

Opening Activity (OA)

- What is the danger of Overconfidence?
- What is Critical Thinking?
- What is Hindsight Bias?

Why do we use the scientific method?

- Overconfidence – people believe that they know more than they actually do. Leads us to false conclusions.
- Critical thinking – thinking that does not blindly accept arguments and conclusions. Rather it evaluates evidence and assess conclusions.

Why do we use the scientific method?

- All of us have subjective views on reality. This causes us to have **biases** -- prejudice in favor of or against one thing, person, or group compared with another.
 - **Hindsight Bias** – The tendency to believe, after learning an outcome, that one would have foreseen it
- Even though we are programmed to connect information, we often make the wrong connections, **False Pattern Recognition**.
 - Conspiracy theories

Essential Questions

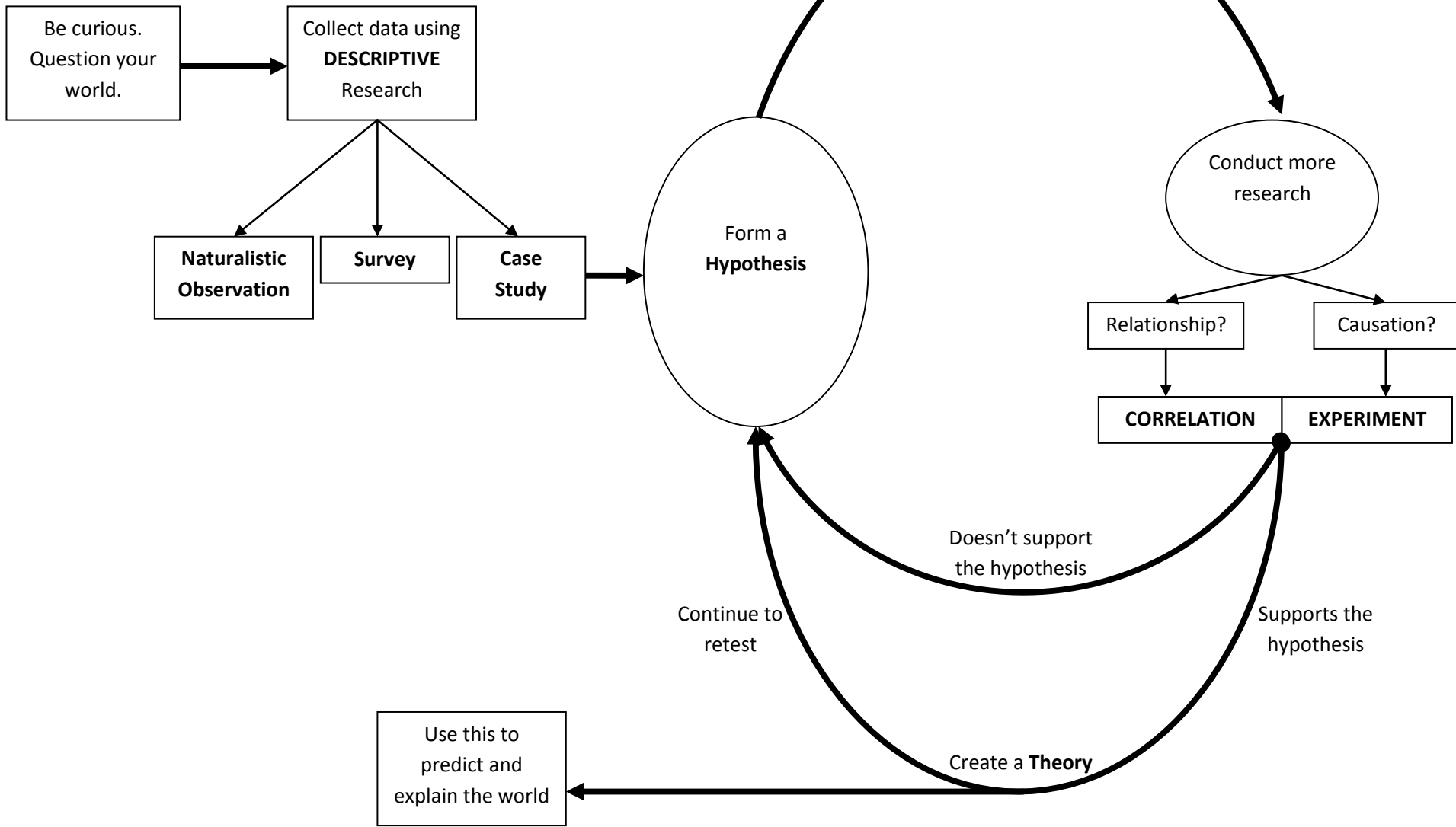
- EQ 1-3: How do psychologists use the scientific method to study behavior and mental processes?
- EQ 1-4: What are the strengths and weaknesses of the different research methods?
- EQ 1-5: How do psychologists draw appropriate conclusions about behavior from research?

Research Methods 8-10%

Describe and compare research methods used in the field of psychology

- I. Description – gathering evidence about A and B
- II. Correlation – A and B are related
- III. Experiment – A causes B

Scientific Method



I. Descriptive Research Methods in Psychology

- **Case Studies**
 - **Detailed in-depth description and analysis of one or a few people**
 - Researchers can use observation, scores on psychological tests, interviews, and other methods to gather information on an individual(s)
 - Takes advantage of nonreplicable situations (Example Genie)
 - **Observer bias** is a problem (expectations or biases of the observer that might distort or influence the interpretation of what was observed)
 - Unable to make **generalizations** past person being studied
 - No cause or effect relationship can be concluded



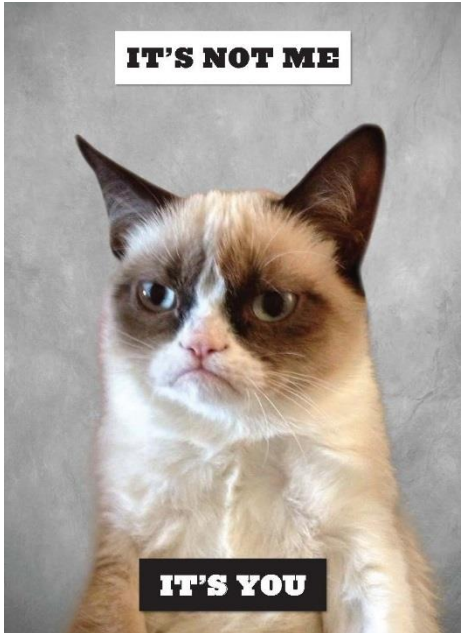
Descriptive Research Methods in Psychology

