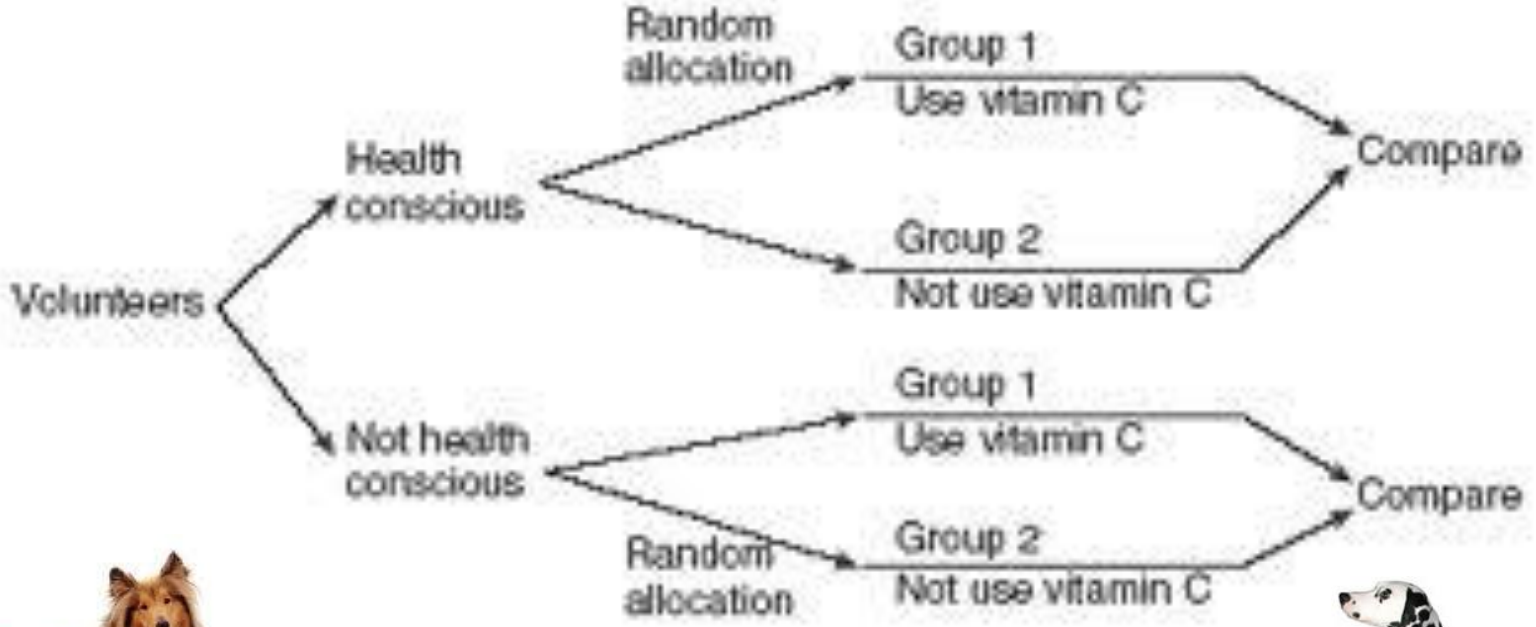
Friday, November 2, 2018

- Warm-up
  - Describe in your own words what is happening in this experiment (treatments, response(s) measured, any grouping, etc) given the diagram.



Blocking Dogs – Day 1

Homework Check: p 313(1-4)

1. **Standardized test scores.**

   a) No, this is not an experiment. There are no imposed treatments. This is a retrospective observational study.

   b) We cannot conclude that the differences in score are caused by differences in parental income. There may be lurking variables that are associated with both SAT score and parental income.

2. **Heart attacks and height.**

   a) No, this is not an experiment. There are no imposed treatments. This is a retrospective observational study.

   b) We cannot conclude that shorter men are at higher risk of heart attack. There may be lurking variables that are associated with both height and risk of heart attack.

Homework Check: p 313(1-4)

3. **MS and vitamin D.**

   a) This is a retrospective observational study.

   b) This is an appropriate choice, since MS is a relatively rare disease.

   c) The subjects were U.S. military personnel, some of whom had developed MS.

   d) The variables were the vitamin D blood levels and whether or not the subject developed MS.

4. **Super Bowl commercials.**

   a) This is a stratified sample. The question was about population values, namely the proportions of men and women who look forward to more commercials. No treatment was applied, so this is not an experiment.

   b) Yes, the design was appropriate.

