1.5: Experiments and Random Assignment

Experiments

An _____ is a controlled study conducted to determine the effect varying one or more explanatory variables or **factors** has on a response variable. Any combination of the values of the factors is called a _____ . In an experiment, the **experimental unit (or _____)** is a person, object, or some other well-defined item upon which a treatment is applied.

The goal in an experiment is to determine the effect various treatments have on the response variable. When participation in a study prompts a physical response from a participant, it is difficult to isolate the effects of the explanatory variable. To counter the power of suggestion, researchers set aside one treatment group as a **control group**. This group is given a **placebo** treatment–a treatment that cannot influence the response variable. The control group helps researchers balance the effects of being in an experiment with the effects of the active treatments.

Of course, if you are participating in a study and you know that you are receiving a pill which contains no actual medication, then the power of suggestion is no longer a factor. **Blinding** in a randomized experiment preserves the power of suggestion. When a person involved in a research study is blinded, they do not know who is receiving the active treatment(s) and who is receiving the placebo treatment. A **double-blind experiment** is one in which both the subjects and the researchers involved with the subjects are blinded.

Random Assignment

In previous lessons, we stated that random assignment helps to make experimental groups similar. In this exercise we will see how well random assignment actually works.

An article in the journal Pediatrics reported on the results of an experiment that compared recovery times for two types of hernia surgery for children.

- Method 1: laparoscopic repair (a surgery that uses three small incisions)
- Method 2: open repair (a surgery that uses one large incision)

To compare the two treatments (hernia surgery methods), the researchers needed to create two groups of children that were similar with respect to any variables that might affect the response variable (recovery time).

Imagine that a new group of researchers thought that another variable - a child's age - might also affect his or her recovery time. The researchers wanted to control for age, so they wanted the two treatment groups to contain children who were similar in age. This would prevent the age variable from influencing the response variable in the experiment.

One way to do this is to randomly assign children to one of the two groups. This might be done by flipping a coin to assign each child to a group. If the coin lands heads, the researchers assign the child to the Method 1 group. If the coin lands tails, the researchers assign the child to the Method 2 group.

Let's investigate whether this method of random assignment creates similar groups. Suppose there are 30 children with hernias who volunteered to participate in the experiment. The identification numbers and ages of these 30 children are given in the following table.

We will randomly assign children to one of the two groups by using a **random number generator**. Then we will look at the results and see if random assignment actually works. Below is a list of 30 children with their ages included.

Child ID #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Age	12	11	9	8	11	10	11	10	7	6	12	10	10	9	10

Child ID #	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Age	7	7	8	6	9	7	9	8	11	9	12	12	11	12	12

Use a random number generator (access through the link or through the QR code below) to determine which 15 children will have the surgery method 1. The remaining children should be placed into the method 2 table.

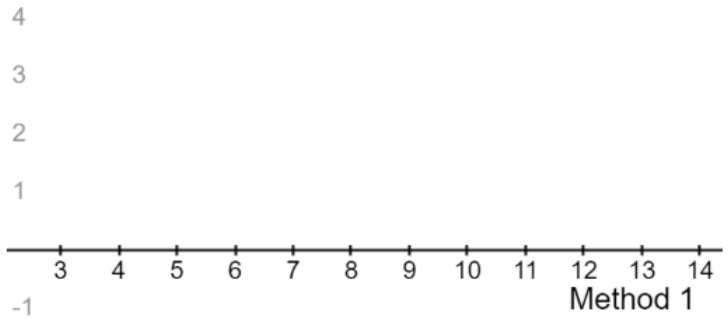
Method 1

Child ID #															
Age															

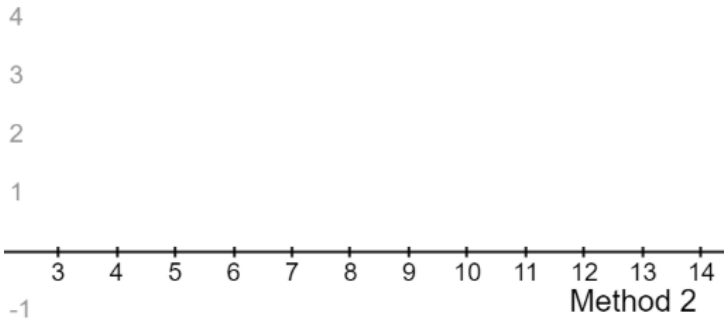
Method 2

Child ID #															
Age															

Below are two labeled number lines. Record your data on them and calculate the average age for each method.



Average age for method 1:



Average age for method 2:

Images are created with the graphing calculator, used with permission from Desmos Studio PBC.

1. Think about the dotplots and their averages. Was the method of random assignment successful in creating groups with similar ages? Explain your answer.

2. Other variables that might affect recovery time are weight and fitness level. Do you think that our random assignment to experimental treatments (method 1 group and method 2 group) would create groups of similar weight and fitness level? Why do you think so?