- **Naturalistic Observation**

- **Systematic observation in natural setting**
- Observing and recording behavior of animals in the wild, to recording self-seating patterns in lunch rooms in a multiracial school constitutes naturalistic observation.
- No control of the situation
- Dangers of the observer bias
- Not replicable so you can't generalize
- No cause and effect relationship



Anthropomorphic Fallacy



- Tip: Definition is in the name (break the words down!)
 - Anthro – Humans
 - Morphic – Change
 - Fallacy – Error
- Tendency to attribute animal behaviors with human motivations
- Example: Your pet cat scratches you – you might believe she hates you

Descriptive Research Methods in Psychology

- **Laboratory Observation**
 - Creates a scenario where controlled conditions are available and a situation is set up and observed
 - Allows more control than naturalistic observation
 - Allows use of sophisticated equipment's
 - Allows researchers to manipulate a situation
 - Observation bias
 - No cause and effect relationship
 - Behavior in a lab may differ from behavior in a naturalistic environment

Descriptive Research Methods in Psychology

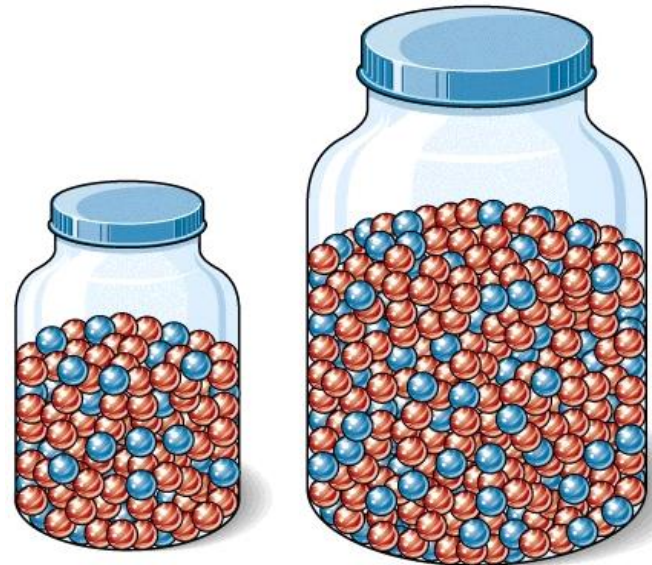
- **Surveys**

- A technique for ascertaining the self-reported attitudes, opinions or behaviors of people usually by questioning a representative, random sample of people.
- Questionnaires or interviews, such as polls prior to an election
- Can generate a lot of information for a fairly low cost
- Questions must be constructed carefully so as to not elicit socially appropriate answers

Survey

Random Sampling

From a population if each member has an equal chance of inclusion into a sample, we call that a random sample (unbiased). If the survey sample is biased, its results are questionable.



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

Discussion

If I wanted to do a survey on how teenagers in California feel about teachers carrying guns in the school, how can we accomplish randomized samples?

Issues with Survey

1. Wording Effect

Wording can change the results of a survey.

Q: Should cigarette ads be allowed on television?

Q: Should cigarette ads be forbidden on television?

2. False Consensus Effect

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

Research Methods 8-10%

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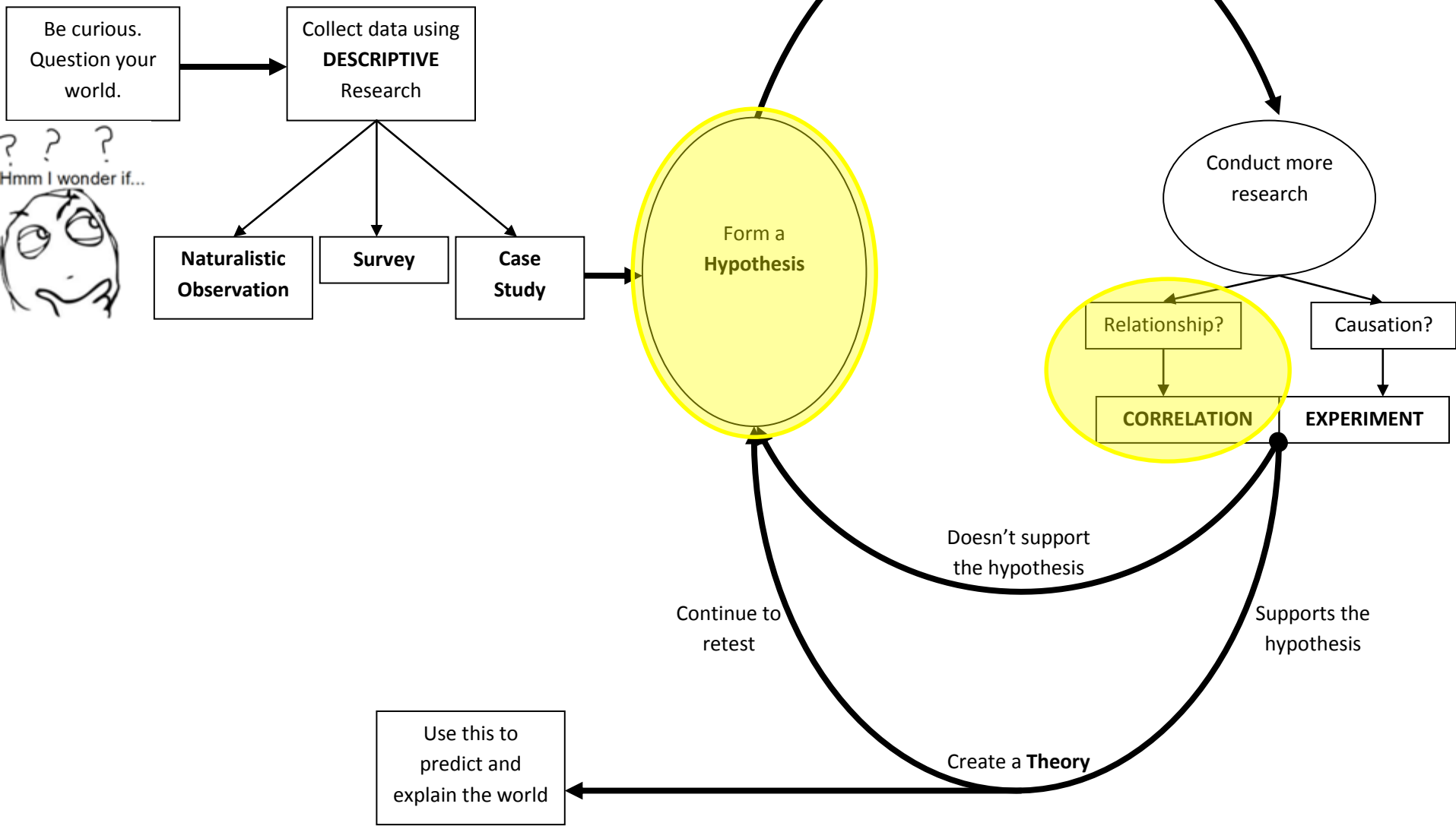
OA: Comparison

