Identifying Study Design: Types of Studies

Learning Objective: Identify the design of a study (controlled experiment vs. observational study) and other features of the study design (randomized, blind etc.).

Identifying Study Design

Because each type of study design has its own advantages and trouble spots, it is important to begin by determining what type of study we are dealing with. The following example helps to illustrate how we can distinguish among the three basic types of design mentioned in the introduction—observational studies, sample surveys, and experiments.

Example

Suppose researchers want to determine whether people tend to snack more while they watch television. In other words, the researchers would like to explore the relationship between the explanatory variable "TV" (a categorical variable that takes the values "on'" and "not on") and the response variable "snack consumption."

Identify each of the following designs as being an observational study, a sample survey, or an experiment.

1. Recruit participants for a study. While they are presumably waiting to be interviewed, half of the individuals sit in a waiting room with snacks available and a TV on. The other half sit in a waiting room with snacks available and no TV, just magazines. Researchers determine whether people consume more snacks in the TV setting.

This is an **experiment**, because the researchers take control of the explanatory variable of interest (TV on or not) by **assigning** each individual to either watch TV or not, and determine the effect that has on the response variable of interest (snack consumption).

2. Recruit participants for a study. Give them journals to record hour by hour their activities the following day, including when they watch TV and when they consume snacks. Determine if snack consumption is higher during TV times.

This is an observational study, because the participants themselves determine whether or not to watch TV. There is no attempt on the researchers' part to interfere.

3. Recruit participants for a study. Ask them to recall, for each hour of the previous day, whether they were watching TV, and what snacks they consumed each hour. Determine whether snack consumption was higher during the TV times.

This is also an observational study; again, it was the participants themselves who decided whether or not to watch TV. Do you see the difference between 2 and 3? See the comment below.

4. Poll a sample of individuals with the following question: While watching TV, do you tend to snack: (a) less than usual; (b) more than usual; or (c) the same amount as usual?

This is a sample survey, because the individuals self-assess the relationship between TV watching and snacking.

Comment

Notice that in Example 2, the values of the variables of interest (TV watching and snack consumption) are recorded forward in time. Such observational studies are called **prospective**. In contrast, in Example 3, the values of the variables of interest are recorded backward in time. This is called a **retrospective** observational study. We'll discuss this distinction later in this module.

Did I Get This

1/1 point (graded)
Identify the type of study design in the following scenario:

An Internet poll asks people to vote for their favorite "American Idol" singer.

- prospective observational study
- retrospective observational study

- (●) survey ✔
- ( ) experiment

Answer
Correct:
Indeed, a study in which individuals report variable values themselves (frequently their opinions), is a **survey**.

Submit

Did I Get This

1/1 point (graded)
Identify the type of study design in the following scenario:

Researchers compare the rates of autism for children who did and did not receive the standard measles-mumps-rubella vaccine, to see if the vaccine might be responsible for autism in some children.

- ( ) prospective observational study
- (●) retrospective observational study ✔
- ( ) survey
- ( ) experiment

Answer
Correct:
Indeed, a **retrospective observational study** involves recording variables' values that naturally happened in the past.

Submit

Did I Get This

1/1 point (graded)
Identify the type of study design in the following scenario:

Researchers injected some patients' underarms with Botox, and others' with salt water, in order to see if Botox (which was originally found to smooth wrinkles) would also reduce sweating.

- prospective observational study
- retrospective observational study
- survey
- experiment ✔

Answer
Correct:
Indeed, this is an **experiment**, since a treatment (Botox/salt water) was imposed on the individuals.

Submit

Did I Get This

1/1 point (graded)
Identify the type of study design in the following scenario:

Researchers classified pregnant women as being nondrinkers or light, moderate, or heavy drinkers; they examined the weights of their children at regular age intervals to see if alcohol during pregnancy results in poor growth.

- prospective observational study ✔
- retrospective observational study
- survey
- experiment

Answer
Correct:
Indeed, a **prospective observational study** records the values of variables (in this case, baby's growth) as they naturally happen forward in time.

Submit

While some studies are designed to gather information about a single variable, many studies attempt to draw conclusions about the relationship between two variables. In particular, researchers often would like to produce evidence that one variable actually causes changes in the other. For example, the research question addressed in the previous example sought to establish evidence that watching TV could cause an increase in snacking. Such studies may be especially useful and interesting, but they are also especially vulnerable to flaws that could invalidate the conclusion of causation. In several of the examples in this module we will see that although evidence of an association between two variables may be quite clear, the question of whether one variable is actually causing changes in the other may be too murky to be entirely resolved. In general, with a well-designed experiment we have a better chance of establishing causation than with an observational study. However, experiments are also subject to certain pitfalls, and there are many situations in which an experiment is not an option. A well-designed observational study may still provide fairly convincing evidence of causation under the right circumstances.