

# Introduction to Experiments

Linguistics 390a  
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## Overview

- Why do experiments?
- How experiments work
- How to design experiments
- How to analyze and interpret results

## 1 Why do Experiments?

Consider the following two very general questions:

- i) What are we trying to find out in studying language (and its use)?
- ii) What do we base our conclusions on?

How do we get from (ii) to (i)?

An illustration using Chris' earlier example: We're wondering about Grice's Maxim of Quantity. We come up with (1), and ask ourselves whether Kyle is lying or not. **What do you think?**

(1) Context: Kyle has \$20 in his pocket. He says, "I have \$8."

Different people will probably give different answers. What's going on? Chris comes up with the following examples:

- (2) a. Kyle and Ellen would like to see a movie. Kyle has \$20 in his pocket. Tickets cost \$8 each. He says, "I have \$8."
- b. Kyle and Ellen would like to see a movie. Kyle has \$20 in his pocket. Tickets cost \$10 each. He says, "I have \$8."

I have a fairly clear sense that Kyle is honest in (2a) but not in (2b). What do you think is going on?

What if someone disagrees with my judgment?

→ An experiment can tell us whether there is a **general difference** between sentences like a and b!

More generally, experiments allow us

- to test whether our intuitions generalize across speakers and examples
- to evaluate subtle differences between similar expressions
- to tease apart different factors that affect our judgments
- to measure differences where intuitions are murky
- to test hypotheses about how difficult certain constructions are to process
- etc.

## 2 How Experiments Work

Experiments answer questions of the following format:

**If there is a change in x, does that cause a change in y?**

**Question:** What do you think x and y would be if we wanted to use (2) for an experiment? What is the **hypothesis** we're testing (i.e., the question we're trying to answer?)

Some Terminology:

x is called the **independent** variable, y the **dependent** variable. An experimenter **manipulates** the dependent variable and **measures** the independent variable.

The dependent variable represents a **factor** whose **effect** on the **outcome** of the independent variable we are investigating. In other words, we're asking what effect factor A has on measure B (this is just another way of putting the question above). A factor always has at least two **levels**, and each factor level is used for one **experimental condition**.

### **A question about causation:**

Is the outcome really **caused** by the factor we're looking at?

Example: I study the quality of college education. I assume that how much money graduates make in their first job reflects this. I find that Harvard graduates make an average of \$70,000, whereas BU graduates make \$35,000.

**Question:** Can I conclude that Harvard provides a better education than Northwestern? Why not?

**Experiments avoid this kind of problem** by making sure that **only the factor under investigation is systematically varied** across conditions. Any other differences that might matter should be **randomized!**

(Question: How could we turn the above study into an (unrealistic) experiment?)

### **Is variability due to our factor?**

In any empirical research, there will be variability, which can be due to many things, e.g., other factors or measurement errors.

**Randomization** (+ collecting enough data) ensures that each condition is affected equally by this type of variation.

#### What statistical analysis does:

- Measure variability in data
- Compare:
  - a) General Variability
  - b) Variability due to the experimental factor
- If b is large enough relative to a, then we can conclude that our factor has an effect on the independent variable (→ Important in design: keep a small!)

#### **What experiments can't do:**

Experiments can only confirm differences (...is there a change in y?). Don't try to show that there is no difference between two conditions!  
(Experiments try to show that the **Null-hypothesis** is false)

### **3 Some Basics of Good Experimental Design**

Knowing how experiments work helps you to design good experiments:

- Try to keep everything the same, except for the factor you're varying
- Ask yourself what other factors might be relevant and make sure they don't provide alternative explanations for a potential outcome of the experiment

**Exercise:**

What could be improved with the following examples of experimental designs? Think about whether the pairs of sentences provide the best way of testing the question above them. (Warning: You may also have to worry about whether the question is the right one, or phrased in the best possible way.)

**I) Question: Does the presupposition trigger 'too' make discourses better (or more coherent) in cases where you can use it?**

Which sentence do you like better?

- a) John liked the game and Bill liked the game.
- b) The student wrote a very good essay and the visitor that is spending a semester here wrote a nice essay, too.

**II) Question: Are pronouns better than definite descriptions (like 'the man') when you can use them?**

On a scale from 1 (best) to 5 (worst), rate the following sentences:

- a) Juan Guerra wrote an interesting new book. **He** tells a story about life in his hometown.
- b) Juan Guerra wrote an interesting new book. **The prize-winning Chilean author** tells a story about life in his hometown.