Research Method	Advantages	Limitations
Naturalistic Observation		
Case Studies		
Surveys		

Comparison

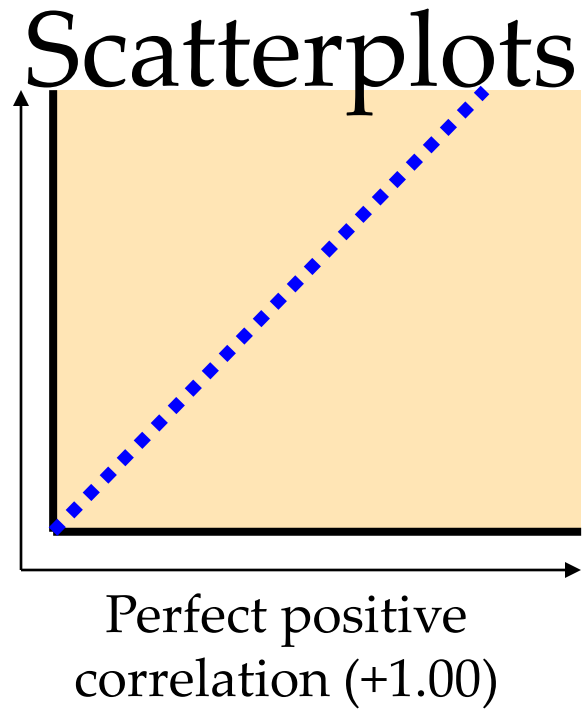
Research Method	Advantages	Limitations
Naturalistic Observation	• More accurate than reports after the fact • Behavior is more natural	• Observer can alter behavior • Observational Bias • Cannot be generalized
Case Studies	• Depth • Takes advantage of circumstances that could not be coordinated in an experiment	• Not representative • Time consuming and expensive • Observational Bias
Surveys	• Immense amount of data • Quick and inexpensive	• Sampling biases can skew results • Bad Questions can corrupt data • Accuracy depends on the ability and willingness of the participants.

Scientific Method



II. Correlational Research

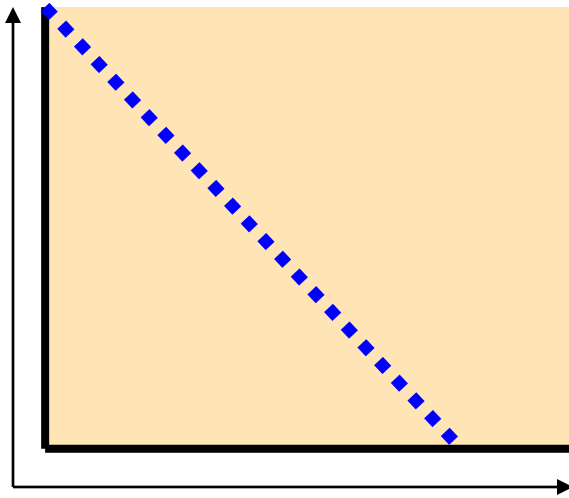
- **Correlational Research**
 - Research technique based on the naturally occurring relationship between two or more variables
 - Used to make PREDICTIONS, such as the relation between SAT scores and success at first year of college
 - Cannot be used to determine cause and effect



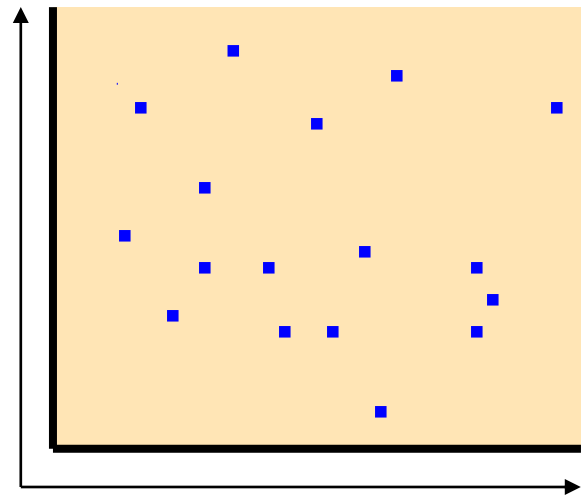
Scatterplot is a graph that comprises of points generated by values of two variables.

The slope of points depicts the direction,
The amount of scatter shows the strength of
relationship.

Scatterplots



Perfect negative
correlation (-1.00)

