



Independent, Dependent and Control Variables

Study Development Factsheet

When reading research papers or designing a study, you may need to name the independent and dependent variables involved. This is a guide on what those names mean, and how you would usually display them.

It's important that you get them the right way around, especially if you are calculating statistics with them, or you won't be testing the hypothesis that you set out to.

Please note: the studies mentioned in this factsheet are made up examples.

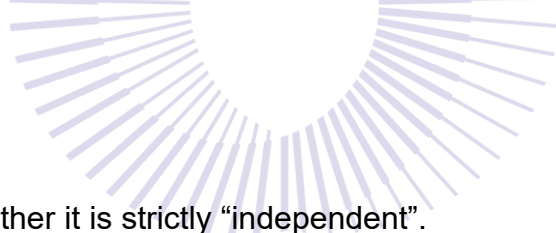
Independent

This is the variable that you (or the experiment designer) change. For example, if I wanted to know if smoking has an effect on lung health, I might observe some participants who smoke and some who don't, so smoking status would be my independent variable.

This variable is also sometimes called the **control variable** (confusingly!), the **exposure** (particularly in epidemiology, as the study is normally looking at exposure to a disease), the **manipulated**, **input**, **predictor**, or the **explanatory variable**.

It's important to note that the definitions of each of these names may not be exactly identical.

"Independent" supposedly refers to the idea that this variable is not affected by other variables in the study, which is not always true, hence why some people prefer to choose a different name,



while others still use it regardless of whether it is strictly “independent”.

This is something you can have a think about yourself to see which name you prefer- there's not really a “wrong” answer here, just what fits best with your area of interest.

The independent variable is displayed on the x-axis (horizontal axis) when making a chart or graph, and is usually the first column in a table.

In some study designs, there are multiple independent variables (e.g. I may look at whether age, number of hours spent outside, and number of hours spent on social media has an effect on overall happiness). They can be studied either as unrelated variables, or intersectional variables, which acknowledges that one of these variables may affect the others and vice versa.

Dependent

This is the variable that is expected to be affected by the independent variable. In the smoking example, the dependent variable would be lung health.

This variable is also sometimes called the **outcome**, **explained**, **experimental**, **output**, **response**, **measured**, or **predicted variable**.

“Dependent” refers to the idea that the change in this variable can be explained by the change in the independent variable, which is not always the case, so again you might want to have a think about which name works best for you.

The dependent variable is displayed on the y-axis (vertical axis) when making a chart or graph, and is usually the second column in a table.



Controls: “control” in study design has many meanings. When we’re talking about controlling variables, we mean variables that we try to keep the same in order to minimise their effect on the dependent variable. In the smoking example, I may want to make sure all my participants are a similar age, as that can determine how likely an individual is to smoke, and will affect their lung health.

The control variables are noted in the methodology/sampling area of a paper, or sometimes a reason is given as to why a variable could not be controlled in the study.

Note that this is different to a “control group”, meaning a group that does not receive an intervention/treatment in a study, or does not have a particular trait that the study is interested in observing. For example, if I wanted to study whether children who attend after school clubs had better social skills, I might need a control group of children who do not attend after school clubs to test them against.

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