

Predicting and Controlling Research

by Sophia Tutorial



WHAT'S COVERED

This tutorial will cover two key aspects of scientific research, predicting and controlling. Our discussion breaks down as follows:

1. Prediction
2. Control
3. Researcher Bias

1. Prediction

The purpose of scientific research is to understand the causes of things within the world; we want to know what is happening in the world around us. That understanding should mean that we have sufficient knowledge about something to be able to predict what's going to happen or determine whether or not something will happen given a certain situation or time.

In other words, the goal of science is **prediction**. We want to be able to understand whatever we are researching well enough that we can predict whether or not certain things will occur—typically, so that we are able to help people or change things.

🔗 **EXAMPLE** For example, you might want to know when an animal might attack or if somebody will get sick, so that you can prevent it in the future.

So, research always starts with a prediction, and that prediction of what might happen as a result of the research is what is called a hypothesis, or an educated guess, about what will or will not occur within a given situation and with given variables.



TERM TO KNOW

Prediction

The ability to forecast outcomes; establish a hypothesis (an educated guess)

2. Control

However, it's important to note that there are multiple influences on things within scientific research. Nothing is actually as simple as it might seem in the world itself. Anything that can change or be measured or can affect research is what we call a variable. In scientific research, it is required that these variables are controlled, and that certain variables are kept the same so that they can be examined in more detail, because we don't want to examine everything. We want to focus on specific things so we can understand them better; hence, **control** of variables allows only the selected effect to be tested.

Within a scientific experiment, for instance, often there will be people that are placed in different groups, called a control group and an experimental group. A control group is a group of people that receive all of the conditions of an experiment *except* the variable that's being tested; in other words, they don't get the experimental factor that's being studied. The experimental group, on the other hand, would be the people that receive *all* of the conditions of the experiment, including the experimental condition or the variable that's being studied.

IN CONTEXT

Suppose you are testing out a new drug. You would take a group of people, split them into two groups, and put each group into the exact same type of room. In the control group, you would give the people a glass of water and something relatively benign, like a sugar pill, which is a pill that wouldn't cause any effect on its own. In the experimental group, you would also give the people a glass of water, but you'd give them the pill that's being studied.

Notice the importance of controlling all of the other conditions in the experiment to make sure nothing else is causing the effects that you measure. You make sure the rooms are the same and that both groups are being given water. The only thing that you change is the pill that you want to study.

This control is done as best as possible; obviously, not everything can be controlled. However, scientific research requires us to try to do the best we can so that we can make sure that we understand the effects of that one variable.



TERM TO KNOW

Control

Accounting for variables so that only the selected effect is tested

3. Researcher Bias

Now, sometimes within a scientific experiment or other scientific research, it's not necessarily the variables that need to be controlled. Sometimes, it's the researcher themselves that also needs to be controlled.

Researcher bias refers to when a scientist doing the research affects the research and the results, either intentionally or unintentionally.

Researcher bias can come from many sources:

- Design bias, when the researcher designs it in a way that doesn't necessarily measure what it's supposed

to.

- Selection bias, meaning the researcher focuses on a particular type of group for the experiment, that might affect the results of the research.
- Measurement or reporting bias, where the researcher is deliberately looking for specific changes that they expect, and so they emphasize those changes more, because they're expecting to see them. This can be overt and purposeful, or it might be accidental.
- Lastly, the presence of the researcher themselves can affect what the subject does. If a scientist is in the room, for instance, it may affect the way a person would normally act.

Researcher bias is why certain scientific methods are reported to other scientists, and examined and repeated before they can become a theory that is widely accepted by others. It is also why it's important that scientific research is what we call repeatable; it needs to be done over and over before we accept the results as being true.



TERM TO KNOW

Researcher Bias

Conscious or unconscious effect the researcher has on the experiment; through design; selection of subjects, or measurement or reporting emphasis, or even the presence of the researcher



SUMMARY

Today we examined how **prediction, control, or research bias** can influence scientific research. Research always starts with a prediction, which is the ability to forecast outcomes or establish a hypothesis or educated guess, about what will or will not occur given a certain situation and variables. However, there are multiple influences on factors within scientific research; therefore, variables must be controlled so that only the selected effect is tested.

Sometimes, it is the researcher themselves that need to be controlled. Researcher bias occurs when a scientist doing the research affects the research and the results, either intentionally or unintentionally. This can occur through design, selection of subjects, measurement or reporting emphasis, or even the presence of the researcher.

Good luck!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR ERICK TAGGART.



TERMS TO KNOW

Control

Accounting for variables so that only the selected effect is tested

Prediction

The ability to forecast outcomes; establish a hypothesis (an educated guess)

Researcher Bias

Conscious or unconscious effect the researcher has on the experiment; through design; selection of subjects, or measurement or reporting emphasis, or even the presence of the researcher