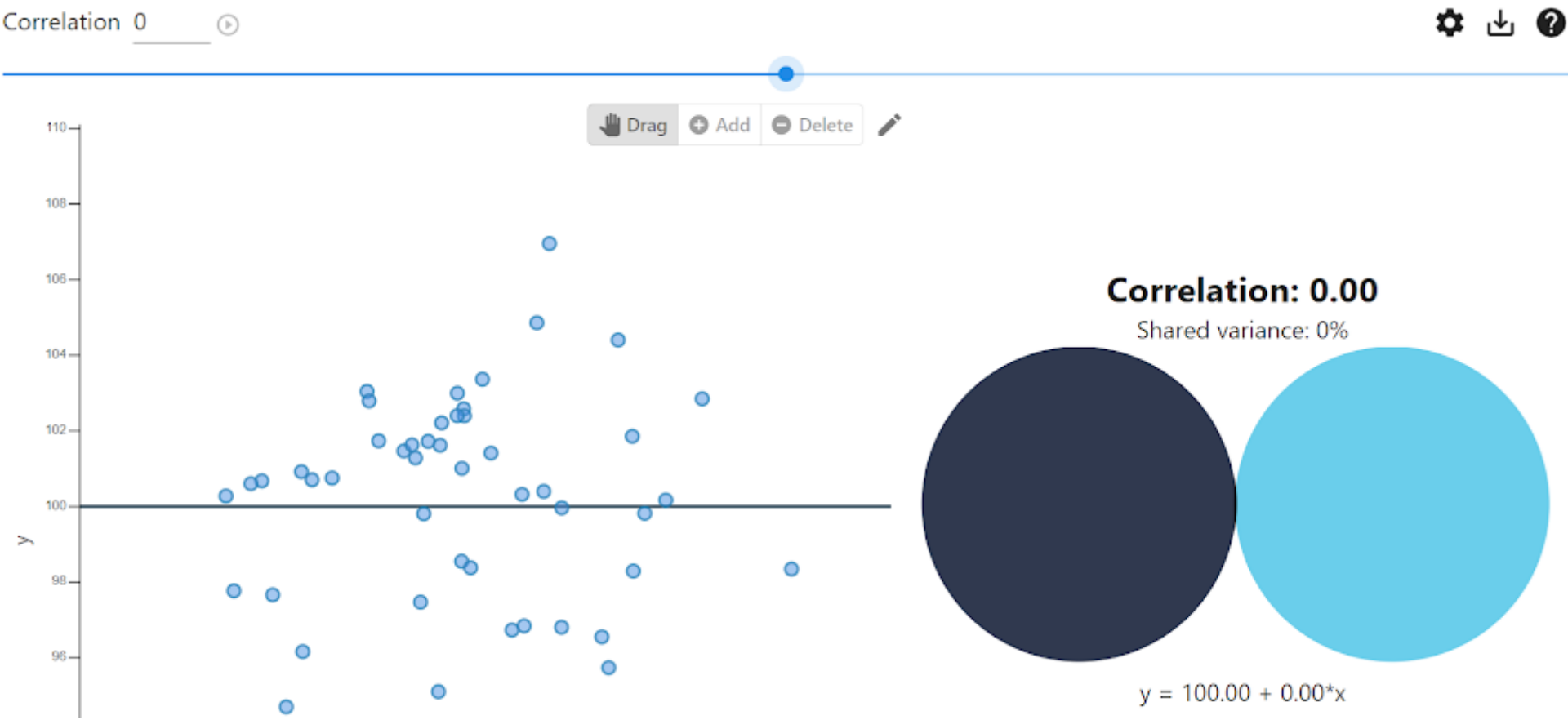
When scatterplots reveal correlations:

Height relates to shoe size, but does it also correlate to "temperamental reactivity score"? A table doesn't show this, but the scatterplot does.



Interactive Correlation Website

[Interpreting Correlations]



CORRELATION DOES NOT PROVE CAUSATION!

VERY IMPORTANT SLIDE!

Correlation is not Causation!

"People who floss more regularly have less risk of heart disease."

If these data are from a survey, can we conclude that flossing might prevent heart disease? Or that people with heart-healthy habits also floss regularly?

"People with bigger feet tend to be taller."

Does that mean having bigger feet **causes** height?

Other examples of correlations from the headlines

Daytime naps once or twice a week may be linked to a healthy heart, researchers say

Some good news for nap fanatics — a new study has found that a daytime nap taken once or twice a week could lower the risk of heart attacks or strokes.

Teens who don't date are less depressed, new study finds

The study surveyed 594 10th grade students.