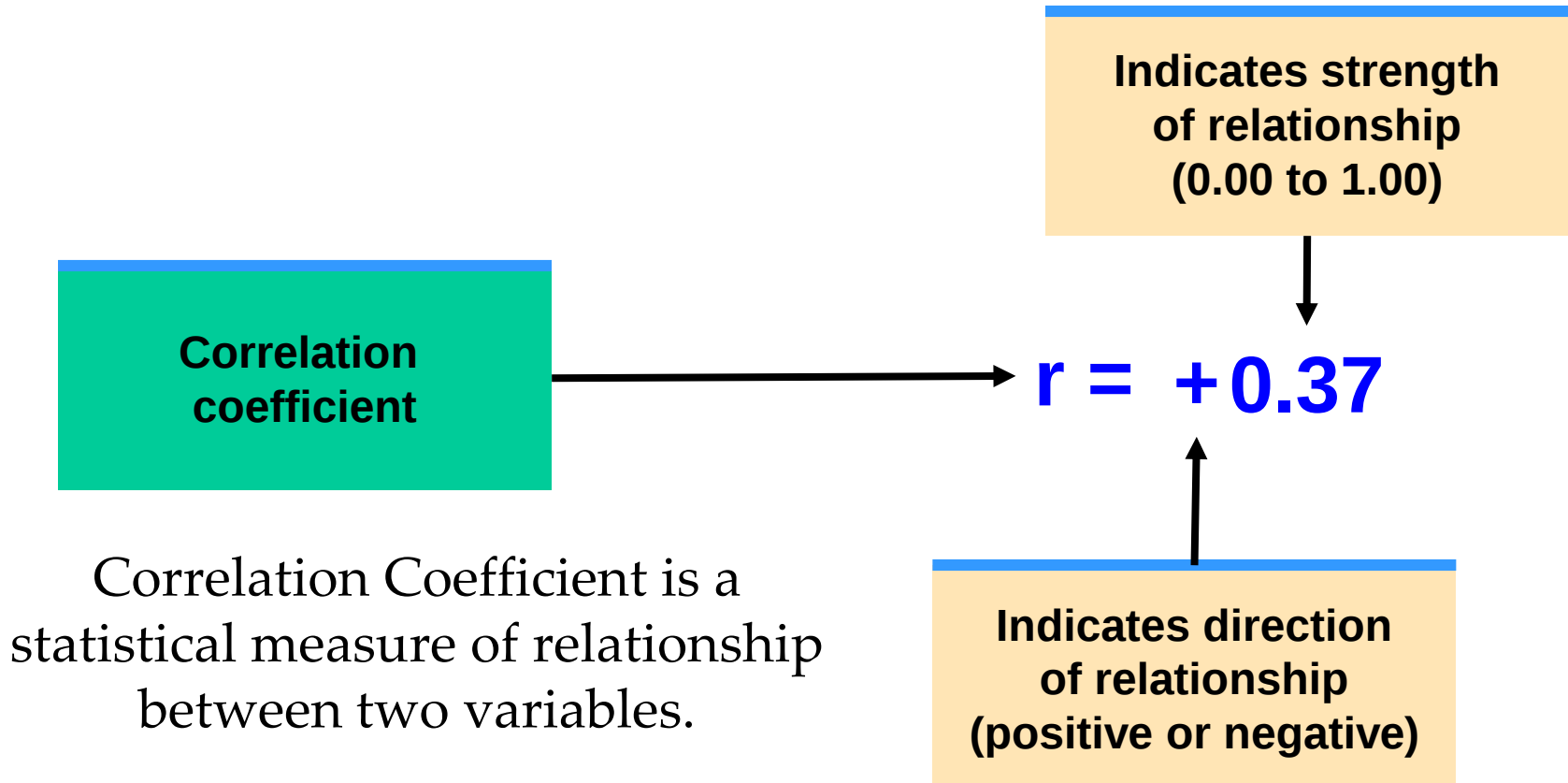


No relationship (0.00)

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

Correlation

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



Correlation

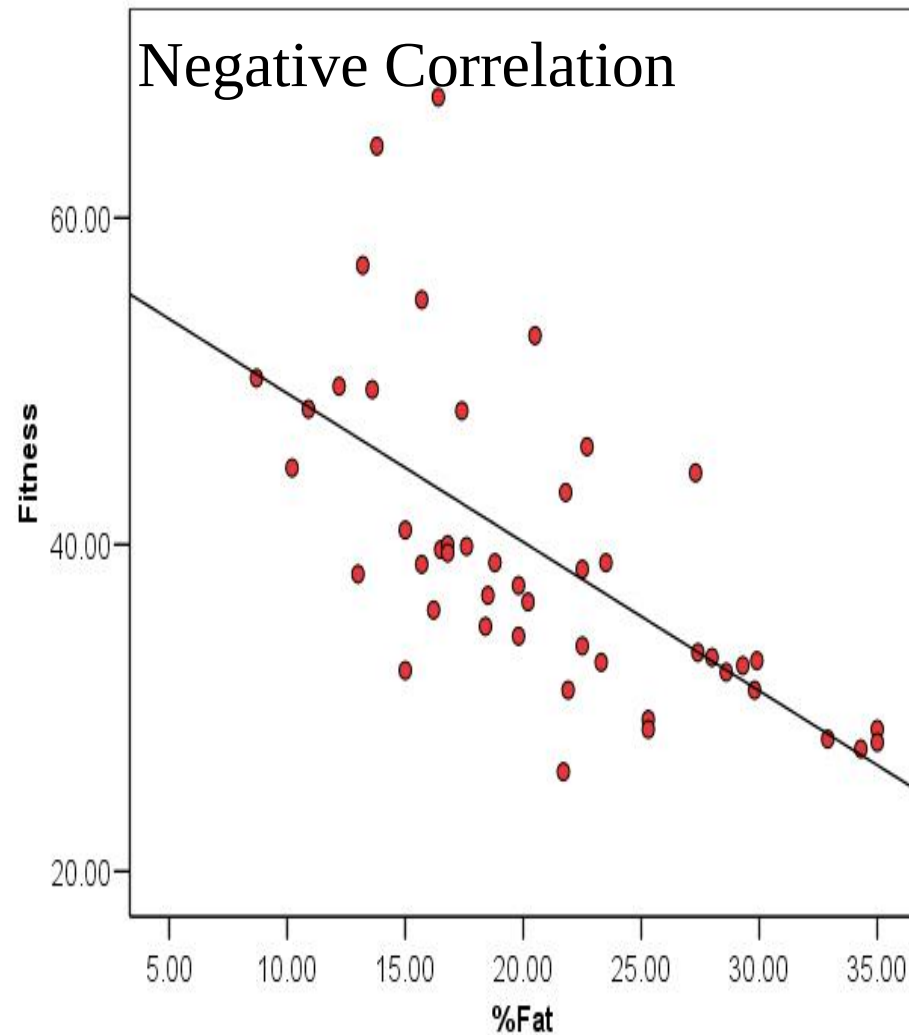
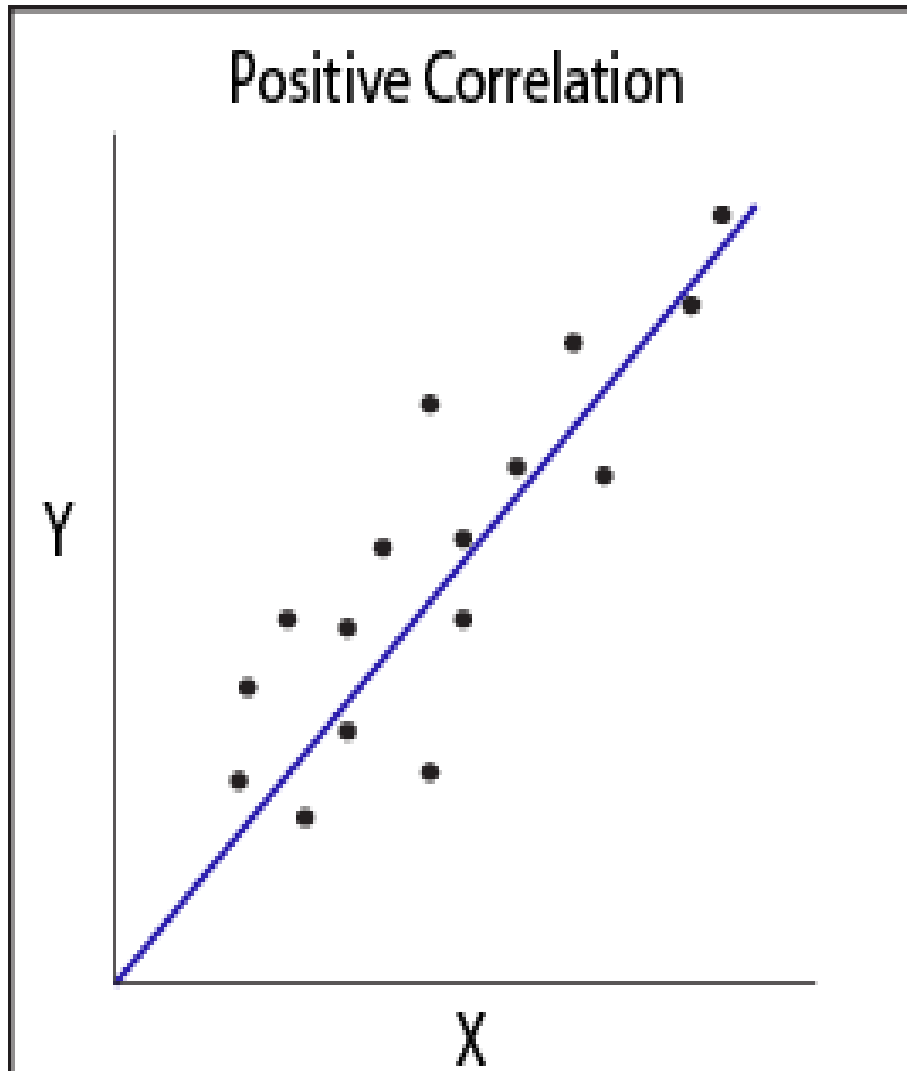
Positive Correlation

