

5.1: Brief review of Experiments

In chapter one we talked a little bit about research methods and experiments. Experiments are a structured way of collecting data that can permit inferences about causality. If we wanted to know whether something like watching cats on YouTube increases happiness we would need an experiment. We already found out that just finding a bunch of people and measuring number of hours watching cats, and level of happiness, and correlating the two will not permit inferences about causation. For one, the causal flow could be reversed. Maybe being happy causes people to watch more cat videos. We need an experiment.

An experiment has two parts. A manipulation and a measurement. The manipulation is under the control of the experimenter. Manipulations are also called **independent variables**. For example, we could manipulate how many cat videos people will watch, 1 hour versus 2 hours of cat videos. The measurement is the data that is collected. We could measure how happy people are after watching cat videos on a scale from 1 to 100. Measurements are also called **dependent variables**. So, in a basic experiment like the one above, we take measurements of happiness from people in one of two experimental conditions defined by the independent variable. Let's say we ran 50 subjects. 25 subjects would be randomly assigned to watch 1 hour of cat videos, and the other 25 subjects would be randomly assigned to watch 2 hours of cat videos. We would measure happiness for each subject at the end of the videos. Then we could look at the data. What would we want to look at? Well, if watching cat videos cause change in happiness, then we would expect the measures of happiness for people watching 1 hour of cat videos to be different from the measures of happiness for people watching 2 hours of cat videos. If watching cat videos does not change happiness, then we would expect no differences in measures of happiness between conditions. Causal forces cause change, and the experiment is set up to detect the change.

Now we can state one overarching question, how do we know if the data changed between conditions? If we can be confident that there was a change between conditions, we can infer that our manipulation caused a change in the measurement. If we cannot be confident there was a change, then we cannot infer that our manipulation caused a change in the measurement. We need to build some change detection tools so we can know a change when we find one.

“Hold on, if we are just looking for a change, wouldn't that be easy to see by looking at the numbers and seeing if they are different, what's so hard about that?”. Good question. Now we must take a detour. The short answer is that there will always be change in the data (remember variance).

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