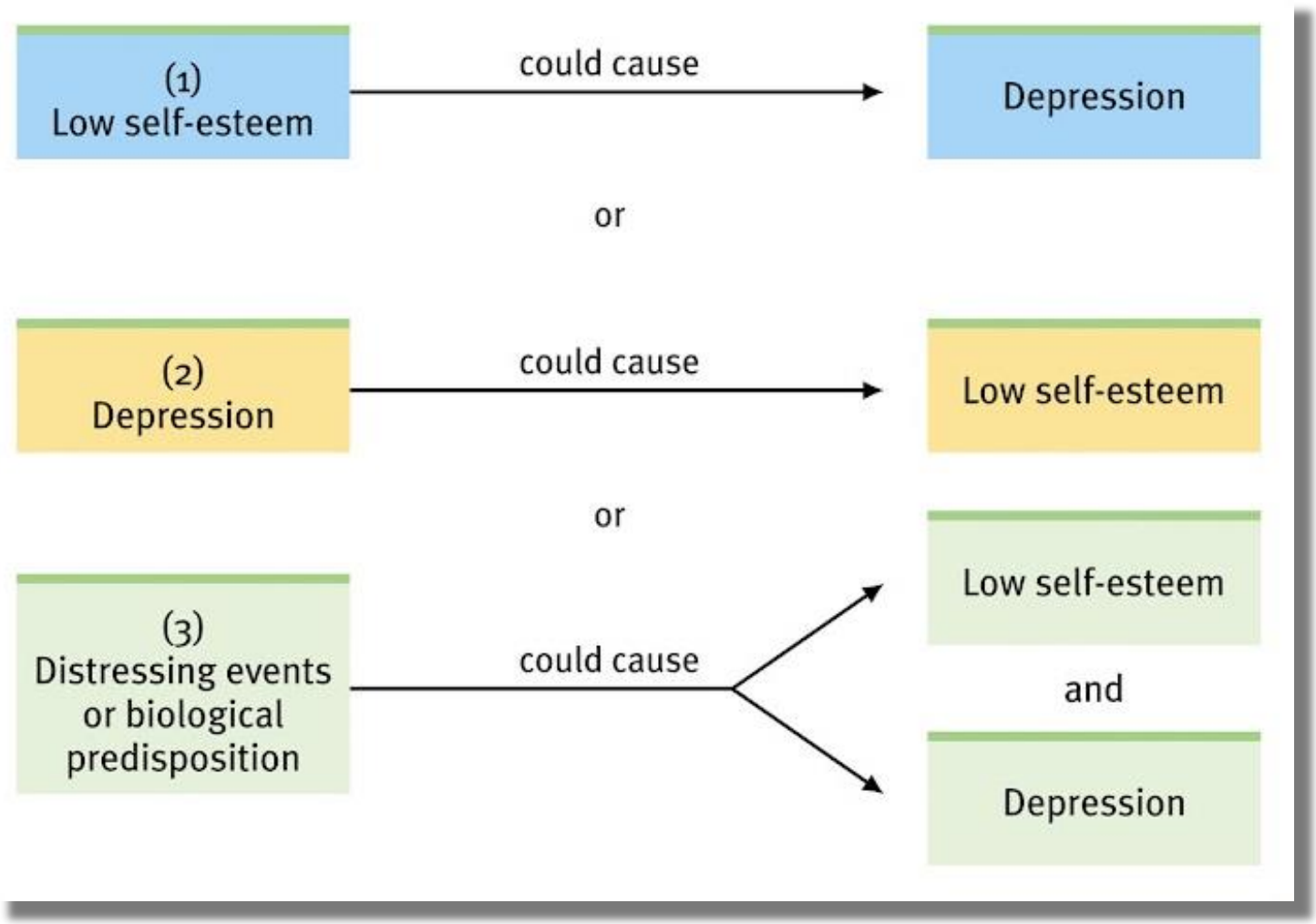
Thinking critically about the text:

If a low self-esteem test score "predicts" a high depression score, what have we confirmed?

- that low self-esteem causes or worsens depression?
- that depression is bad for self-esteem?
- that low self-esteem may be part of the definition of depression, and that we're not really connecting two different variables at all?

If self-esteem correlates with depression,

there are still numerous possible causal links:



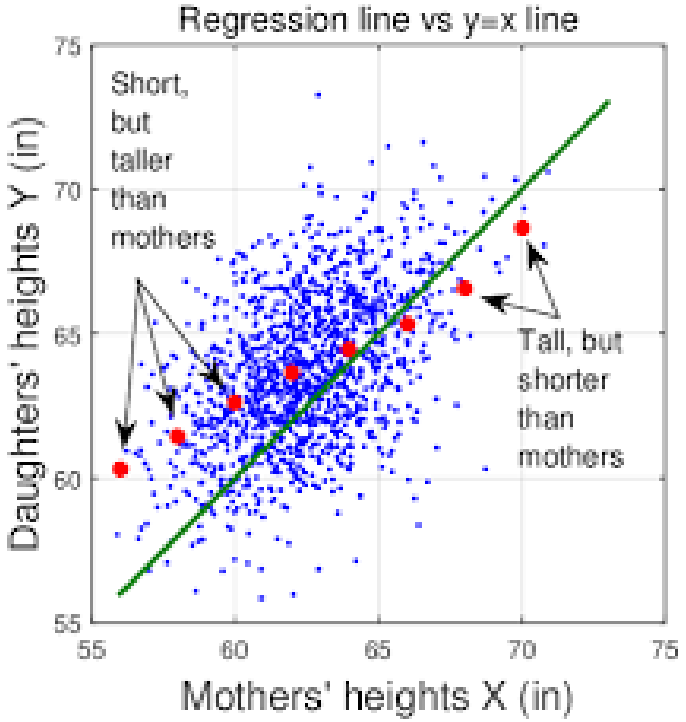
Watch out for the **Third Variable Problem**