- **Direct Association between two variables**
- As one variable becomes large, the other also becomes large, and vice versa
 - As drug use rises, crime rates rise

Negative Correlation

- **Inverse association between two variables.**
- As one variable becomes large, the other becomes small
 - As number of Police officer rises, crime rate decreases

Correlation



Example

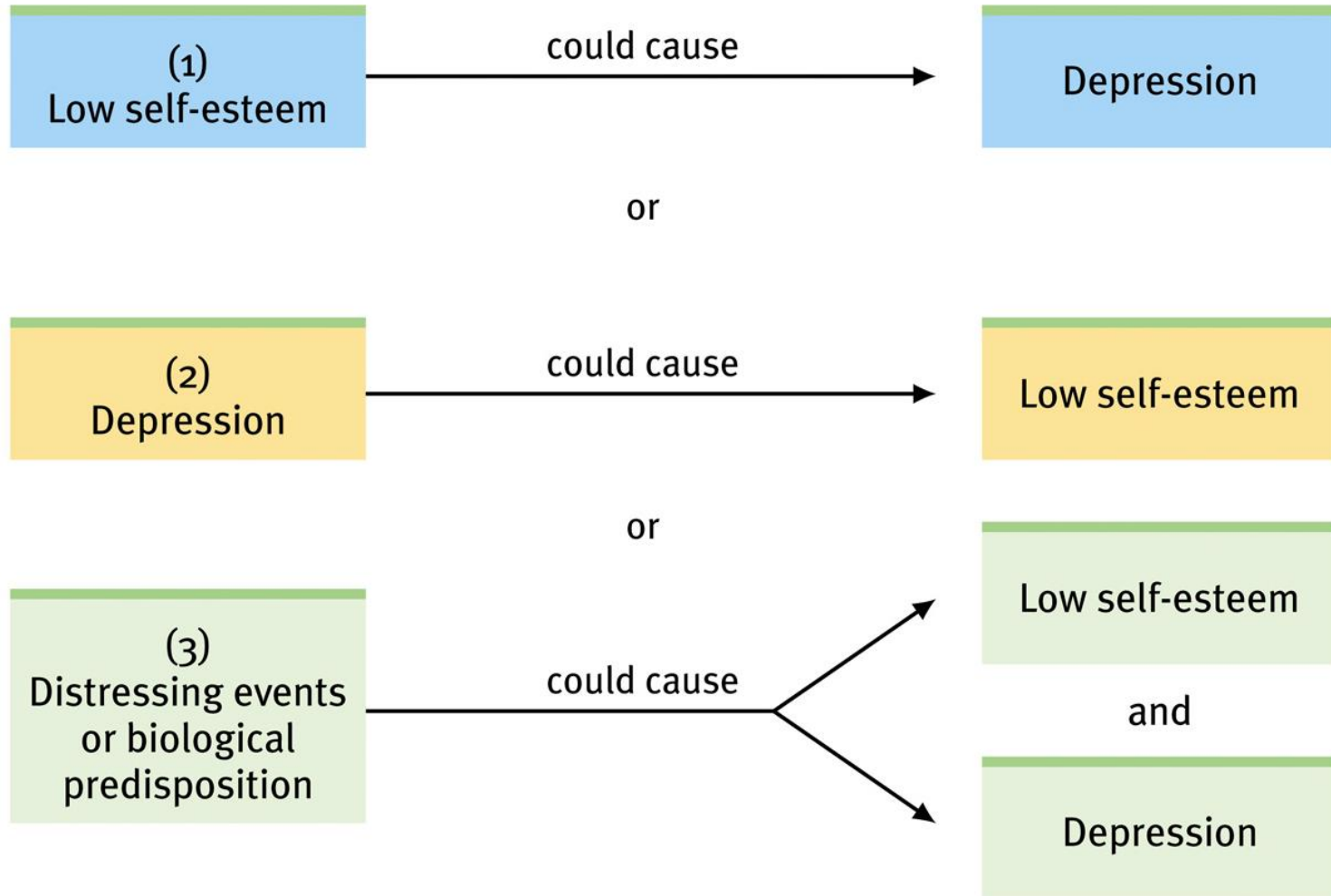
Positive Correlation:

_____ # BURGERS CONSUMED IN A WEEK
_____ WEIGHT

NEGATIVE CORRELATION:

_____ Hours spent on playing video games
_____ GPA level

Correlation and Causation



In a Gallup poll, surveyors asked, “Do you believe correlation implies causation?””

- 64% of American’s answered “Yes” .
- 38% replied “No”.
- The other 8% were undecided.

Correlation DOES NOT mean Causation:

- There is a positive correlation between number of churches and the number of prostitutes in a city.
 - Is the high number of churches causing higher number of prostitutes?
 - Is the high number of prostitutes causing more people to go to church?
 - Maybe a city with a larger population needs more churches and prostitutes?



Correlation DOES NOT mean
Causation:



Dangers to look out for!

- **Confounding** – Unknown variable is playing a role (3rd Variable)
 - Example of shark attacks and ice-cream what is the confounding variables?

