

ignore any duplicate questions

1. Suppose that you want to study whether an SAT prep program actually helps students to score higher on the SAT's. You gather data on a random sample of students who attended the program and you find that 86% of the sample scored higher on the SAT's after attending the program than before attending the program.

a) Explain why you cannot legitimately conclude that the SAT coaching program caused these students to improve their scores on the SAT.

→ this is an observational study

→ there is no control group

b) Suggest some other explanations for their improvement. Explain in the context of this problem why one of these might confound the results of this study.

→ students may have completed other courses at school that helped ↑ their scores

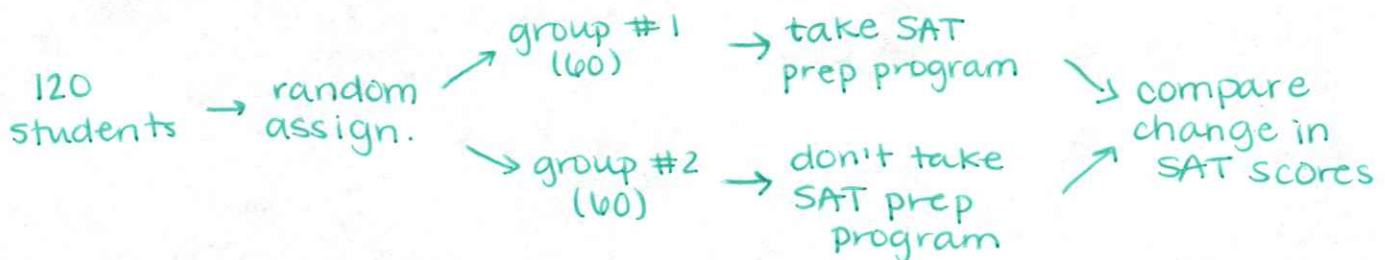
2. Suppose you wanted to conduct an experiment to investigate whether an SAT prep program would improve students' scores on the SAT. Assume you have 120 students available for the study.

(a) Identify the explanatory variable and the response variables in your experiment.

participation in program

→ change in students' SAT scores

(b) Explain carefully how you would randomize the 120 students to the treatment groups.



3. Confounding often defeats attempts to show that one variable causes changes in another variable. Confounding means that

- (a) this was an observational study, so cause and effect conclusions are not possible
- (b)** the effects of several variables are mixed up, so we cannot say which is causing the response
- (c) we don't know which is the response variable and which is the explanatory variable
- (d) we would get widely varied results if we repeated the study many times
- (e) no randomization was used in the study.

4. A report in the April 26, 2001 *New England Journal of Medicine* studied a new treatment for children with a severe anxiety disorder. The study was a randomized blinded? comparative experiment. Data from the study showed that 76% of the children treated with the new drug had a reduced anxiety level. Of the children who were given a placebo, 29% had a reduced anxiety level. Almost none of the patients in the study exhibited an increase in anxiety levels.

a) What is meant by blinded? *neither the people giving nor receiving the treatments know which subjects get which treatment*

b) What is meant by randomized? *subjects are randomly assigned a group/drug*

c) What is the explanatory variable? *drug taken*

d) What is the response variable? *change in anxiety levels*

e) What are the treatments? *new drug & placebo*

This is a "fill in the blanks" exercise. **The next three questions** ask you to fill in the blanks in this statement:

BLANK A try to gather data without influencing the responses. **BLANK B**, on the other hand, impose some **BLANK C** in order to observe the response.

5. **BLANK A** should read

- (a) matched pairs designs. (b) observational studies. (c) explanatory variables.
(d) experiments. (e) Double-blind methods.

6. **BLANK B** should read

- (a) explanatory variables. (b) observational studies. (c) sample surveys.
(d) lurking variables. (e) experiments.

