Wednesday, October 31, 2017

- Warm-up
  - Choose the best answer for the given problem. Explain your reasoning.

9. A television news editor would like to know how local registered voters would respond to the question, "Are you in favor of the school bond measure that will be voted on in an upcoming special election?" A television survey is conducted during a break in the evening news by listing two telephone numbers side by side on the screen, one for viewers to call if they approve of the bond measure, and the other to call if they disapprove. This survey method could produce biased results for a number of reasons. Which one of the following is the most obvious reason?

(A) It uses a stratified sample rather than a simple random sample.
(B) People who feel strongly about the issue are more likely to respond.
(C) Viewers should be told about the issues before the survey is conducted.
(D) Some registered voters who call might not vote in the election.
(E) The wording of the question is biased.

- Examine more Vocabulary…
- Diagrams in experiments

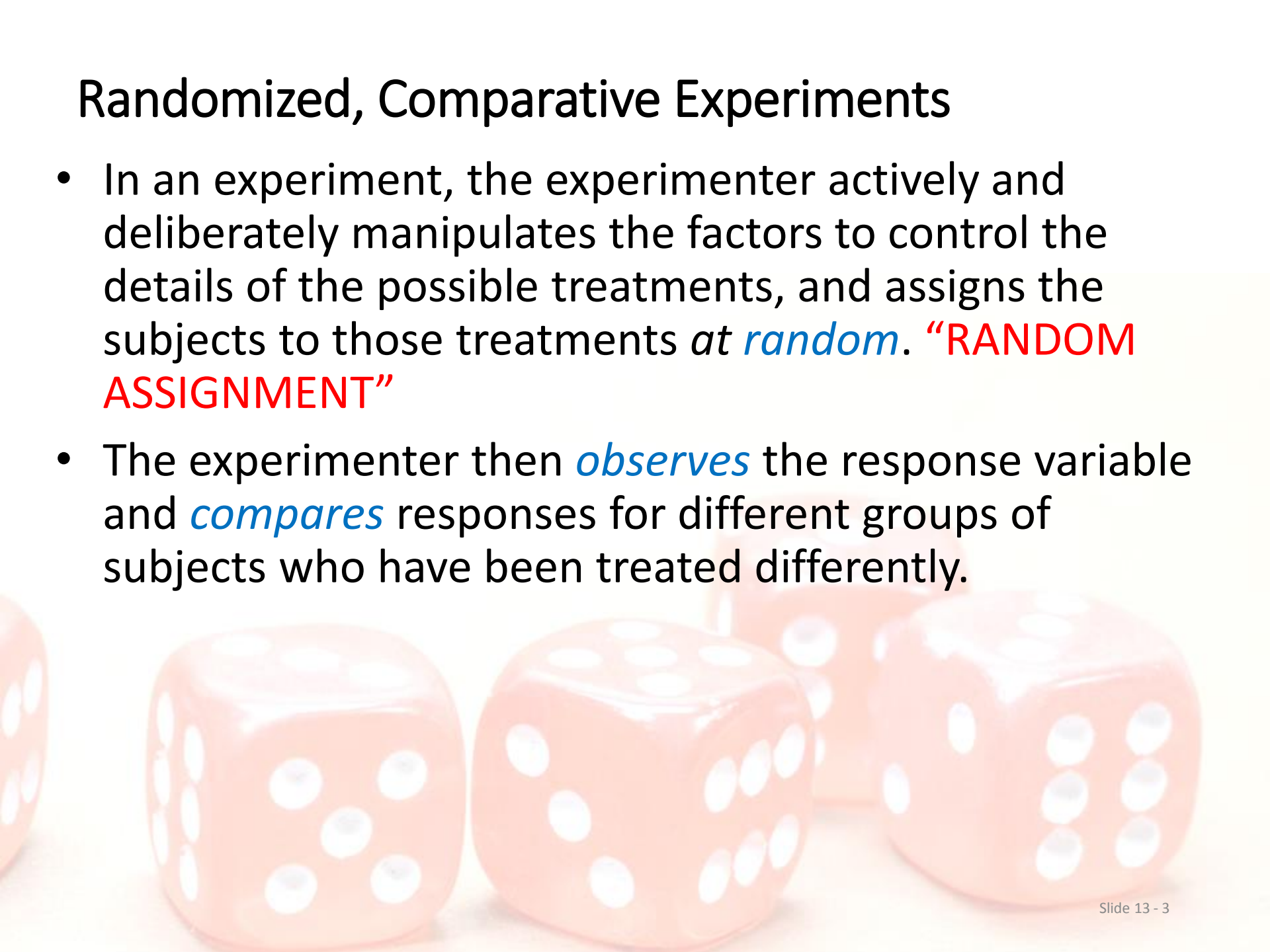
Objectives

- Content/Language Objective: I will become familiar with the vocabulary from this chapter.

- Social Objective: I will work with my group to solve problems.

Randomized, Comparative Experiments

- In an experiment, the experimenter actively and deliberately manipulates the factors to control the details of the possible treatments, and assigns the subjects to those treatments *at random*. "RANDOM ASSIGNMENT"
- The experimenter then *observes* the response variable and *compares* responses for different groups of subjects who have been treated differently.



