

2.5: Experimental and Non-experimental Research

One of the big distinctions that you should be aware of is the distinction between “experimental research” and “non-experimental research”. When we make this distinction, what we’re really talking about is the degree of control that the researcher exercises over the people and events in the study.

2.5.1 Experimental research

The key features of experimental research is that the researcher controls all aspects of the study, especially what participants experience during the study. In particular, the researcher manipulates or varies the predictor variables (IVs), and then allows the outcome variable (DV) to vary naturally. The idea here is to deliberately vary the predictors (IVs) to see if they have any causal effects on the outcomes. Moreover, in order to ensure that there’s no chance that something other than the predictor variables is causing the outcomes, everything else is kept constant or is in some other way “balanced” to ensure that they have no effect on the results. In practice, it’s almost impossible to think of everything else that might have an influence on the outcome of an experiment, much less keep it constant. The standard solution to this is randomisation: that is, we randomly assign people to different groups, and then give each group a different treatment (i.e., assign them different values of the predictor variables). We’ll talk more about randomisation later in this course, but for now, it’s enough to say that what randomisation does is minimise (but not eliminate) the chances that there are any systematic difference between groups.

Let’s consider a very simple, completely unrealistic and grossly unethical example. Suppose you wanted to find out if smoking causes lung cancer. One way to do this would be to find people who smoke and people who don’t smoke, and look to see if smokers have a higher rate of lung cancer. This is not a proper experiment, since the researcher doesn’t have a lot of control over who is and isn’t a smoker. And this really matters: for instance, it might be that people who choose to smoke cigarettes also tend to have poor diets, or maybe they tend to work in asbestos mines, or whatever. The point here is that the groups (smokers and non-smokers) actually differ on lots of things, not just smoking. So it might be that the higher incidence of lung cancer among smokers is caused by something else, not by smoking per se. In technical terms, these other things (e.g. diet) are called “confounds”, and we’ll talk about those in just a moment.

In the meantime, let’s now consider what a proper experiment might look like. Recall that our concern was that smokers and non-smokers might differ in lots of ways. The solution, as long as you have no ethics, is to control who smokes and who doesn’t. Specifically, if we randomly divide participants into two groups, and force half of them to become smokers, then it’s very unlikely that the groups will differ in any respect other than the fact that half of them smoke. That way, if our smoking group gets cancer at a higher rate than the non-smoking group, then we can feel pretty confident that (a) smoking does cause cancer and (b) we’re murderers.

2.5.2 Non-experimental research

Non-experimental research is a broad term that covers “any study in which the researcher doesn’t have quite as much control as they do in an experiment”. Obviously, control is something that scientists like to have, but as the previous example illustrates, there are lots of situations in which you can’t or shouldn’t try to obtain that control. Since it’s grossly unethical (and almost certainly criminal) to force people to smoke in order to find out if they get cancer, this is a good example of a situation in which you really shouldn’t try to obtain experimental control. But there are other reasons too. Even leaving aside the ethical issues, our “smoking experiment” does have a few other issues. For instance, when I suggested that we “force” half of the people to become smokers, I must have been talking about starting with a sample of non-smokers, and then forcing them to become smokers. While this sounds like the kind of solid, evil experimental design that a mad scientist would love, it might not be a very sound way of investigating the effect in the real world. For instance, suppose that smoking only causes lung cancer when people have poor diets, and suppose also that people who normally smoke do tend to have poor diets. However, since the “smokers” in our experiment aren’t “natural” smokers (i.e., we forced non-smokers to become smokers; they didn’t take on all of the other normal, real life characteristics that smokers might tend to possess) they probably have better diets. As such, in this silly example they wouldn’t get lung cancer, and our experiment will fail, because it violates the structure of the “natural” world (the technical name for this is an “artifactual” result; see later).

One distinction worth making between two types of non-experimental research is the difference between quasi-experimental research and case studies. The example I discussed earlier – in which we wanted to examine incidence of lung cancer among smokers and non-smokers, without trying to control who smokes and who doesn’t – is a quasi-experimental design. That is, it’s the

same as an experiment, but we don't control the predictors (IVs). We can still use statistics to analyse the results, it's just that we have to be a lot more careful.

The alternative approach, case studies, aims to provide a very detailed description of one or a few instances. In general, you can't use statistics to analyse the results of case studies, and it's usually very hard to draw any general conclusions about "people in general" from a few isolated examples. However, case studies are very useful in some situations. Firstly, there are situations where you don't have any alternative: neuropsychology has this issue a lot. Sometimes, you just can't find a lot of people with brain damage in a specific area, so the only thing you can do is describe those cases that you do have in as much detail and with as much care as you can. However, there's also some genuine advantages to case studies: because you don't have as many people to study, you have the ability to invest lots of time and effort trying to understand the specific factors at play in each case. This is a very valuable thing to do. As a consequence, case studies can complement the more statistically-oriented approaches that you see in experimental and quasi-experimental designs. We won't talk much about case studies in these lectures, but they are nevertheless very valuable tools!

This page titled [2.5: Experimental and Non-experimental Research](#) is shared under a [CC BY-SA 4.0](#) license and was authored, remixed, and/or curated by [Danielle Navarro](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.