7. **BLANK C** should read

- (a) randomization. (b) confounding. (c) response variable.
(d) treatment. (e) common response

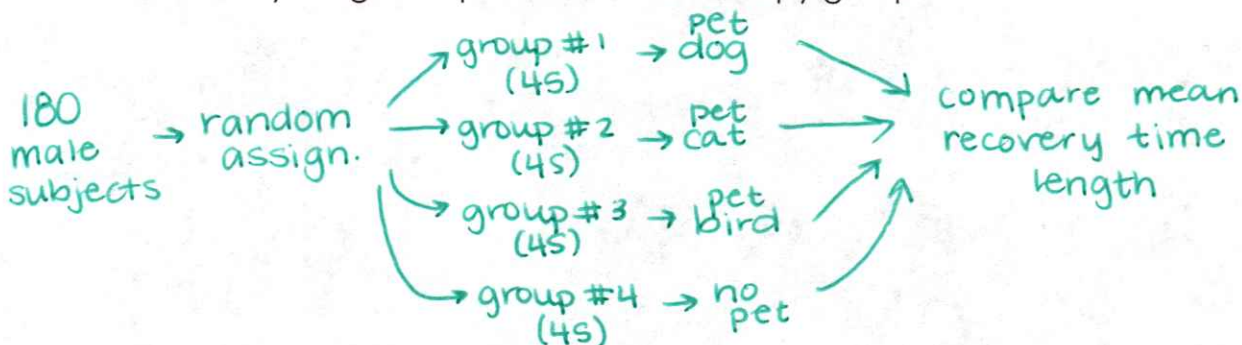
8. Does owning a pet have therapeutic benefits for heart attack patients? Specifically, you decide to investigate whether heart attack patients who own a pet tend to recover more quickly than those who do not. You randomly select a sample of male heart attack patients from a large hospital and follow them for one year. You then compare the difference in the mean length of time until full recovery between those in the group who had a pet and those who did not.

a) Identify the explanatory and response variables.

owning a pet

length of full recovery time after a heart attack

b) You want to design an experiment to investigate the proposition that owning a pet has therapeutic benefits for heart attack patients. You will use dogs, cats, and birds in this experiment. Suppose that you have 180 male heart attack patients between the ages of 55 and 65 (all of whom have no other physical impairments) who have volunteered to be part of this study and have agreed to accept one of these pets as part of their therapy. Describe a method to randomly assign the patients to the therapy groups.