The Third Variable Problem (sometimes called an Illusory Correlation): the perception of a relationship where none exists

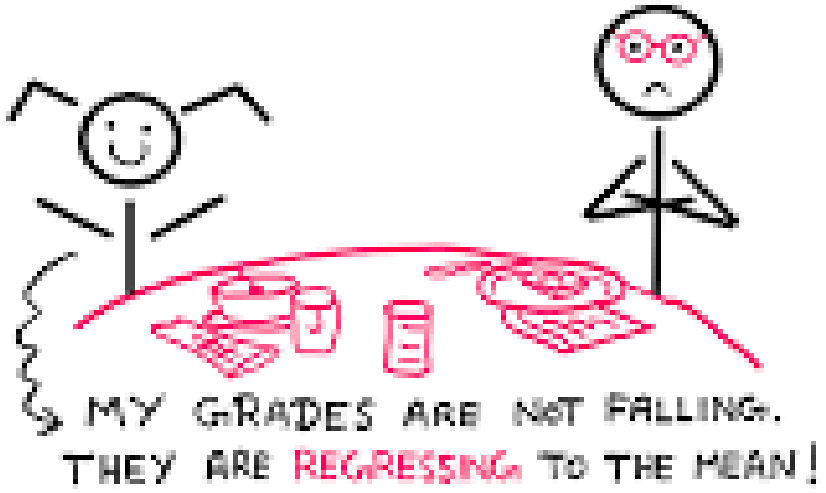
While correlations make visible relationships between variables we might otherwise miss, we need to be careful of making connections between variables that really have no relationships…. This is how superstitions form.

Example: The Redskins football team scores every time I enter the room. My husband forces me to watch the rest of the game….

Another problem with correlations: regression towards the mean



- Regression towards the mean is the tendency for extreme scores or events to fall back (regress) toward the average.



Module 0.4 The Non-Experimental Method versus the Experimental Method

Myers 4ed pages 0.22 to 31

We use different methods to describe, predict and explain how we think, feel and action

- A non-experimental method, such as Correlational research, describes the relations between two or more variables
- Experiments attempt to establish cause and effect connection

5. EXPERIMENTATION

The GOLD STANDARD of all research methods.

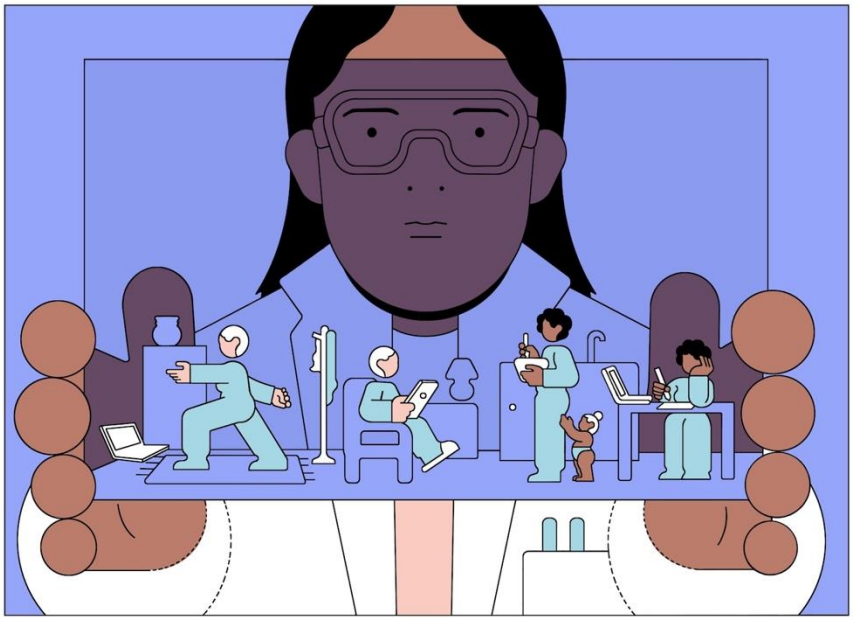
Why?... because it is the only type of research that **can show a causal relationship**!!!!