Illusory Correlations

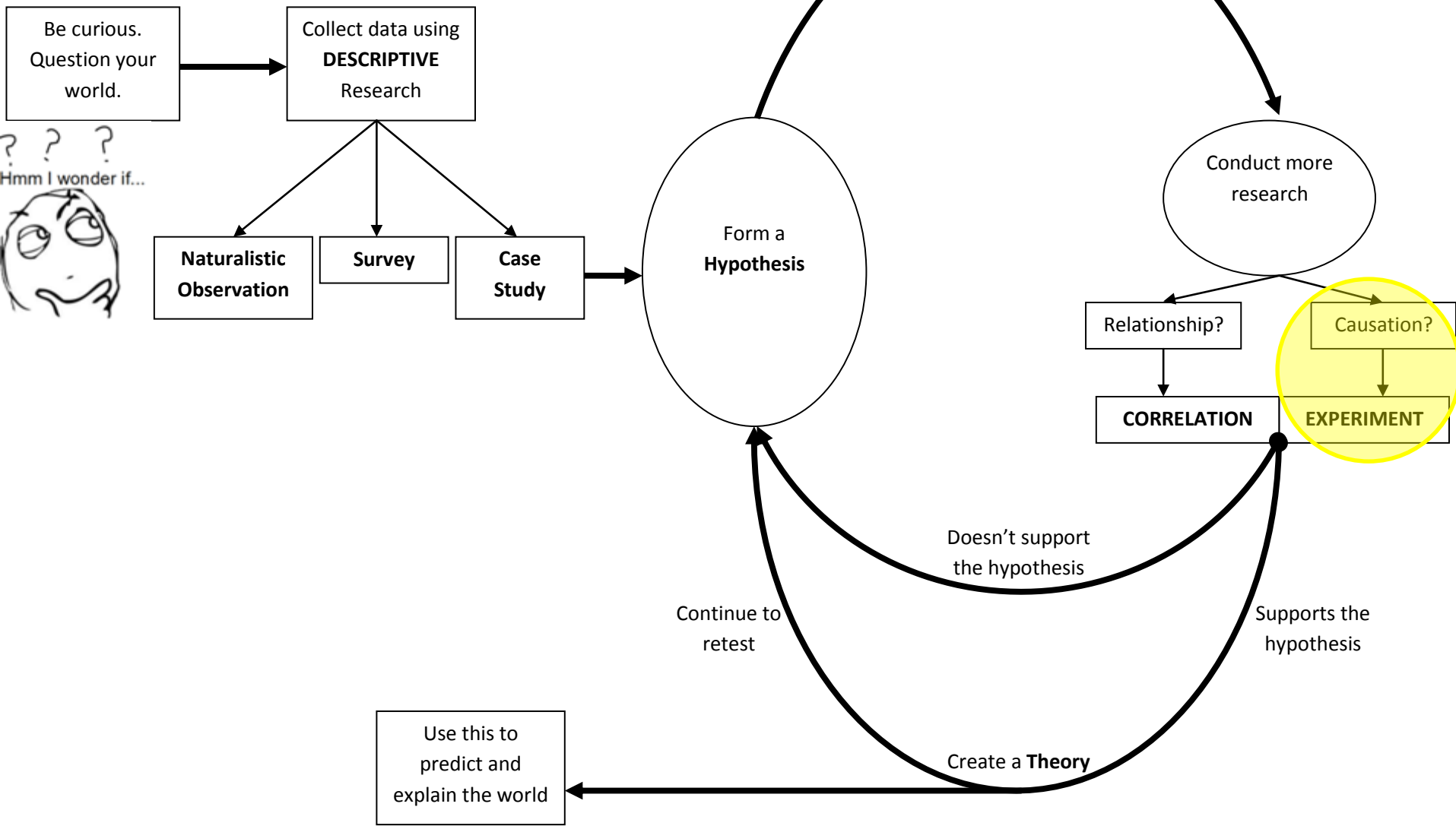
- Perception of a relationship where none exist
- Redelmeier and Tversky (1996) assessed 18 arthritis patients over 15 months, while also taking comprehensive meteorological data. Virtually all of the patients were certain that their condition was correlated with the weather.
- In fact the actual correlation was close to zero.
- People are sensitive to dramatic or unusual events, we make the wrong connections.

Research Methods 8-10%

Describe and compare research methods used in the field of psychology

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Scientific Method



Hypothesis

- **Hypothesis** is a testable prediction that lets us accept, reject or revise a theory.
- It specifies relationships among events or variables
- It can be tested empirically

Theory

- Theory is an EXPLANATION based on evidence that PREDICTS behaviors or events.
- It is a system of ideas that interrelates facts and concepts.

A Theory must:

1. Fit the known facts
2. Predict new discoveries
3. Be falsifiable
4. be simple. The simpler the better
i.e. Men and women are motivated by sex

Operational Definition

- An exact description of how to derive a value for a characteristic you are measuring (Quantifiable). It includes a precise definition of the characteristic and how, specifically, data collectors are to measure the characteristic.
 - “An apple a day keeps the doctors away”
 - Eat one Apple – 1 medium sized Fuji Apples 1/3 lbs
 - One Day – 24 hrs
 - Doctors away – cold flu symptoms (sneezing, mucus, and coughing) within 3 month period

III. Experimental Research

- **Experimental Research**
- **A controlled test of a hypothesis in which the researcher manipulates one variable to discover its effect on another**
 - The **only** research method that can be used to determine **cause and effect**
 - Often called the experimental method
 - A researcher systematically manipulates a variable under controlled conditions.
 - It can be replicated

Experimental Research

- Experimental Research
- Disadvantages:
 - Artificial and results may not generalize
 - Sometimes it is difficult to avoid **experimenter effect**—researcher's bias causes them to unconsciously influence the participants of an experiment

OA

1. Come up with an hypothesis for an experiment that has to do with **sleep and reaction time**.
2. Create an operation definition for your experiment

Components of an Experiment

- Participants¹ or subjects
- Variable² – Factors that can have different values
- Operational Definition³ – Describes the specific procedure used to determine the presence of a variable
- Independent variable (IV)⁴
 - Cause (what you are studying)
 - This is the variable that is **manipulated by the experimenter**
- Dependent variable (DV)⁵
 - Effect (result of experiment)
 - This is the variable that is **measured by the experimenter**
 - It *DEPENDS* on the independent variable

Hint

- A good way to determine the IV from the DV is to word the hypothesis in the form of an “If . . . then . . .” statement.
- What follows the **IF** is the IV (Independent)
- What follows the **THEN** is the DV (Dependent)
 - **If** children read more every day **then** they are more likely to improve on their IQ tests.