Randomized, Comparative Experiments

- In general, ***the individuals on whom or which we experiment are called experimental units.***
  - ***When humans are involved, they are commonly called subjects or participants.***
- ***The specific values that the experimenter chooses for a factor are called the levels of the factor.***
- ***A treatment is a combination of specific levels from all the factors that an experimental unit receives.***

The Four Principles of Experimental Design

1. Control:
   - We control sources of variation other than the factors we are testing by making conditions as similar as possible for all treatment groups.
2. Randomize:
   - Randomization allows us to equalize the effects of unknown or uncontrollable sources of variation.
     - It does not eliminate the effects of these sources, but it spreads them out across the treatment levels so that we can see past them.
   - Without randomization, you do not have a valid experiment and cannot draw valid conclusions from your study.

The Four Principles of Experimental Design

3. Replicate:

- Repeat the experiment, applying the treatments to a number of subjects.
  - The outcome of an experiment on a single subject is an anecdote, not data.
- When the experimental group is not a representative sample of the population of interest, we might want to replicate an entire experiment for different groups, in different situations, etc.
  - Replication of an entire experiment with the controlled sources of variation at different levels is an essential step in science.

The Four Principles of Experimental Design

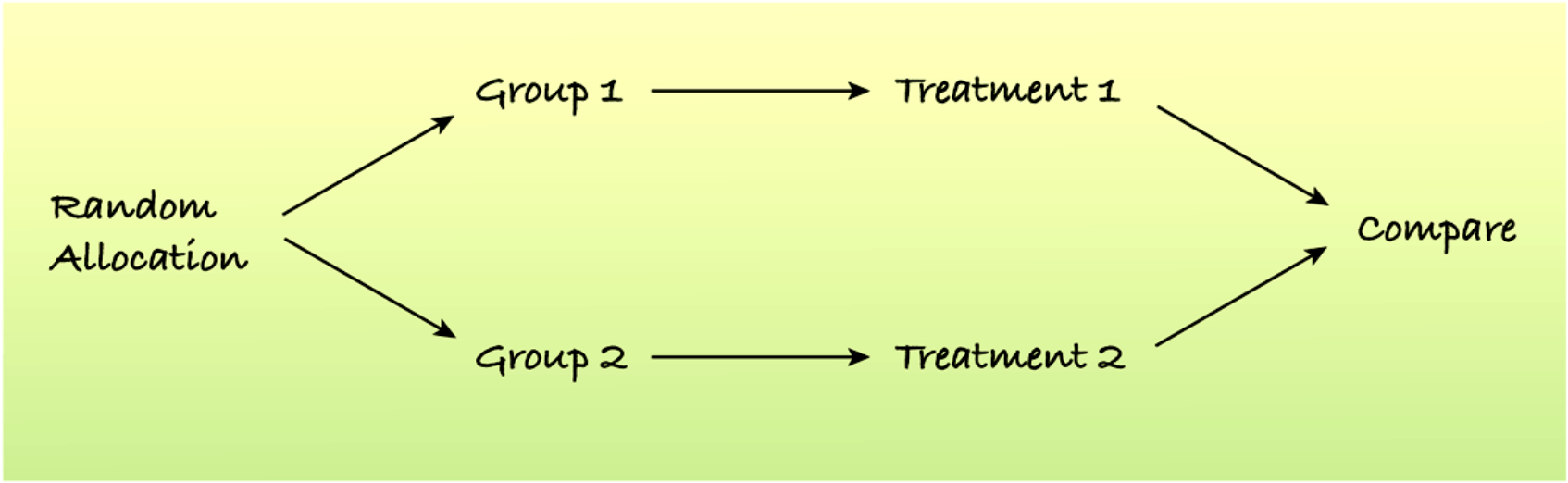
4. Block:

- Sometimes, attributes of the experimental units that we are not studying and that we can't control may nevertheless affect the outcomes of an experiment.
- If ***we group similar individuals together*** and then randomize within each of these ***blocks,*** we can remove much of the variability due to the difference among the blocks.

Note: Blocking is an important compromise between randomization and control, but, unlike the first three principles, is ***not required in an experimental design.***

Diagrams of Experiments

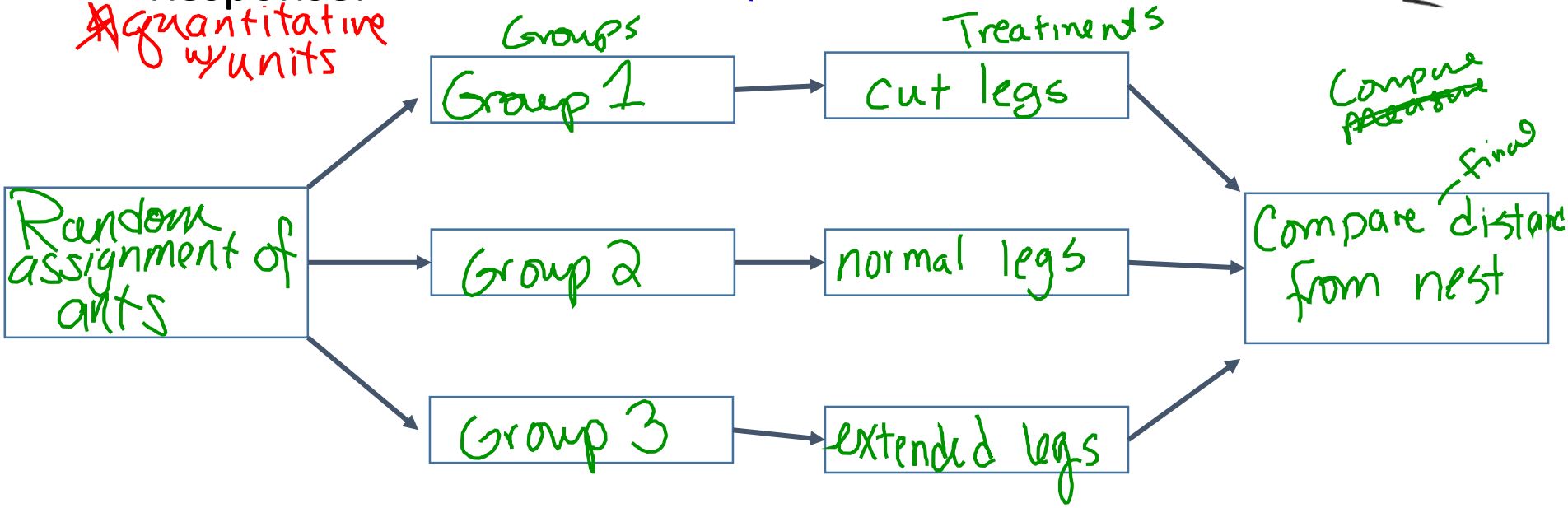
- It's often helpful to diagram the procedure of an experiment.
- The following diagram emphasizes the random allocation of subjects to treatment groups, the separate treatments applied to these groups, and the ultimate comparison of results:



Experiment Example

- In your notes identify
  - Experimental Units: Ants
  - Factor(s): Leg length
    - Level(s): short, normal, extended
  - Treatment(s): cut legs, normal legs, extended legs
  - Response: Final distance from the nest

Quantitative w/units



Experiment Example

An experiment investigated the effects of repeated exposure to an advertising message using undergraduate students as subjects. All subjects viewed a 40-minute television program that included ads for a digital camera. Some subjects saw a 30-second commercial; others, a 90-second version. The same commercial was shown either 1, 2, or 5 times during the program. After viewing, all the subjects answered questions about their recall of the ad, their attitude toward the camera, and their intention to purchase it.

- Experimental Units? Undergraduate Students
- Factor(s) (explanatory variables)? Length and Frequency of commercial
- Response variables? Recall, attitude, intention to purchase
- Treatment? (levels within the treatment?) 30 sec 1 time 90 sec 5 times (6 total) 2 x 3
- How could this be randomized?
- How could this be blocked?
- Potential Diagram?

Experiment Example

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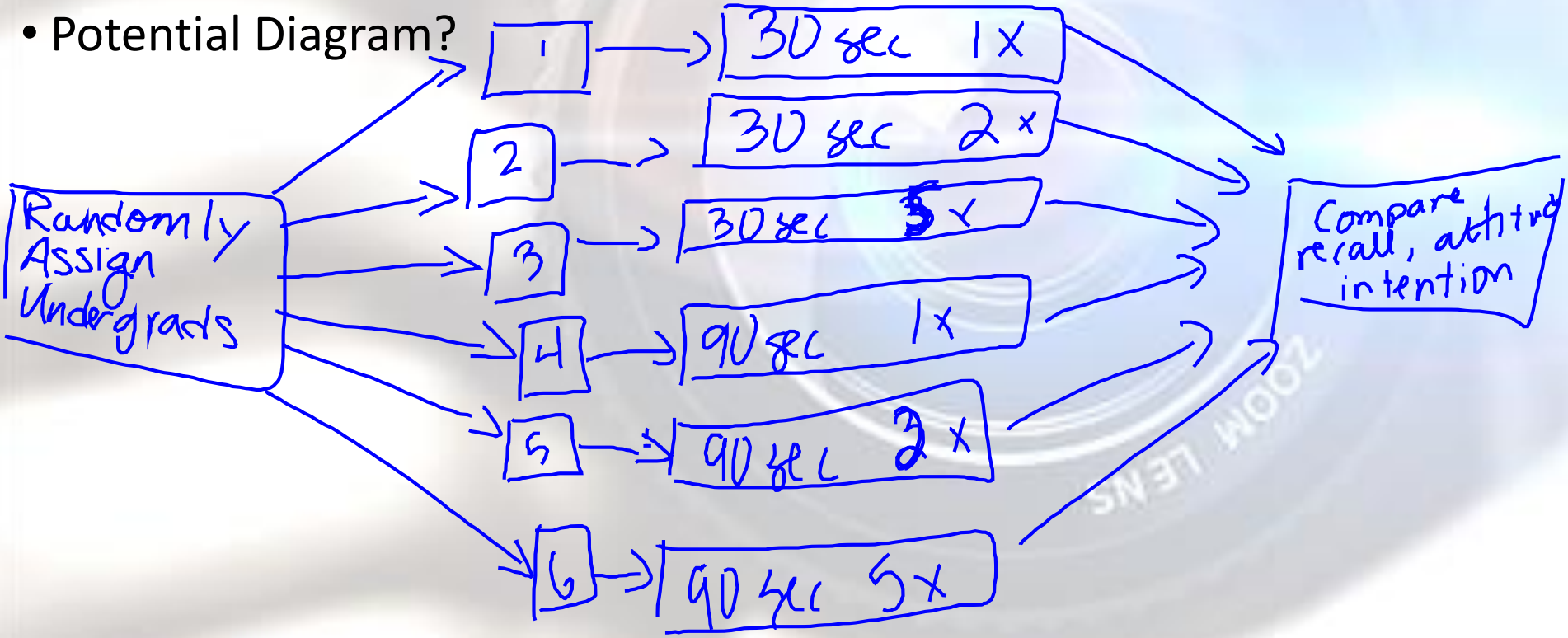
- Potential Diagram?