IMPORTANT NOTE: Other types of "non-experimental descriptive research" (case study, naturalistic observations & meta-analysis may allow us to PREDICT, but they do NOT show cause and effect).

The EXPERIMENT is the ***preferred method,*** but it's more difficult to do than the other types of research methods...

THE EXPERIMENTAL METHOD

- This is the preferred method of research because only through carefully controlled experiment can one show a causal relationship.
- It allows for a researcher to manipulate the independent variable and control for the confounding variables.



VERY IMPORTANT NOTE:
You will know you are in an experiment if you see either of these elements:

(1) RANDOM ASSIGNMENT or
(2) MANIPULATION OF THE INDEPENDENT VARIABLE!

Why use the Experimental Method?

To determine CAUSE & EFFECT which can EXPLAIN a behavior or mental processes

Especially if you see "Random Assignment" or "Manipulation of the I.V." ...

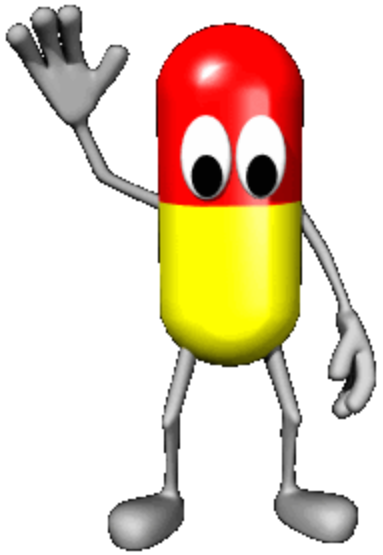
VERY IMPORTANT SLIDE!

The Experimental Method, continued

- Independent Variable is what you **manipulate** or attempt to change in an experiment.
- Dependent Variable is what you **measure** at the end of your experiment
- Confounding Variables is **any difference** between your groups that you are studying that are not due to the independent variable.

Independent Variable

- The experimental group gets the Independent Variable.
- Whatever is being manipulated in the experiment.
- Hopefully, the independent variable brings about change.



If there is a drug in an experiment, the drug is almost always the independent variable.

Operationally defining the Independent Variable

<u>Often on the A.P. Exam they will ask you how to</u> operationally define the I.V.

How would you operationally define "chocolate" or "sugar"?

<u>Be Specific:</u> How much of it is given? How frequently

VERY IMPORTANT SLIDE!

Dependent Variable

- Whatever is being measured in the experiment.
- It is dependent on the independent variable.

The dependent variable would be **<u>the effect</u>** of the drug.

Operationally defining the Dependent Variable or Results

<u>Often on the AP Exam will ask you:</u>

How to operationally define the D.V.

Notice it is quantifiable-

VERY IMPORTANT SLIDE!

It will be the score, or number or level of something that is observable or measurable.

What does Aggression look like?

"The number of times a participant punches the wall."

What does ADHD look like?

"The number of times a student gets out of their seat in class"

Operationally defining the Dependent Variable or Results

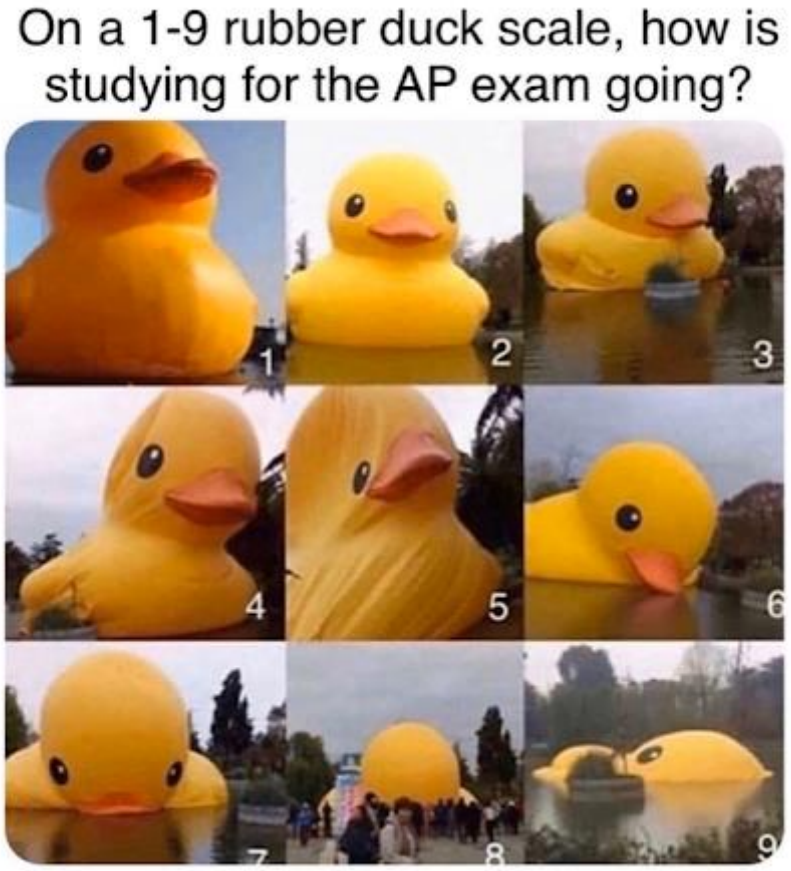
<u>Often on the AP Exam will ask you:</u>

to operationally define the D.V.