Homework Check: p 313(7,21,23,25;10,22,24,26)

7. **a)** This is an experiment, since treatments were imposed.

b) The subjects studied were 30 patients with bipolar disorder.

c) The experiment has 1 factor (omega-3 fats from fish oil), at 2 levels (high dose of omega-3 fats from fish oil and no omega-3 fats from fish oil).

d) 1 factor, at 2 levels gives a total of 2 treatments.

e) The response variable is "improvement", but there is no indication of how the response variable was measured.

f) There is no information about the design of the experiment.

g) The experiment is blinded, since the use of a placebo keeps the patients from knowing whether or not they received the omega-3 fats from fish oils. It is not stated whether or not the evaluators of the "improvement" were blind to the treatment, which would make the experiment double-blind.

h) Although it needs to be replicated, the experiment can determine whether or not omega-3 fats from fish oils cause improvements in patients with bipolar disorder, at least over the short term. The experiment design would be stronger is it were double-blind.

Homework Check: p 313(7,21,23,25;10,22,24,26)

21. Omega-3.

The experimenters need to compare omega-3 results to something. Perhaps bipolarity is seasonal and would have improved during the experiment anyway.

23. Omega-3 revisited.

a) Subjects' responses might be related to other factors, like diet, exercise, or genetics. Randomization should equalize the two groups with respect to unknown factors.

b) More subjects would minimize the impact of individual variability in the responses, but the experiment would become more costly and time-consuming.

25. Omega-3 finis.

The researchers believe that people who engage in regular exercise might respond differently to the omega-3. This additional variability could obscure the effectiveness of the treatment.

Homework Check: p 313(7,21,23,25;10,22,24,26)

10. a) This is an experiment, since treatments were imposed on randomly assigned groups.

b) The subjects were 40 volunteers suffering from insomnia.

c) There are 2 factors in this experiment (dessert and exercise). The dessert factor has 2 levels (no dessert and normal dessert). The exercise factor has 2 levels (no exercise and an exercise program).

d) 2 factors, with 2 levels each, results in 4 treatments.

e) The response variable is improvement in ability to sleep.

f) This experiment is probably completely randomized.

g) This experiment does not use blinding.

h) This experiment indicates that insomniacs who refrain from desserts and exercise will experience improved ability to sleep.

Homework Check: p 313(7,21,23,25;10,22,24,26)

22. Insomnia.

The experimenters need a basis for comparison. Perhaps insomnia is related to the amount of daylight, and that changed during the time when the experiment was conducted.

24. Insomnia again.

a) Subjects responses might be related to many other factors, such as diet, medications, or genetics. Randomization should equalize the two groups with respect to unknown factors.

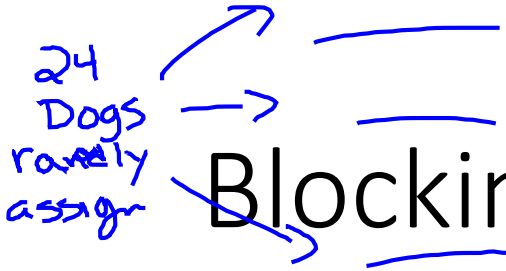
b) More subjects would minimize the impact of individual variability in the responses, but the experiment would become more costly and time-consuming.

26. Insomnia, at last.

The researchers believe that people who are overweight might respond differently to exercise. This additional variability could obscure the effectiveness of the treatment.

Objectives

- Content Objective: I will review experimental design including the concept of blocking.
- Social Objective: I will participate in the class activity and discussions.
- Language Objective: I will use correct vocabulary in my writing and speaking especially using terms blocking, experimental design, treatments, and response.



Blocking Dogs…

A set of 24 dogs (6 of each of 4 breeds, each attending 1 of 4 veterinary clinics) has been randomly selected from a population of dogs older than 8 years of age whose owners have given consent for their inclusion in a study. The purpose of this study is to determine (a) whether there are different changes in bone density over the year of the study for dogs in three treatment groups and, is so, (b) how much each treatment influences that change in bone density.

Each dog will be assigned to exactly one of three treatments. Group "Ca" will receive a dietary supplement of calcium, Group "Ex" will receive a dietary supplement of calcium and a daily exercise regimen, and Group "Co" will be a control group that receives no supplement to their ordinary diet and no additional exercise. All dogs will be given a bone density evaluation at the beginning and end of the one-year study. Bone density is measured in Houndsfield units – positive values indicate an increase in bone density and negative values represent a decrease.