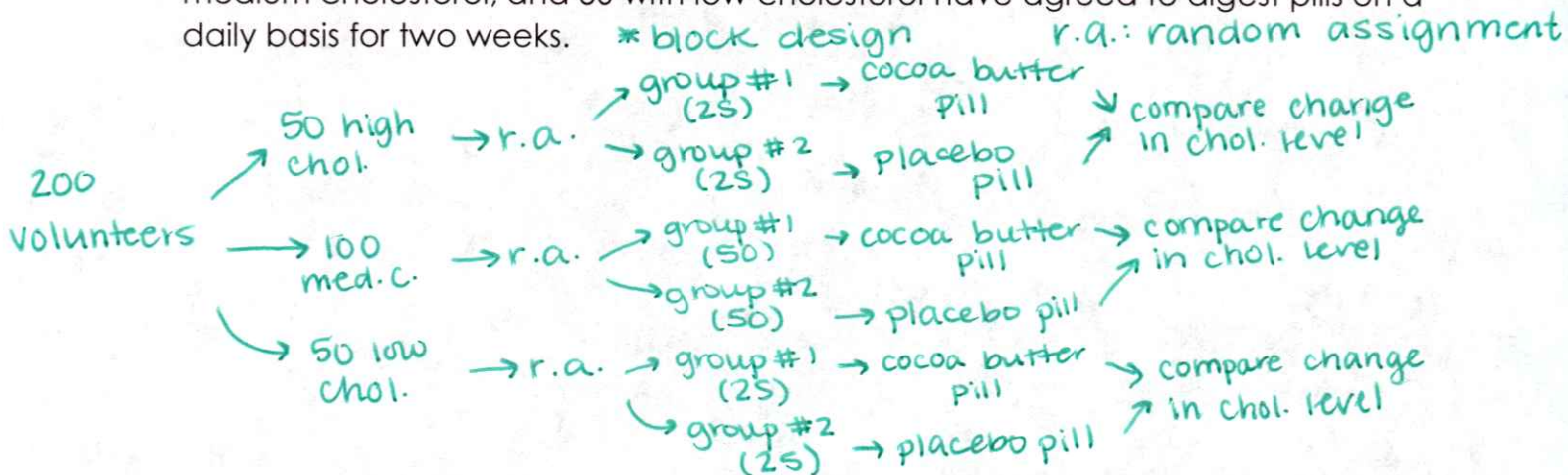


9. Does the cocoa butter in chocolate raise cholesterol levels? You would like to design an experiment to help answer this question.

(a) Previous studies have found that people's current cholesterol levels – high, medium, or low – can affect how much their cholesterol level changes over the course of an experiment. Explain how blocking could be used to take this information into account.

blocking by current cholesterol level will help to see cocoa butter's impact in different subgroups

(b) Explain carefully how you would design an experiment to answer the question posed. You may assume that 200 volunteers – 50 with high cholesterol, 100 with medium cholesterol, and 50 with low cholesterol have agreed to digest pills on a daily basis for two weeks.



The next three questions concern this situation: Does using a cell phone while driving ^{cause} make an accident more likely? Researchers compared telephone company and police records to find 699 people who had cell phones and were also involved in an auto accident. Using phone billing records, they compared the frequency of accidents when cell phones were in use to the frequency when they were not in use.

10. This study is

do cell phones ← explan. var.
cause/explain
accidents ← response var.

- (a) a randomized comparative experiment.
- (b) an experiment, but without randomization.
- (c) a simple random sample.
- (d) an observational study, but not a simple random sample.
- (e) none of the above

11. The explanatory variable in this study is

- (a) whether or not the subject had an auto accident.
- (b) whether or not the subject was using a cell phone.
- (c) the risk of an accident.
- (d) whether or not the subject owned a cell phone.
- (e) billing records.

12. An example of a lurking variable that might affect the results of this study is:

- (a) whether or not the subject had an auto accident.
- (b) whether or not the subject was using a cell phone.
- (c) whether or not the subject was talking to a passenger in the car.
- (d) whether or not the subject owned a cell phone.
- (e) both (c) and (d).

→ not one of the variables being studied

13. The drug manufacturer Merck recently stopped testing a promising new drug to treat depression. It turned out that in a randomized, double-blind trial a dummy pill did almost as well as the new drug. The fact that many people respond to a dummy treatment is called

- (a) confounding.
- (b) nonresponse.
- (c) comparison.
- (d) the placebo effect.
- (e) voluntary response.

14. A report in a medical journal notes that the risk of developing Alzheimer's disease among subjects who (voluntarily) regularly took the anti-inflammatory drug ibuprofen (the active ingredient in Advil) was about half the risk among those who did not. Is this good evidence that ibuprofen is effective in preventing Alzheimer's disease?

- (a) Yes, because the study was a randomized, comparative experiment.
- (b) No, because the effect of ibuprofen is confounded with the placebo effect.
- (c) Yes, because the results were published in a reputable professional journal.
- (d) No, because this is an observational study. A clinical trial would be needed to confirm (or not confirm) the observed effect.
- (e) Yes, because a 50% reduction can't happen just by chance.

15. 35. In an experiment to see if aspirin reduces the chance of having a heart attack, a placebo is

- (a) the place where the subjects go when they have a heart attack
- (b) a dummy pill that looks like aspirin but has no active ingredients
- (c) a procedure for deciding who gets the aspirin treatment
- (d) the margin of error
- (e) 95%

16. Ethical standards for randomized, controlled clinical trials include

- (a) not asking subjects to agree to participate without first informing them of the nature of the study and possible risks and benefits.
- (b) insuring that each subject knows which treatment he or she received.
- (c) allowing subjects to decide whether or not to be in the control group
- (d) never testing drugs which have not been proven to be completely safe.
- (e) All of the above.