OR

to identify how the researcher measured the results of their research.

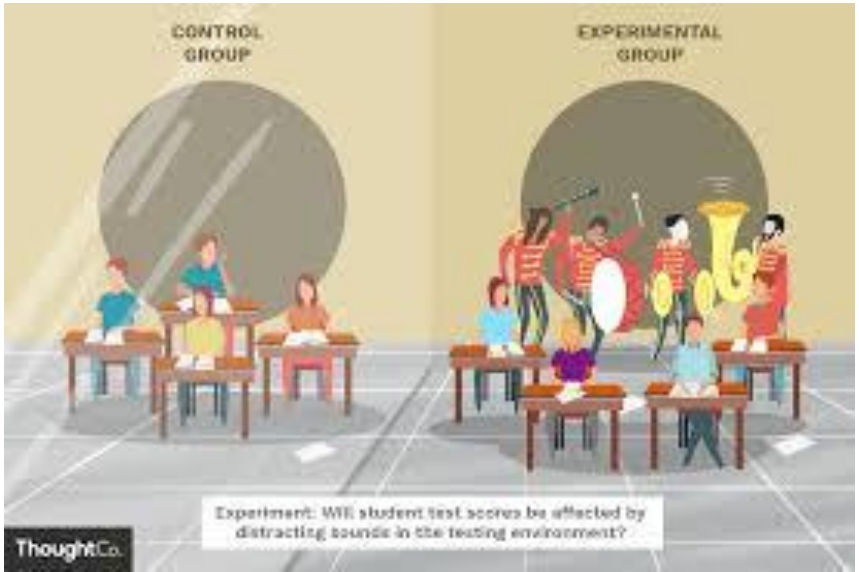
Typically, it will be a "The Score on a Rating Scale"



Experimental Manipulation

- Experimental group:

The group exposed to the treatment—that is, to the one version of the independent variable



- Control group:

The group NOT exposed to the treatment; contrasts with the experimental group and serves as a comparison for evaluating the effect of the treatment

Beware of Confounding Variables

If I wanted to prove that smoking causes heart issues, what are some confounding variables?

- **The goal of an experiment is to prove that A causes B.**
- A confounding variable is anything that could cause change in B, that is not A.

Lifestyle (eating habits and a being a couch potato) as well as family history may also affect the heart.

Example: Situation-relevant confounding variables

- If my study hypothesizes that violent TV programs causes aggression, the independent variable is the violent TV program (*and I need to include an operational definition of "violent TV programming"*). My dependent variable is the aggression displayed after watching (*operational definition?*).
- What if I show the experimental group the violent TV programming at night in the large lecture hall and the control group watches other programs in the morning in a small classroom?

How to reduce the situation relevant confounding variable…

- The confounding variable is any differences in my subjects other than the type of TV programming they watch that could impact my results… how do we reduce that?
- I need to treat both groups essentially the same EXCEPT for the programming they watch.
- Both groups will watch their respective programming in the same room (the auditorium) at the same time of day (after lunch).
- Other situation relevant variables can include the time of day, the weather, and the presence of other people in the room….need to control for these….

A word of caution . . .

- There are two similar sounding terms, but we use them in different types of research methods:
  - 3rd Variable Problem is used to describe illusory correlations (and thus, used in correlational studies)
  - Confounding Variables are what occur when we do not use random assignment to reduce differences between participants (and thus used in experiments).

Another way to CONTROL for the Confounding Variable is through RANDOM ASSIGNMENT!

(Do not confuse Random Assignment with Random Sample)

- RANDOM ASSIGNMENT:

To reduce the problem of a confounding variable, we will "randomly assign" our participants to a control group OR an experiment group.

The two groups will be sorted by chance and have an equal opportunity to be placed in one of the two groups.

RANDOM ASSIGNMENT!

Remember, "random" means EQUAL CHANCE

METHODOLOGY:

Use same method as we did with the random sample by having a computer select or pull names out of a hat.

- The control group will not watch the violent TV programming (i.e., they are not exposed to the independent variable)
- The experimental group will watch the violent TV shows (i.e., they WILL GET the independent variable).