- Font – IV (CAUSE)
- The length of the time (speed) it takes students to read the statement -- DV (EFFECT)
 - (Remember! Dependent Variable is what is being measured... it *depends* on the IV)

Identify the Independent and Dependent Variables

An experiment is designed to determine whether watching violence on television causes aggression in its viewers. Two groups of children are randomly placed either in front of violent or nonviolent television for one hour. Afterwards, a large doll is placed in front of the children for one hour and the experimenter measures how many times the children strike the doll.

Identify the Independent and Dependent Variables

Students will be able to read a statement printed in the Comic Sans font faster than the same statement written in the Lucida Calligraphy font.

Components of an Experiment cont'd

- Things to worry about
 - **Confounding Variables**⁶ – differences (other than the IV of course) that arise due to poor planning, sloppy work, or bias.
 - **Experimenter Bias**⁷ - Expectations by the experimenter that might influence the results of an experiment or its interpretation.
 - Self-fulfilling Prophecy -- A prediction that leads to act in ways to make the prediction come true. (Social Psych)
 - Extraneous Variables (Unwanted Variables) – Conditions that researcher wants to prevent from affecting the outcome of the experiment.

Randomness

- Randomness is a procedure that creates the attempt to limit bias and create representatives
 - **Random Selection** : Choosing subjects for the experiment without bias
 - **Random Assignment**: Choosing which group, the experimental or control group each subject goes to

Components of an Experiment that involves treatments of some kind.

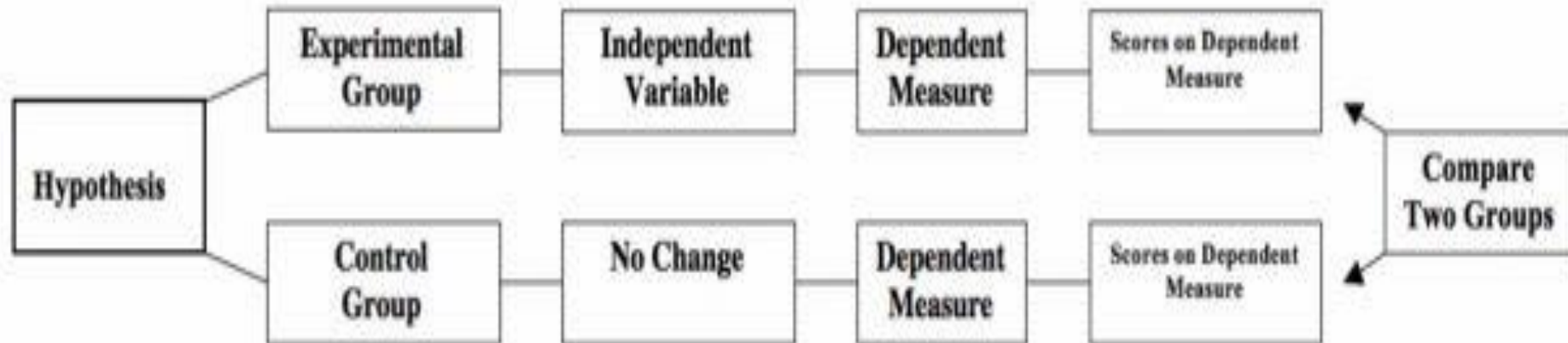
- Experimental group⁸

- Receives treatment or has the DV changed
- Receiving the independent variable

- Control group⁹

- Does not receive treatment or doesn't have the DV changed, but is the same in every other way
- Kept identical
- Demand Characteristics¹⁰ – clues participants perceive about the experiment suggesting how they should respond.

A Graphic Overview



A summary of steps during experimentation.

Breast milk makes babies smarter!

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

Practice

Sleep and Reaction Time

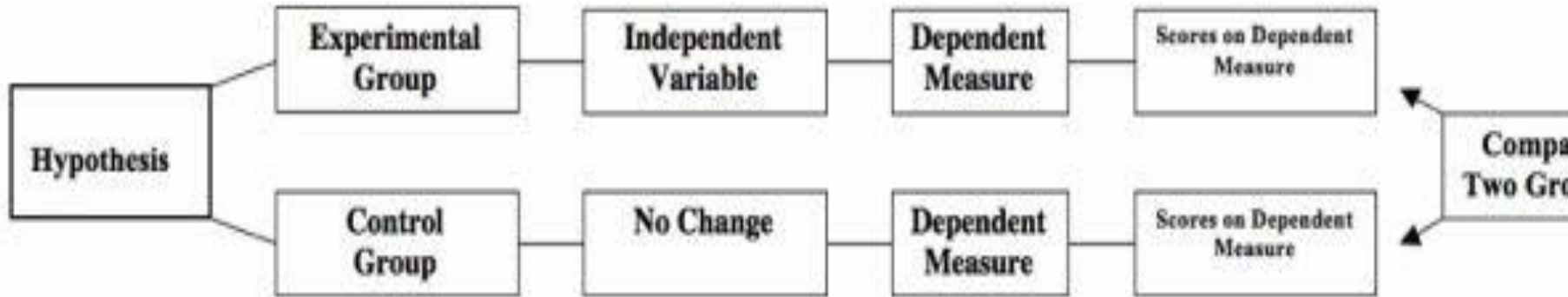
- Independent Variable?
- Dependent Variable?
- Experimental Group? (IV? DV?)
- Control Group?

Practice — Sleep and Reaction Time

Amount
of Sleep

Reaction
test

Reaction
Time

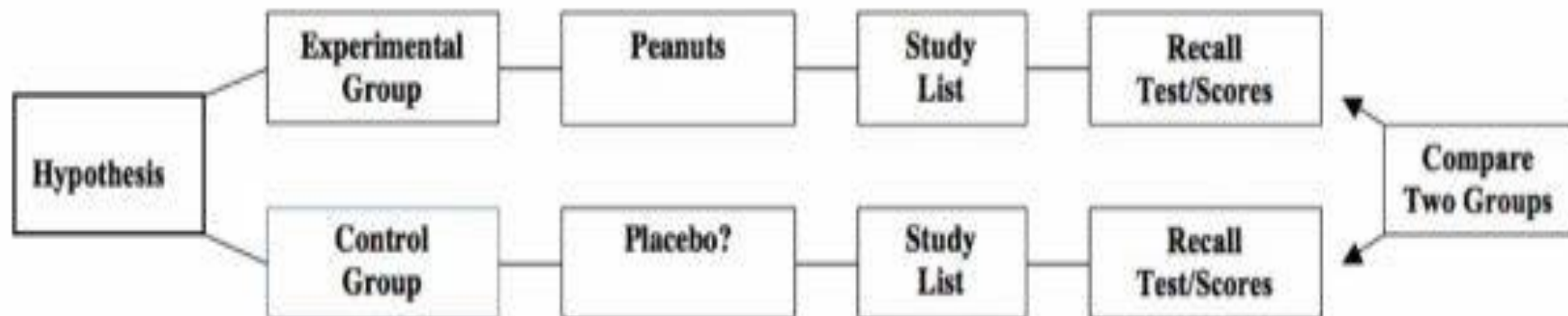


Practice

If one eats peanuts, one will recall better

- Independent Variable?
- Dependent Variable?
- Experimental Group?
- Control Group?