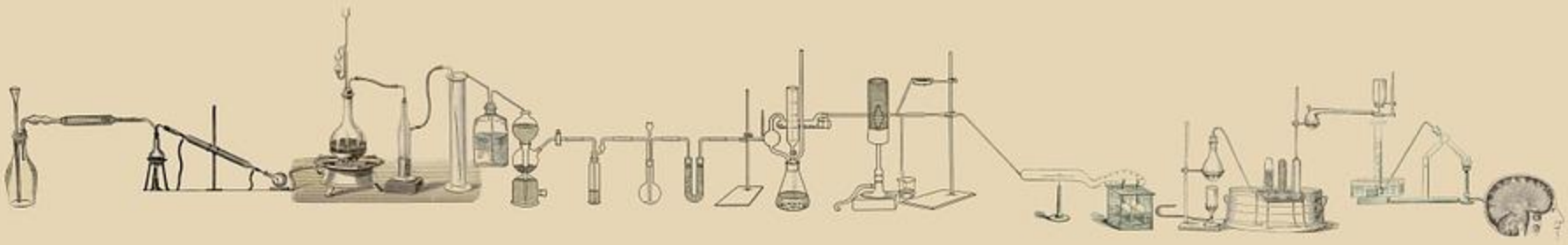


Blinding

- A drug manufacturer tests a new cold medicine with 200 volunteer subjects - 100 men and 100 women. The men receive the drug, and the women do not. At the end of the test period, the men report fewer colds.
- As a result of no controls, many variables are confounded, and it is impossible to say whether the drug was effective. For example, gender is confounded with drug use. Perhaps the men experienced a placebo effect.
- This experiment could be strengthened with a few controls. Women and men could be randomly assigned to treatments. One treatment could receive a placebo, with blinding. Then, if the treatment group (i.e., the group getting the medicine) had sufficiently fewer colds than the control group, it would be reasonable to conclude that the medicine was effective in preventing colds.

Confounding

- ***When the levels of one factor are associated with the levels of another factor, we say that these two factors are confounded.***
- When we have confounded factors, we cannot separate out the effects of one factor from the effects of the other factor.
- Example:



Lurking or Confounding

- ***A lurking variable creates an association between two other variables*** that tempts us to think that one may cause the other.
  - This can happen in a regression analysis or an observational study.
  - A lurking variable is usually thought of as a prior cause of both *y* and *x* that makes it appear that *x* may be causing *y*.
- Example

An example of confounding/lurking

A group of concerned parents from town X would like to learn about the effects of television watching on their 6th grade children's level of self-esteem. There are forty teenagers to be studied, and they are in the same class. The parents decide to divide all students into two groups of twenty. One group becomes the control group, and these teenagers maintain unlimited access to television. The other group becomes the treatment group, and those teenagers' access becomes limited. The children do not know about this experiment. After two years, at the end of 8th grade, parents decide to evaluate the results. They prepare the same questionnaire for each group and look at the outcome. As a result, among many other things, parents learn from the control group that there are lurking variables such as puberty, peer pressure, movie theater access, teenage magazines, etc, factors which were not studied in their experiment, but which also affect self-esteem. They realized that their children's levels of self-esteem depended upon more than one factor

Homework

- p 313 (1-4)
- ~~P 314~~ (31, 32, ~~34, 35~~)

P313
(7, 21, 23, 25;
10, 22, 24, 26)

(7, 10, 21-26)