

## **Cognitive Foundations**

### **Setting up a Simple Experiment**

Consider the two following sentences:

*The doctor cured by the treatment needed several weeks to recover.*

*The patient cured by the treatment had been diagnosed as terminal.*

In both cases, *cured* is a past participle and introduces a reduced relative clause. However, intuitively, it seems that after reading the sentence onset "*The doctor cured...*" readers might at first expect a reading in which the doctor is the agent of the sentence because of the meaning of the word *doctor*. In the second sentence, this appears less likely, because a patient is more likely to be cured than to cure someone (in linguistic terms, more likely to be the patient of *curing* than its agent).

Imagine you wanted to investigate whether the lexical semantics of the subject can immediately affect the type of syntactic structure built by the parser, or whether the parser is autonomous and semantic processing only steps in afterward.

In order to create materials for your experiment, you need to find verbs like *cured* and pairs of nouns like *doctor* and *patient*. First, you need to look for verbs and nouns using your personal intuition. Then, you are going to pre-test your materials in a web experiment to obtain plausibility ratings for each verb-noun pair. Setting up, running and analyzing a reading time experiment is a lot of work, so you don't want to rely on your own judgment only, because you don't want to go through all that effort and then realize your materials were flawed! In the pretests, the participants will be asked to indicate on seven point scale how likely it is for each agent or patient to do something. For example:

*How likely is it for a doctor to cure someone?*

*How likely is it for a patient to cure someone?*

### **Tasks**

1. Formulate  $H_0$  and  $H_1$  for the main experiment: What predictions with respect to reading times does a modular account make, what predictions does an interactive account make?

**You may work in pairs for the following part of the tutorial.**

2. Find four items (4 verbs and 4 pairs of nouns) you could use as materials, such that when in company of the given verb, one noun should intuitively be rated high and one rated low.
3. With a t-test, check whether the lexical frequency of the two nouns with the verb is overall equal for the two conditions. Use Google to approximate both, by entering them in the search field (in between quotes in the case of co-occurrence frequencies) and writing down the number of documents found. For example, at the moment, *doctor* returns 236.000.000 documents, *patient* returns 161.000.000, "*doctor cures*" finds 11.900 documents in which the two words co-occur and "*patient cures*" 1.030.  
  
(If you were really going to use these items for an experiment, the t-test would have to be non-significant. However, in this case, it is ok to do the following steps even if the t-test is significant, since this is only an exercise.)
4. Using a "latin-square", create the lists for presentation of the stimuli to the participants. No participant must ever see more than one condition of an item, otherwise the second time a verb is presented, the participants' rating might be influenced by the fact that the same verb was presented before. This can be done, for example, using a spreadsheet program, Excel or other.
5. Then create fillers to intersperse between your items so participants won't be able to guess what the experiment is about. All filler should start with "How likely is it..." and it should be possible to rate them on the same scale. You need at least twice as many fillers as items, plus three for the beginning of the experiment so the participants get used to the task before seeing any real items.
6. Finally pseudo-randomize the lists to avoid effects of presentation order.
7. If you wish, you may submit this by Thursday evening 6pm so that I can have a cursory look at it before we discuss it on Friday morning. The subject of your e-mail should be "Cognitive Foundations Exercise" so I can filter out your e-mails and nothing gets lost in the spam filter.