FIRST: Random Sample
SECOND: Random Assignment

Random Sample

- The process of choosing the research participants from the population
- Happen BEFORE assignment

Random Assignment

- Each participant has equal chance of being placed into any group
- Placement into experimental or control group

RANDOM SAMPLE comes from the POPULATION we will study

RANDOM ASSIGNMENT occurs AFTER we sample. We will split our sample into two groups—the experimental group will get the I.V. and the control group will get "nothing".

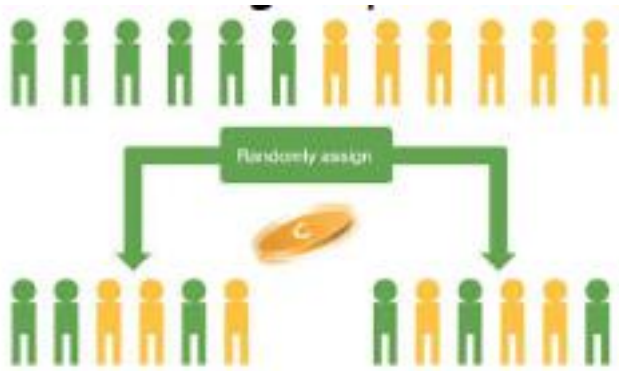
ANOTHER VIP MOMENT:

MEMORIZE THIS:

RANDOM ASSIGNMENT REDUCES PARTICIPANT BIAS AND ALLOWS FOR CAUSE AND EFFECT!

***IMPORTANT NOTE: "Reducing bias" allows you to minimize the impact of any confounding variables that participants naturally bring to the experiment. Maybe all the "green people" are brilliant- so if I use random assignment then half will go into the control group and half into the experimental group

VERY IMPORTANT SLIDE!

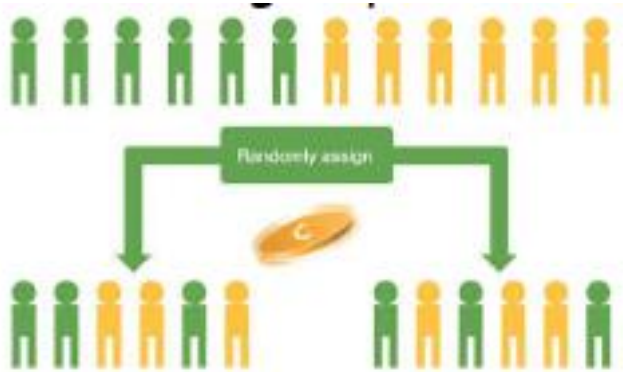


WHAT TYPE OF BIAS DOES RANDOM ASSIGNMENT REDUCE?:

MEMORIZE THIS:

RANDOM ASSIGNMENT REDUCES **PARTICIPANT** BIAS!

If all Green People are BRILLIANT, we want to make sure they have an equal chance of being in either my control & experimental group!



VERY IMPORTANT SLIDE!

VIP: In all experiments...

First, we "SAMPLE"
Then we "ASSIGN"

In other words, first select your **Random Sample** from the population you are studying.

THEN, use **Random Assignment** to select a Control Group and an Experimental Group

Just to clarify two similar-sounding terms…

Random sampling is how you get a pool of research participants that represents the population you're trying to learn about.

Random assignment of participants to control or experimental groups is how you control all variables except the one you're manipulating.

First you sample, then you sort (assign).

In other words, once I select my jellybeans from the jar, then I need to assign them to different experimental groups…

Generalizability:

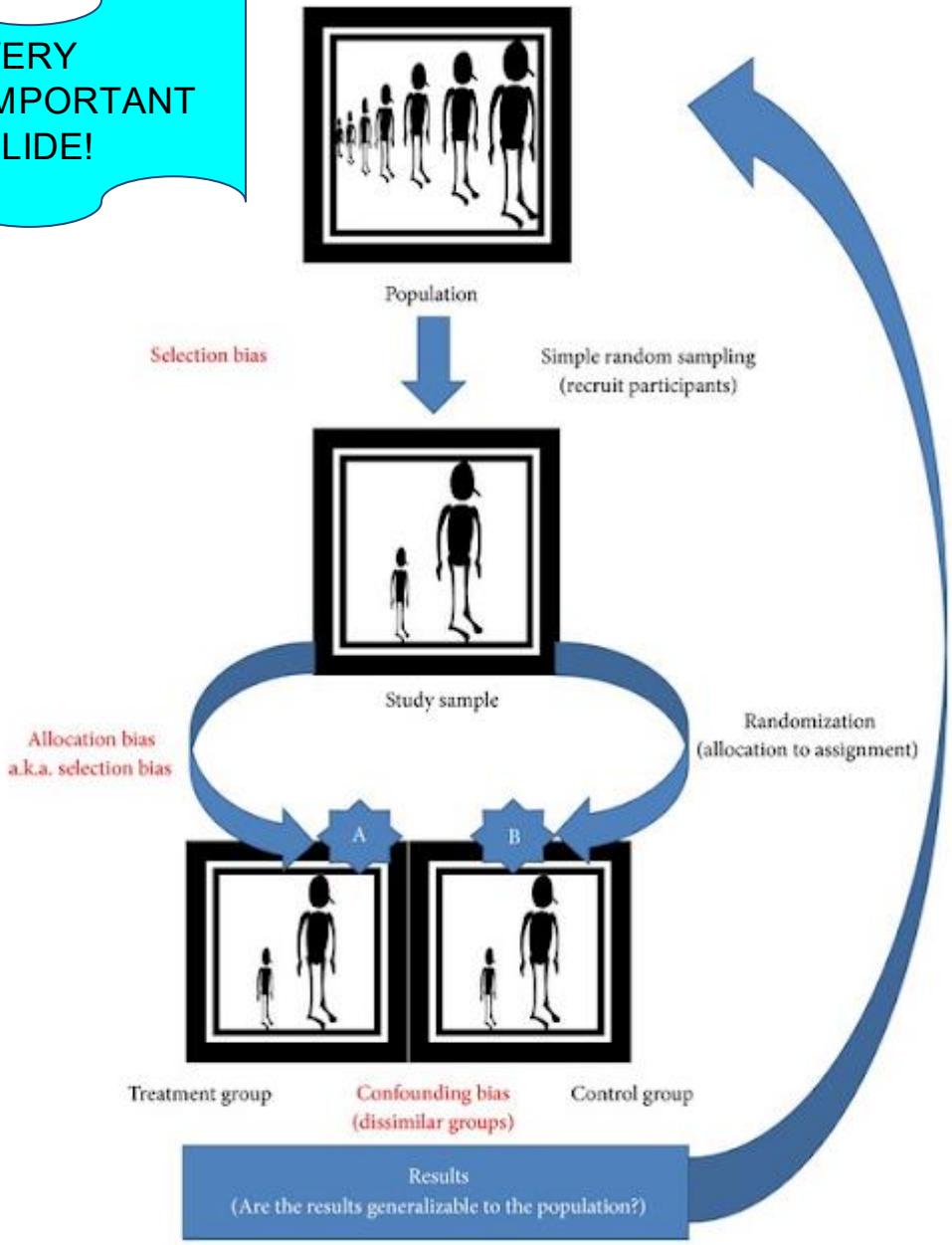
Can the results of your study be applied to a population larger than or different from the particular sample?

For a well-designed experiment with a LARGE ENOUGH Random Sample we can make an inference about the population.

With Random assignment, we can infer there is cause and effect (showing there is a large difference in outcomes between the control and experimental group)

YES!

VERY IMPORTANT SLIDE!



Significance of how to interpret results with Random Sample & Random Assignment about: (1) the population and (2) cause and effect

Were Individuals Randomly Assigned?	Were Individuals Randomly Sampled?	
	YES –Randomly Sampled YES- Randomly Assigned • Can make inferences about the population • Can make inferences about cause & effect	NO-Randomly Sampled YES-Random Assigned • CANNOT make inferences about the population • Can make inferences about cause & effect
	YES-Randomly Sampled NO- Randomly Assigned • Can make inferences about the population • CANNOT make inferences about cause & effect	NO- Randomly Assigned NO-Randomly Sampled • CANNOT make inferences about the population • CANNOT make inferences about cause & effect

Hawthorne Effect

- But even the control group may experience changes.
- Just the fact that you know you are in an experiment can cause change.

Whether the lights were brighter or dimmer, production went up in the Hawthorne electric plant.

Many other ways to control!

- Single-blind & Double-blind procedure
- Counterbalancing
- The Placebo

Single-Blind vs. Double-Blind

- **Single-Blind study**: participants do not know whether they are in the experimental or control group
- **Double-Blind study**: both subjects AND experimenters are kept uniformed

- Why conduct a blind studies? To reduce experimenter bias

Experimenter Bias

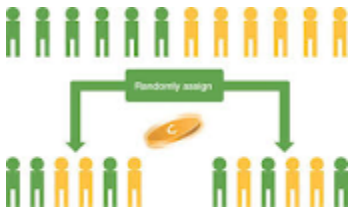
- Another confounding variable.
- Not a conscious act.
- To reduce Experimenter bias, use the **Double-Blind** Procedure:

*Neither the participants nor the person administering the experiment know which group is the control and which is experimental

VERY IMPORTANT SLIDE!

A word on "biases"

RANDOM ASSIGNMENT reduces:



Participant bias!

Do not want all the "smart" people in your experimental group. Need to divide them equal with control group

DOUBLE BLIND reduces:

Experimenter bias!

So that the person who conducts the experiment does not inadvertently influence the participants behavior

Another method of control: **The placebo**

- Whenever participants in the experimental group are supposed to ingest **an active drug**, the participants in the control group are given an **inert** but otherwise identical substance. ("Sugar Pill")
- Allows researchers to separate the physiological effects of the drug from the psychological effects of people thinking they took a drug (called the Placebo Effect).

