

1.5: Type of Research Designs

Research studies come in many forms, and, just like with the different types of data we have, different types of studies tell us different things. The choice of research design is determined by the research question and the logistics involved. Though a complete understanding of different research designs is the subject for at least one full class, if not more, a basic understanding of the principles is useful here. There are three types of research designs we will discuss: experimental, quasiexperimental, and non-experimental.

Experimental Designs

If we want to know if a change in one variable causes a change in another variable, we must use a true experiment. An experiment is defined by the use of random assignment to treatment conditions and manipulation of the independent variable. To understand what this means, let's look at an example:

A clinical researcher wants to know if a newly developed drug is effective in treating the flu. Working with collaborators at several local hospitals, she randomly samples 40 flu patients and randomly assigns each one to one of two conditions: Group A receives the new drug and Group B received a placebo. She measures the symptoms of all participants after 1 week to see if there is a difference in symptoms between the groups.

In the example, the independent variable is the drug treatment; we manipulate it into 2 levels: new drug or placebo. Without the researcher administering the drug (i.e. manipulating the independent variable), there would be no difference between the groups. Each person, after being randomly sampled to be in the research, was then randomly assigned to one of the 2 groups. That is, random sampling and random assignment are not the same thing and cannot be used interchangeably. For research to be a true experiment, random assignment must be used. For research to be representative of the population, random sampling must be used. The use of both techniques helps ensure that there are no systematic differences between the groups, thus eliminating the potential for sampling bias.

The dependent variable in the example is flu symptoms. Barring any other intervention, we would assume that people in both groups, on average, get better at roughly the same rate. Because there are no systematic differences between the 2 groups, if the researcher does find a difference in symptoms, she can confidently attribute it to the effectiveness of the new drug.

Quasi-Experimental Designs

Quasi-experimental research involves getting as close as possible to the conditions of a true experiment when we cannot meet all requirements. Specifically, a quasiexperiment involves manipulating the independent variable but not randomly assigning people to groups. There are several reasons this might be used. First, it may be unethical to deny potential treatment to someone if there is good reason to believe it will be effective and that the person would unduly suffer if they did not receive it. Alternatively, it may be impossible to randomly assign people to groups. Consider the following example:

A professor wants to test out a new teaching method to see if it improves student learning. Because he is teaching two sections of the same course, he decides to teach one section the traditional way and the other section using the new method. At the end of the semester, he compares the grades on the final for each class to see if there is a difference.

In this example, the professor has manipulated his teaching method, which is the independent variable, hoping to find a difference in student performance, the dependent variable. However, because students enroll in courses, he cannot randomly assign the students to a particular group, thus precluding using a true experiment to answer his research question. Because of this, we cannot know for sure that there are no systematic differences between the classes other than teaching style and therefore cannot determine causality.

Non-Experimental Designs

Finally, non-experimental research (sometimes called correlational research) involves observing things as they occur naturally and recording our observations as data. Consider this example:

A data scientist wants to know if there is a relation between how conscientious a person is and whether that person is a good

employee. She hopes to use this information to predict the job performance of future employees by measuring their personality when they are still job applicants. She randomly samples volunteer employees from several different companies, measuring their conscientiousness and having their bosses rate their performance on the job. She analyzes this data to find a relation.

Here, it is not possible to manipulate conscientious, so the researcher must gather data from employees as they are in order to find a relation between her variables.

Although this technique cannot establish causality, it can still be quite useful. If the relation between conscientiousness and job performance is consistent, then it doesn't necessarily matter if conscientiousness causes good performance or if they are both caused by something else – she can still measure conscientiousness to predict future performance. Additionally, these studies have the benefit of reflecting reality as it actually exists since we as researchers do not change anything.

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