

Chapters 13: Experiments

1. What are the 4 principles of experiment design? Include a description of each.
 - A) CONTROL – MAKE CONDITIONS AS SIMILAR AS POSSIBLE FOR ALL TREATMENT GROUPS
 - B) RANDOMIZE – RANDOMIZE WHO GOES INTO EACH GROUP: TREATMENT/PLACEBO
 - C) REPLICATE – RESULTS SHOULD BE REPEATABLE; YOU SHOULD HAVE MORE THAN ONE SUBJECT FOR EACH TREATMENT
 - D) BLOCK – FORM BLOCKS BY GROUPING SIMILAR ITEMS TOGETHER, ESPECIALLY IF YOU THINK PARTICULAR GROUPS WILL HAVE SIGNIFICANTLY DIFFERENT RESPONSES TO TREATMENT

2. Researchers plan to investigate a new medication that may reduce blood pressure for individuals with higher than average blood pressure. 90 volunteers with higher than average blood pressure are solicited. Volunteers are randomly assigned 100 mg of the medicine, 200 mg of the medicine, or a placebo. Blood pressure will be measured at the beginning and conclusion of the study.
 - a) Identify the subjects.
90 VOLUNTEERS WITH HIGHER THAN AVERAGE BLOOD PRESSURE

 - b) Identify the treatments.
100 MG OF MEDICINE, 200 MG OF MED, OR PLACEBO

 - c) Identify the response variable.
BLOOD PRESSURE

 - d) Describe an advantage to random assignment of treatment.
ELIMINATES VARIATION – ALLOWS US TO DETERMINE EFFECT EVEN THOUGH PATIENTS ARE VOLUNTEERS. WE MAY BE ABLE TO ESTABLISH CAUSATION

 - e) Describe an advantage of the placebo.
CONTROL

 - f) Describe a disadvantage of using volunteers in this study.
WE ARE NOT ABLE TO GENERALIZE

 - g) Is this study blind?
DOESN'T SOUND DOUBLE-BLIND, BUT THE SUBJECTS ARE PROBABLY BLIND

 - h) Is this an observational study or an experiment?
EXPERIMENT – LEVEL OF TREATMENT IS RANDOMLY ASSIGNED TO EACH VOLUNTEER

 - i) Will the researchers be able to draw cause and effect conclusions at the end of the study? Why or why not?
YES – THIS IS AN EXPERIMENT.

3. A group of people are concerned that the coach of a local high school men's and women's basketball teams alters the amount of air in the basketball to gain an unfair advantage over opponents during home games. The idea is that the basketballs are pumped up with one pound per square inch less air than required, and his teams practiced with these altered balls all week prior to home basketball games. Since these under-pumped basketballs would react differently to being shot at a basket, the team that practiced with these balls would have an unfair advantage when shooting free-throws.
 - a) Design an **observational study** to determine if the home teams have an unfair advantage when shooting free-throws with the altered basketballs.

WATCH BOTH HOME GAMES AND AWAY GAMES. RECORD THE NUMBER OF FREE THROWS MADE (AND ATTEMPTED) BY EACH TEAM MEMBER (BOTH HOME AND AWAY). COMPARE THE DIFFERENCES.

 - b) Design an **experiment** to determine if the home teams have an unfair advantage when shooting free-throws with the altered basketballs.

RESPONSE: # FREE THROW SUCCESS OUT OF 30 ATTEMPTED

MY DESIGN...

ONE CAN EXPECT THERE TO BE A LOT OF VARIABILITY FROM PLAYER TO PLAYER (A GOOD PLAYER WILL SHOOT WELL USING EITHER BALL, AND A POOR PLAYER WILL SHOOT POORLY WITH EITHER). THEREFORE, I WILL FORM BLOCKS ON EACH PERSON. EACH PERSON WILL SHOOT 30 SHOTS WITH EACH BALL. THE ORDER THEY SHOOT THE BALLS WILL BE RANDOMIZED (SOME WILL SHOOT FIRST WITH THE REGULAR BALL, AND SOME WILL SHOOT FIRST WITH THE UNDER-INFLATED BALL).

TRIALS WILL BE COMPLETED INDOORS, ON THE SAME COURT.

WHILE I WOULD TRY TO KEEP THE STUDY BLIND, IT IS FAIR TO REASON THAT A 'GOOD' PLAYER WOULD NOTICE THE DIFFERENCE IN THE BALLS.

c) Analyze your experiment design by pointing out how you implemented the 4 principles of experiment design.

- I. CONTROL – USE THE SAME COURT FOR EACH TRIAL TO KEEP THE CONDITIONS ROUGHLY THE SAME (MAYBE BETTER IF I CONTROL TIME TOO)
- II. RANDOMIZE – ORDER OF SHOTS (BALL USED) IS RANDOMIZED
- III. REPLICATE – EACH PERSON WILL SHOOT 30 WITH EACH BALL, THERE SHOULD BE MORE THAN ONE PLAYER.
- IV. BLOCK – EACH PERSON IS A BLOCK

d) Which is design is better? Why?

THE EXPERIMENT IS BETTER BECAUSE IT WILL ALLOW US TO DRAW CAUSE-AND-EFFECT CONCLUSIONS.