Chapter 4.2 Lecture Notes & Examples Day 3

Learning Targets

- Describe the placebo effect and the purpose of blinding in an experiment.

Section 4.2 (Part 4) pp. 243-246

Experiments: What Can Go Wrong?

The logic of a randomized comparative experiment depends on our ability to treat all the subjects the same in every way except for the actual treatments being compared. Good experiments require careful attention to details to ensure that all subjects are really treated identically.

Placebo Effect - The placebo effect is the tendency in humans to show a response whenever they think a treatment is in effect. Well-designed experiments use a control group so that the placebo effect operates equally on both the treatment group and the control group, thus allowing us to attribute changes in the response variable to the explanatory variable.

Double-Blind - In a **double-blind** experiment, neither the subjects nor those who interact with them and measure the response variable know which treatment a subject received.

Single-Blind - Some experiments cannot be carried out in a double-blind manner. Sometimes the subjects know what treatment they are receiving. If those who interact with them do not know how the individuals are treated, the experiment is **single-blind**.

CHECK YOUR UNDERSTANDING

In an interesting experiment, researchers examined the effect of ultrasound on birth weight. Pregnant women participating in the study were randomly assigned to one of the two groups. The first group of women received an ultrasound; the second group did not. When the subjects' babies were born, their birth weights were recorded. The women who received the ultrasounds had heavier babies.

1. Did the experimental design take the placebo effect into account? Why is this important?

No. It is possible that women who thought they were getting an ultrasound would have different reactions to pregnancy than those who knew that they hadn't received an ultrasound.

2. Was the experiment double-blind? Why is this important?

No. The people who weighed the baby did not know what treatment was given, but the mother's did know, and the mother's knowing may have affected the results.

3. Based on your answers to Questions 1 and 2, describe an improved design for this experiment.

Make it a double blind experiment. All mother's treated as if they have ultrasound, but turn machine on for one group and off for another.

4. Inference for Experiments - In an experiment, researchers usually hope to see a difference in the responses so large that it is unlikely to happen just because of chance variation. We can use the laws of probability, which describe chance behavior, to learn whether the effects are larger than we would expect to see if only chance were operating. If they are, they are called **statistically significant**.

Definition: An observed effect so large that it would rarely occur by chance is called **statistically significant**.

significant

If we observed statistically differences among groups in a randomized comparative experiment, we have good evidence that the treatments actually caused these differences. **A statistically significant association in data from a well-designed experiment *does* imply causation.**

HW 4.2 Part C pages 256 - 257 problems 69, 71, 73