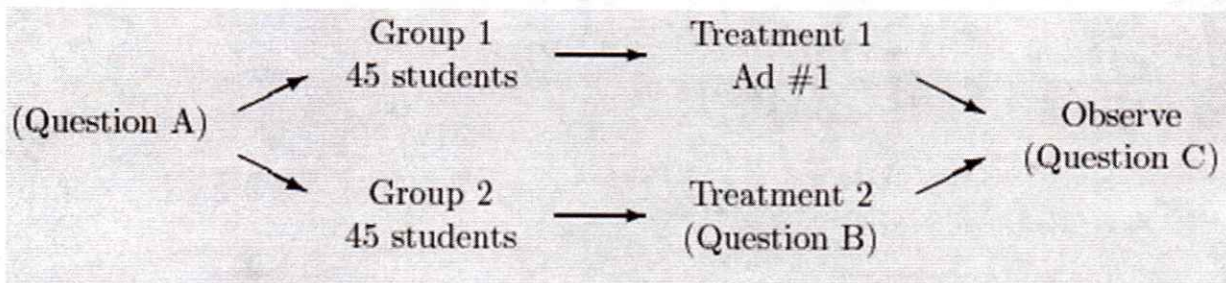
17. An experiment compares two brands of automobile tires. Each of a number of cars is equipped with one tire of each brand on a rear wheel (the order is randomized from car to car) and tread wear is measured periodically. This is called a

- (a) simple random sample.
- (b) stratified random sample.
- (c) completely randomized design.
- (d) matched pairs design.
- (e) double-blind design.

18. You work for an advertising agency that is preparing a new television commercial to appeal to women. You have been asked to design an experiment to compare the effectiveness of three versions of the commercial. Each subject will be shown one of the three versions and then asked her attitude toward the product. You think there may be large differences between women who are employed and those who are not. Because of these differences, you should use

- (a) a completely randomized design.
- (b) a categorical variable.
- (c) a block design.
- (d) a matched pairs design.
- (e) a multistage sample.

A study compares the effect on college students of two different TV advertisements for spring break in Gulf Shores, Alabama. Call the ads "Ad #1" and "Ad #2." We want to know which ad makes more students want to visit Gulf Shores during spring break. The subjects are 90 students taking a course in hotel management. The design of the study looks like this:



The next five questions concern this study.

19. The statistical name for this study design is

- (a) simple random sample.
- (b) stratified random sample.
- (c) observational study.
- (d) matched-pairs experiment.
- (e) randomized comparative experiment.

20. The method used to form the groups appears in the diagram above at the point marked "Question A." This method is

- (a) Men in Group 1, women in Group 2.
- (b) Students choose which group they want.
- (c) Voluntary response.
- (d) Random assignment.
- (e) The first students to appear go to Group 1.

21. What is Group 2's treatment (at the point marked "Question B" in the diagram)?

- (a) A placebo.
- (b) Ad #2.
- (c) One of the ads, chosen at random.
- (d) Watch TV, but see no advertisement.
- (e) Can't say because of double blindness.

22. The response variable should be named in the outline at (Question C). The response variable in this study is

- (a) whether a student wants to visit Gulf Shores.
- (b) which advertisement a student watched.
- (c) 90 college students.
- (d) randomization.
- (e) Ad #2.

23. A weakness of this study is

- (a) This is an observational study, so we can't conclude that the ad viewed causes the response.
- (b) The design is biased in favor of Ad #1.
- (c) The double-blind technique was not used.
- (d) Because the students all come from one course, the findings may not extend to all college students.
- (e) There is no placebo group.

24. The most important advantage of experiments over observational studies is that

- (a) experiments are usually easier to carry out.
- (b) experiments can give better evidence of causation.
- (c) confounding cannot happen in experiments.
- (d) an observational study cannot have a response variable.
- (e) observational studies cannot use random samples.