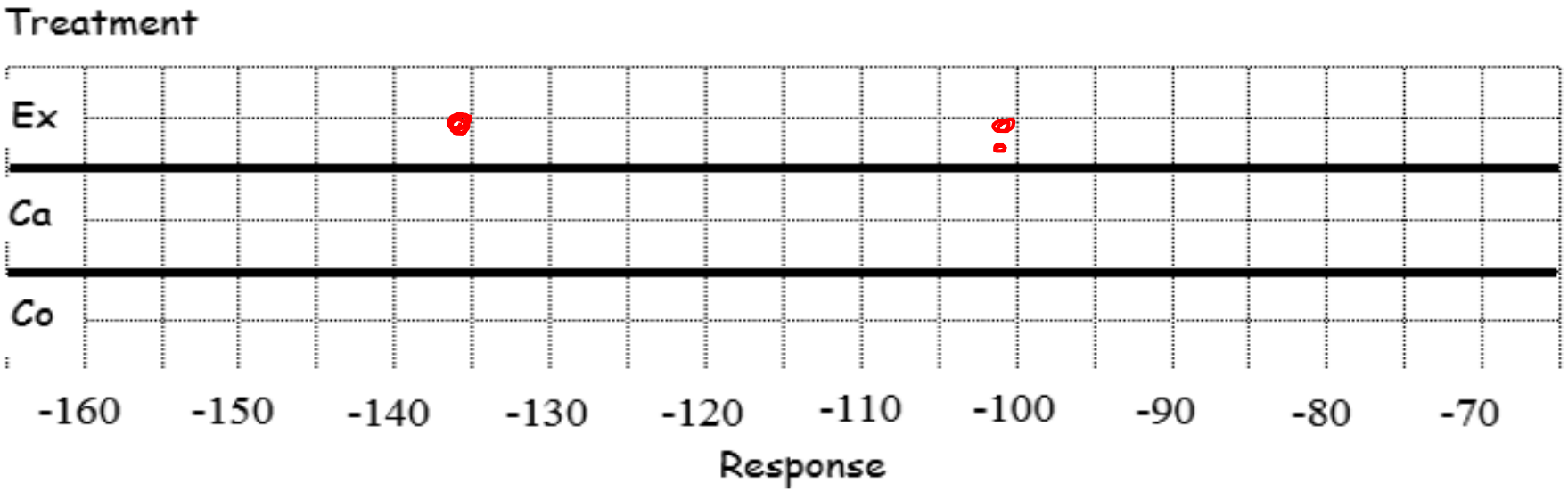
The simulation

We will simulate three possible design scenarios for this study – Completely Randomized Design, Blocked by Breed, and Blocked by Clinic. Throughout the course of this simulation YOU will be playing a particular dog who will be assigned to a treatment. Your breed and clinic will not change as we switch design. However, your treatment may change. Your job is to calculate your change in bone density as a response to your given treatment under each design. My job is to act as the researcher and randomly assign treatments under each design.

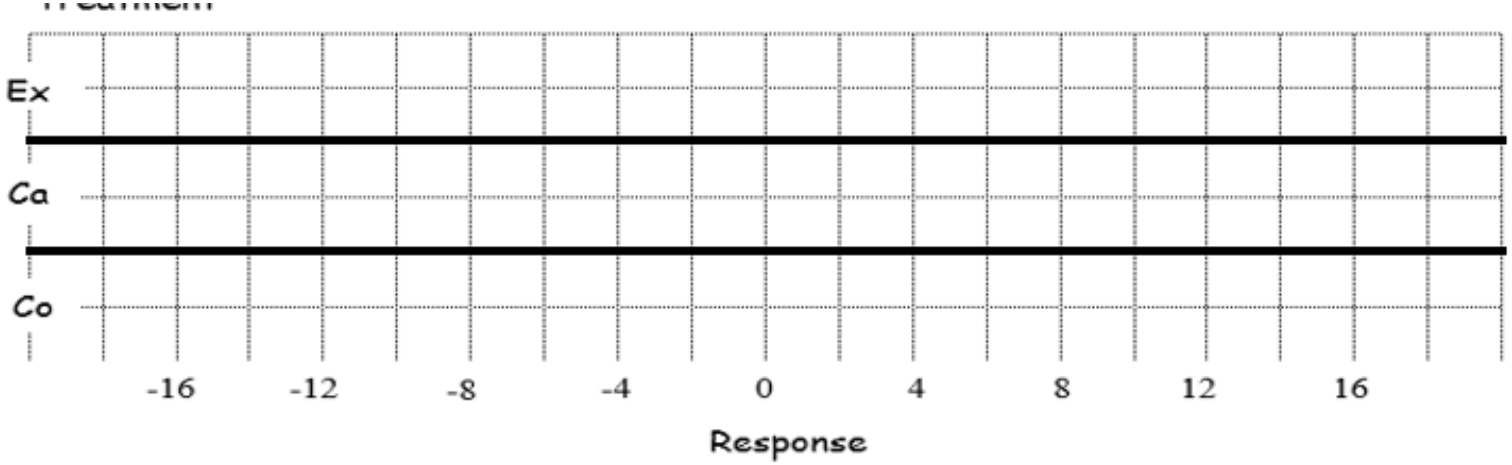
Use this table to go throughout the class and gather all of the totals – sort them by treatment:

Ex	-101.8	-100.9	-136.9	-67.2	-95.8	-98.1	-91.1	-68.8
Ca	-139.7	-72.1	-92.9	-138.6	-89.5	-98.8	-106.5	-69.4
Co	-151.8	-153.8	-111.7	-113.8	-150.1	-78.9	-100.6	-87.3

Create 3 dot plots to indicate the treatment:



		Akitas		Beagles		Collies		Dalmations	
Raw Data	Ex								
	Ca								
	Co								
Breed Averages									
Data with breed variability removed									



Homework

- P 315(42-44)