BASIC GUIDELINES FOR PLANNING A STATISTICAL STUDY

1. First, identify the individuals or objects of interest.
2. Specify the variables as well as the protocols for taking measurements or making observations.
3. Determine if you will use an entire population or a representative sample. If using a sample, decide on a viable sampling method.
4. In your data collection plan, address issues of ethics, subject confi - dentiality, and privacy. If you are collecting data at a business, store, college, or other institution, be sure to be courteous and to obtain permission as necessary.
5. Collect the data.
6. Use appropriate descriptive statistics methods (Chapters 2, 3, and 4) and make decisions using appropriate inferential statistics methods (Chapters 8–11).
7. Finally, note any concerns you might have about your data collection methods and list any recommendations for future studies.

- **Independent (Explanatory) Variable:** It is a variable that stands alone and isn't changed by the other variables you are trying to measure.

  Example: For example, someone's age might be an independent variable. Other factors (such as what they eat, how much they go to school, how much television they watch) aren't going to change a person's age.

- **Dependent (Response) Variable:** It is something that depends on other factors.

  Example: A test score could be a dependent variable because it could change depending on several factors such as how much you studied, how much sleep you got the night before you took the test, or even how hungry you were when you took it. Usually when you are looking for a relationship between two things you are trying to find out what makes the dependent variable change the way it does.

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- **A lurking variable:** is a variable that is not among the ~~explanatory~~ or ~~response~~ variables in a study but that may influence the ~~response~~ variable.

Indepenent dependent

independent

SKIP

~~**Remark:** A lurking variable is one for which no data have been collected but that nevertheless has influence on other variables in the study.~~

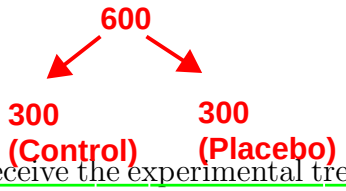
- Two variables are **confounded** when the effects of one cannot be distinguished from the effects of the other.

  Example1: A research scientist studies the effect of diet and exercise on a person's blood pressure. Lurking variables that also affect blood pressure are whether a person smokes and stress levels.

Diet, Exercise (Independent Variables)
Blood Pressure (Dependent Variable)

Example 1. Dr. Doyle teach a class where students must submit weekly homework and then take a weekly quiz. Dr. Doyle want to see if there is a relationship between the scores on the two assignments (i.e. higher homework scores are aligned with higher quiz scores). Think about a lurking variable.

# of studying hours.
# of sleeping hours.



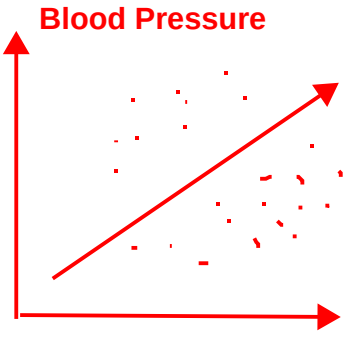
- The **treatment group** consists of participants who receive the experimental treatment whose effect is being studied.
- The **control group** consists of participants who do not receive the experimental treatment being studied. Instead, they get **a placebo** (a fake treatment)
- The **placebo effect** occurs when a subject receives no treatment but (incorrectly) believes he or she is in fact receiving treatment and responds favorably.
- **A completely randomized experiment** is one in which a random process is used to assign each individual to one of the treatments.

Q 1. What is the difference between Observational study and Experimental study?

1) Observation Study: Let's say you have a population of 400 people and you're curious about weather average daily time on computer, how it relates to peoples blood pressure.

It looks like these two variables move together.

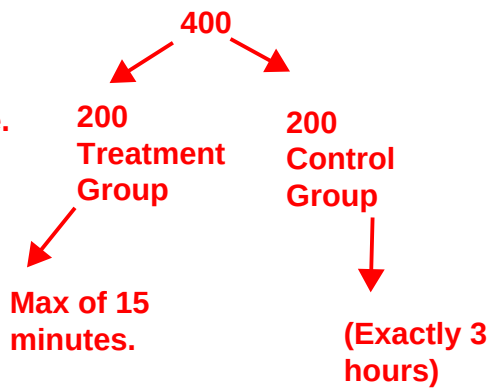
Conclusion: More computer time correlates with higher blood pressure



Don't Say: Computer time causes blood pressure. We can't make a conclusion about causality because there could be a lurking variable, such as Lack of activity.

- **2) Experimental Study:** It's about trying to establish causality. We randomly assign 400 people to two groups.

Let's say we found that the treatment group individuals has a higher blood pressure => There is a causality here. (by making these people spend more time infront of a computer that actually raised their blood pressure)



Example 2. Determine if the below situations are observational studies or experiments—and why.

1. The leg muscles of men aged 60 to 75 were 50% to 80% stronger after they participated in a 16-week, high-intensity resistance-training program twice a week.

   Observation Study: Part chose to do the training. No treatment.

2. Some gardeners prefer to use non-chemical methods to control insect pests in their gardens. Researchers have designed two kinds of traps, and want to know which design will be more effective. They randomly choose 10 locations in a large garden and place one of each kind of trap at each location. After a week, they count the number of bugs in each trap.

   Experiment Study: Treatment was imposed.

3. In 2001 a report in the Journal of the American Cancer Institute indicated that women who work at nights have a 60% greater risk of developing breast cancer. Researchers based these findings on the work histories of 763 women with breast cancer and 741 women without the disease.

   Observation Study: No treatment (not forced to work at night)