Placebo v. Placebo Effect

Placebo: An intervention that resembles medical therapy, but has no medical effects. Sugar pills are common placebos, which are given to the control group.

Placebo Effect: A change in a patient's illness attributed to an imagined treatment, rather than a medical treatment.

1:36 PM · 17 Sep 2019

Placebo effect

- How do we make sure that the experimental group doesn't experience an effect because they expect to experience it?
- Example: An experimental group gets a new drug while the control group gets nothing, yet both groups improve.

Guess why.

Placebo effect: *experimental effects that are caused by expectations about the intervention*

Working with the placebo effect:

Control groups may be given a **placebo** – *an inactive substance or other fake treatment in place of the experimental treatment.*

- The control group is ideally "blind" to whether they are getting real or fake treatment.
- Many studies are **double-blind** – neither participants nor research staff knows which participants are in the experimental or control groups.

Placebo/Nocebo Effect

- The **difference between placebo** and **nocebo** is in the response to the inert therapy.
- A beneficial response to an inert substance is a **placebo** response
- A side effect to an inert substance is a **nocebo** response.

Different Research Methods

Non-Experimental Designs versus Experimental Designs

Non-experimental Designs	Correlation	Case Study	Naturalistic Observation	Meta-analysis
To describe data and maybe make predictions about future behavior	A linear relationship between two variables Positive-direct relationship Negative- inverse relationship	In-depth investigation of an individual or small group. Can include structured interviews (qualitative)	Watching behavior in authentic environments Data collected in afield-setting without manipulation of a variable	Summarizes previous studies on a topic. Could summarize multiple correlational studies or multiple experimental studies

Experimental Designs	The Experiment!
To show a cause and effect	Involves the manipulation of an **independent variable** and random assignment to groups or comparison of equivalents groups

Important note on the Survey	The survey is NOT considered a design method. Rather is is considered a technique used to collect data. For example, you can use a survey for a correlational design to compare two variables OR you can use a survey in an experiment as your dependent variable

Summary of the types of Research

Comparing Research Methods

Research Method	Basic Purpose	How Conducted	What is Manipulated	Weaknesses
Non-Experimental Research Method (Descriptive)	To observe and record behavior	Perform case studies, naturalistic observations, meta-analysis	Nothing	No control of variables; single cases may be misleading
Non-Experimental Research Method (continued) 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-effect; one variable predicts another but this does not mean one causes the other
Experimental	To explore cause-effect	Manipulate one or more factors; randomly assign some to control group	The independent variable(s)	Sometimes not possible for practical or ethical reasons; results may not generalize to other contexts

How do we decide to measure the behaviors or mental processes being studied?

Quantitative Research

- Use numerical data to represent degrees of a variable.
- REMEMBER- Quantitative has an N for Numbers
- EXAMPLE: A Likert Scale where questions fall on a continuum:
  - "Strongly disagree" to "strongly agree"

Qualitative Research

- Rely on in-depth narrative data that are not translated into numbers
- REMEMBER- Qualitative has an L for Language
- EXAMPLE: Conduct structured interviews to understand the causes and consequences of an individual's aggression.

More on Quantitative versus Qualitative

Quantitative Research

- If the data you collect and analyze can be expressed in a numeric form, it is quantitative. So if you're counting the number of times something happens, or measuring a percentage of times something happens, or getting survey results that can be expressed numerically — all of those are quantitative.
- Anything not quantitative is qualitative.

Qualitative Research

- if you're asking people to describe an experience in an interview, or reading sentences people write, or looking at sketches people draw — those are qualitative.

APA Ethical Guidelines for Research

- IRB- Internal Review Board
- Both for humans and animals.
- Important to have an institutional review for research involving both humans and non-human animals
- Ethics & IRB to protect research participants

Human Research

Six things a researcher MUST ensure to be considered ethical:

- Internal Review Board: review for research involving both humans and non-human animals
- Informed consent (adults) or informed assent (minors) must be used in the research scenario. Participants are free to leave at any time during research scenario and prefer no coercion. Happens BEFORE research.
- Anonymity/Confidentiality of participant's information
- Were participants protected from harm--No significant risk during research scenario
- Was deception used in the research (with the possibility of help from research "confederates"?)
- Must debrief at conclusion of the research (including for temporary deception). Occurs AFTER (true nature of study revealed)

Ethics & Research

Case Study BEST USED when psychologists are interested in studying the effects of a wide range of behaviors and experiences; including the effects of brain damage, childhood behaviors and perceptions, traumatic experiences, and animal intelligence.

Why?

Animal Research:

Four things a researcher MUST ensure to be considered ethical~ Not in CED

- Clear purpose
- Treated in a humane way
- Acquire animals legally
- Least amount of suffering possible.