What is a Manipulated Variable?

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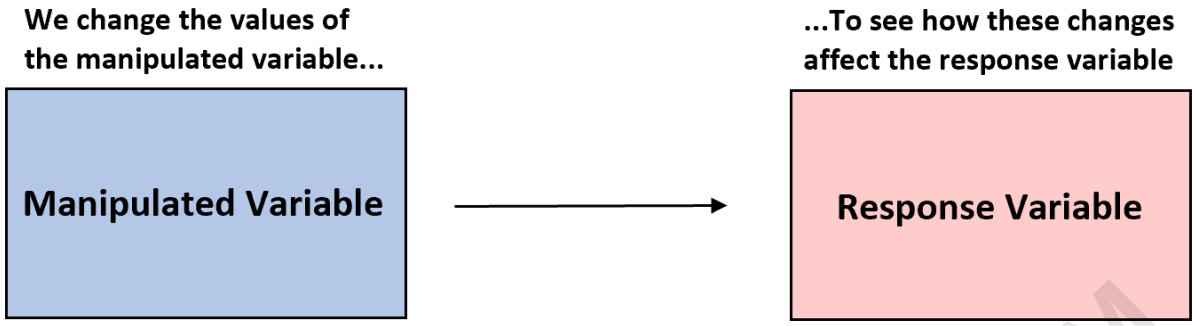
A manipulated variable, also known as an independent variable, is an element or factor that is intentionally changed or controlled by a researcher in an experiment or study. It is the variable that is being tested or manipulated in order to observe its effect on the dependent variable, which is the outcome or result of the experiment. The manipulation of this variable allows researchers to determine its influence on the overall outcome and helps to establish cause and effect relationships in the study. Manipulated variables are crucial in scientific research as they allow for the identification and understanding of the factors that impact a particular phenomenon.

What is a Manipulated Variable? (Definition & Example)

An experiment is a controlled scientific study. In statistics, we often conduct experiments to understand how changing one variable affects another variable.

A manipulated variable is a variable that we change or "manipulate" to see how that change affects some other variable. A manipulated variable is also sometimes called an .

A response variable is the variable that changes as a result of the manipulated variable being changed. A response variable is sometimes called a because its value often depends on the value of the manipulated variable.



Often in experiments there are also controlled variables, which are variables that are intentionally kept constant.

The goal of an experiment is to keep all variables constant *except* for the manipulated variable so that we can attribute any change in the response variable to the changes made in the manipulated variable.

Let's check out a couple examples of different experiments to gain a better understanding of manipulated variables.

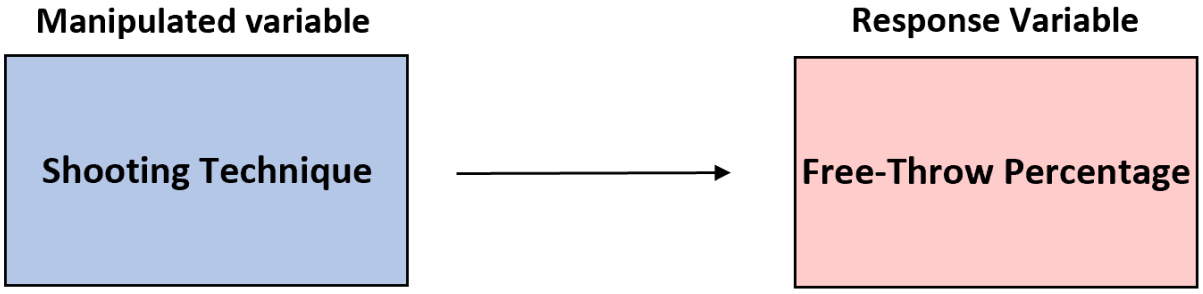
Example 1: Free-Throw Shooting

Suppose a basketball coach wants to conduct an experiment to determine if three different shooting techniques affect the free-throw percentage of his players.

He divides his team into three groups and has each group use a different technique to shoot 100 free-throws. He then records the average free-throw percentage for each group.

In this experiment, we would have the following variables:

Manipulated variable: The shooting technique. This is the variable that we manipulate to see how it affects free-throw percentage.Response variable: The free-throw percentage. This is the variable that changes as a result of the manipulated variable being changed.Controlled variables: We would want to make sure that each of the three groups shoot free-throws under the same conditions. So, variables that we might control include (1) gym lighting, (2) time of day, and (3) gym temperature.

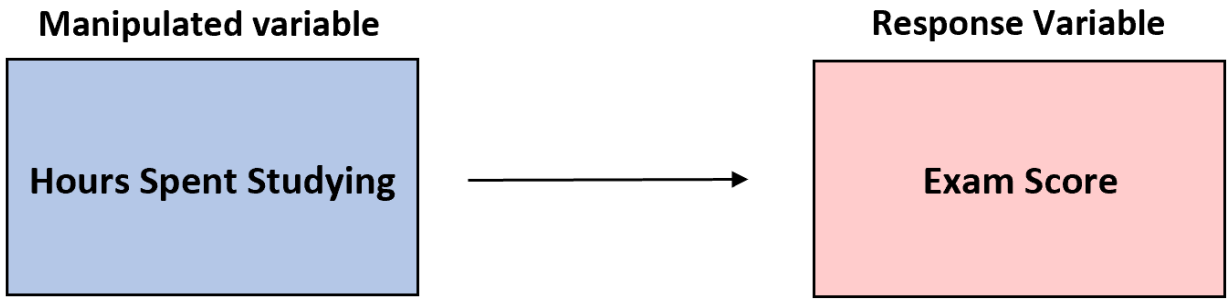


Example 2: Exam Scores

Suppose a teacher wants to understand how the number of hours spent studying affects exam scores. She intentionally has groups of students study for 1, 2, 3, 4, or 5 hours prior to an exam. She then has each group take the same exam and records the average scores for each group.

In this experiment, we would have the following variables:

Manipulated variable: The number of hours spent studying. This is the variable that the teacher manipulates to see how it affects exam scores.Response variable: The exam scores. This is the variable that changes as a result of the manipulated variable being changed.Controlled variables: We would want to make sure that each of the groups of students take the exam under the same conditions. So, variables that we might control include (1) time available to complete exam, (2) number of breaks given during exam, and (3) time of day when exam is administered.



Additional Reading

What is a Confounding Variable?