

*Blocking* is used to control the factors you can see;  
*Randomization* helps balance the ones you cannot see.”  
Richard L. Scheaffer

Directions: Design the experiment from the description. Name the type of experimental design used. Describe your random assignment of the subjects.

1. In marketing children’s products, it’s extremely important to produce television commercials that hold the attention of the children who view them. A psychologist hired by a marketing research firm wants to determine whether differences in attention span exist among advertisements for different types of products. Fifteen children under 10 years of age are randomly asked to watch one 60-second commercial for one of three types of products, and their attention spans are measured in seconds.
2. Upon reconsidering the above problem, the psychologist decides that the age of the child may affect the attention span. Consequently, the psychologist randomly assigns fifteen 10-year-olds, fifteen 8-year-olds, fifteen 6-year-olds, and fifteen 4-year olds to watch one of the commercials, and their attention spans are measured.
3. A new dog food, specially designed for dogs with kidney problems, has been developed. A veterinarian wants to test this new food against another dog food currently on the market to see if it improves the dog’s health. Thirty dogs with kidney problems were recruited to participate in the study. They were fed either the “new” or “old” food for six months and the improvement in kidney health was rated.
4. Does talking while walking slow you down? In a study reported in the journal *Physical Therapy*, the cadence was measured for subjects who were walking (using no device, a standard walker, or a rolling walker) and required (or not required) to respond to a signal while walking.
5. Researchers have developed a new insulin inhaler to replace daily insulin shots needed by patients with diabetes. Design an experiment to test the effects of this new insulin treatment on a volunteer group of 100 diabetes patients.
6. The Associated Insurance Institute sponsors studies of the effects of drinking and driving. In one such study, 30 adult men were randomly selected for an experiment designed to measure their blood alcohol level one hour after consuming 2 drinks in an hour and one hour after consuming 5 drinks in an hour.
  - A. Outline a completely randomized design to determine the difference in the blood alcohol levels one hour after consuming 2 or 5 drinks in an hour.
  - B. The researcher believes the weight of the individual will affect the blood alcohol level. The subjects are divided into two groups: 12 men who weigh less than 160 pounds and 18 men who weigh more than 160 pounds. Outline an appropriate block design for the experiment.
  - C. The researcher believes that an individual's metabolism will affect the blood alcohol level. Describe in detail the design of a matched pairs experiment in which each subject serves as his own control.

## Answers:

1. Completely Randomized. There are 3 treatments: Product 1, Product 2, and Product 3. There is no placebo group, and to have one would be a waste of subjects. To randomize, place children's names on separate slips of paper, and put them in a hat. First one drawn goes to Product 1; second, to Product 2; Third to Product 3; 4<sup>th</sup> drawn goes to Product 1, etc. Attention span is measured. Explanatory variable: Product; Response Variable: Attention span.
2. Randomized Block. Block by age group; Treatments are the same as problem 1. For each age group, follow the same procedure in problem 1.
3. Completely randomized. Put dogs names into a hat, and draw to put dogs into old and new treatment groups, alternating between groups. Measure health before starting experiment. Measure health after time period is up. Explanatory variable: new or old food, response variable: improvement in health
4. Completely randomized with 6 treatments: 1. no device, response not required; 2. no device, response required; 3. standard walker, response not required; 4. standard walker, response required; 5. rolling walker, response not required; 6. rolling walker, response required. Response variable: cadence of walk
5. Completely randomized with 2 treatments: insulin shots and inhaler.
6. a. Draw men's names from a hat; first chosen gets 2 drinks group; second chosen gets 5 drinks group. Alternate groups until all are chosen. Find the means of each group and measure the differences in the means between the groups.  
b. Randomized block design. Separate the men into their weight groups. For each block, put their names into a hat and draw names to assign the 2 drink or the 5 drink group in the same manner as part a.  
c. Measure each subject's metabolism level before starting experiment. Randomly assign each subject to either the 2 drink or the 5 drink group as given in part a. Compare the difference for each subject before and after drinking.