If One Eats Peanuts, One Will Recall Better



Clinical Research

Studies performed in humans that are intended to increase knowledge about how well a diagnostic test or treatment works in a particular patient population.

Clinical Research cont'd

Single-blind Procedure^{11a}

Participants don't know which treatment group – experimental or control – they are in

Placebo / Placebo effect¹²

Fake treatment / Some participants expect improvement in health so they imagine it

Double-blind Procedure^{11b}

In evaluating drug therapies it important to keep the patients and experimenter's assistants blind to which patients got real treatment and which placebo.

Clinical Research cont'd

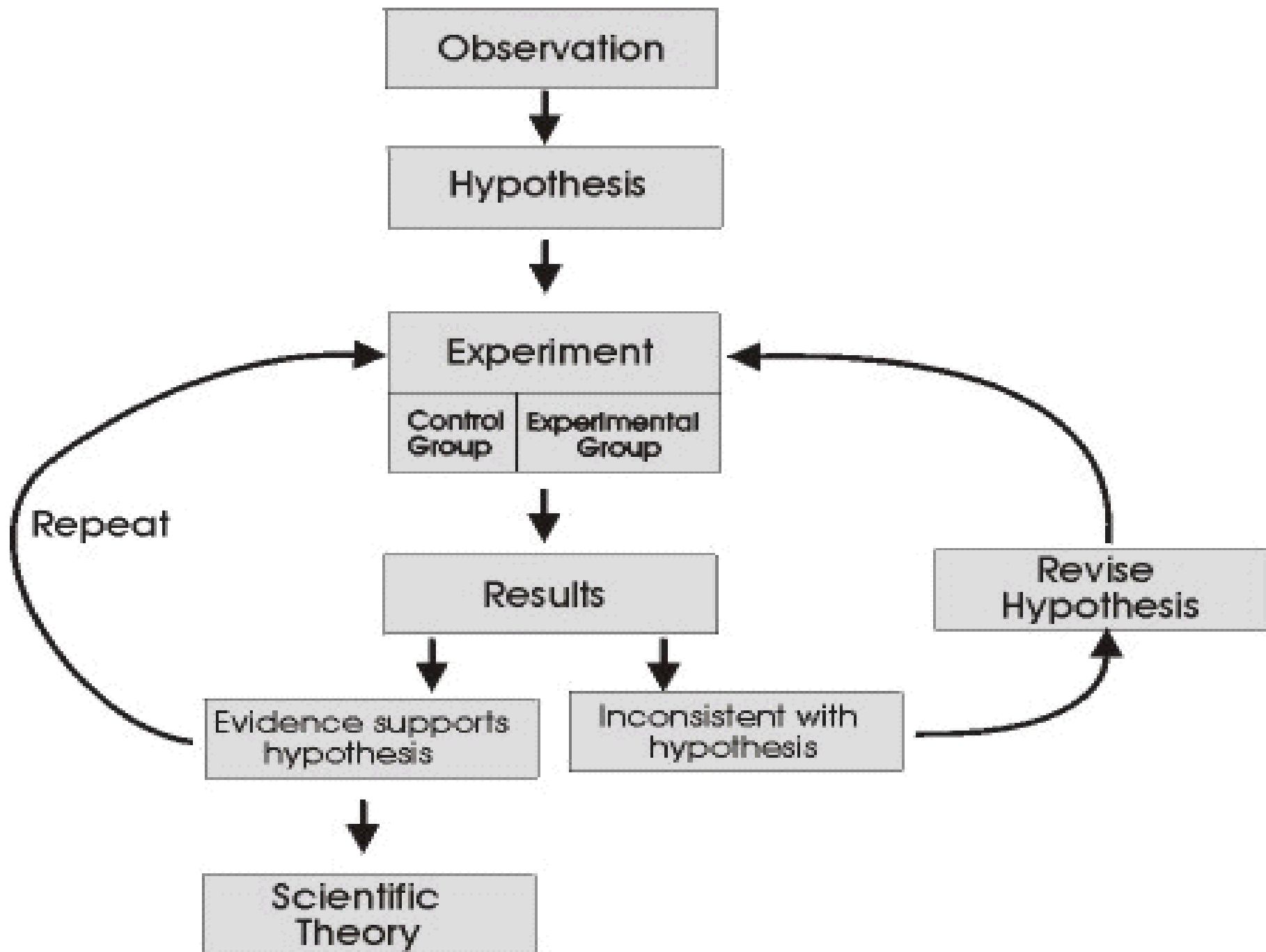
Random Assignment¹³

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

This is not the same as random selection!

Evaluating Results

- **Statistically Significant** – Results gained would occur rarely by chance alone
 - $P < .05$ (Less than 5 experiments out of 100)
 - IV is causing the DV
- **Meta-Analysis** – Study of results of other studies (that are similar to your own experiment).



COMPARING RESEARCH METHODS

Research Method	Basic Purpose	How Conducted	What Is Manipulated	Weaknesses
Descriptive	To observe and record behavior	Do case studies, surveys, or naturalistic observations	Nothing	No control of variables; single cases may be misleading
Correlational	To detect naturally occurring relationships; to assess how well one variable predicts another	Compute statistical 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

Ethical Guidelines

Ethics/Ethical Responsibility

- No coercion-participation must be voluntary
- Doctrine of “informed consent”—must be volunteer and know enough to intelligently decide about participating
- Anonymity or confidentiality of participants
- Respecting dignity and welfare of human subjects
- Protection from physical or emotional risk—temporary discomfort ok, but not long-term harm
- Ability to withdraw at any time[⊕]
- Deception of subjects can be ok
- “debriefing”—done after experiment-explains true purpose of study and if any deceptions

Experimenting on Animals

- Humans are similar to other animals in many ways
- Two extreme options—do no testing or test in any way we want, without constraint
- Researchers must (APA 2002) ensure the “comfort, health, and humane treatment” of animals and of minimizing “infection, illness, and pain of animal subjects.”
- Must have a clear scientific purpose
- Must answer a specific, important scientific question
- Animals chosen must be best suited for the question
- Animals must be acquired legally (accredited companies or trapped humanely, if wild)