

MEM example

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The question

Background: experience-based processing

Evidence: reading times when temporarily ambiguous sentences are disambiguated:

The experienced soldiers warned about the dangers...

Main Verb: The experienced soldiers warned about the dangers **before the midnight** raid.

Rel. clause: The experienced soldiers warned about the dangers **conducted the midnight** raid.

Unambig RC: The experienced soldiers who were warned about the dangers **conducted the midnight** raid.

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But as experience with language in a specific environment accumulates, subjects might LEARN that $p(\text{RC})$ is locally higher, which leads to the prediction that the ambiguity effect should decrease over the course of the experiment.

The experienced soldiers warned about the dangers...

Rel. clause: The experienced soldiers warned about the dangers **conducted the midnight** raid.

Unambig RC: The experienced soldiers who were warned about the dangers **conducted the midnight** raid.

Design

- Subjects read 40 critical sentences that contained the relative clause structure
- Half of these were ambiguous, half unambiguous (counter-balanced, etc.)
- 80 fillers
- Sentences presented in two pseudo-randomized orders

Predictions

Ambiguous: ...warned about the dangers...

Unambiguous: ...warned about the dangers...

Prediction 1: Overall cost for ambiguous sentences (*main effect of ambiguity*)

Prediction 2: As experience in the environment accumulates, ambiguity effect gets smaller (interaction between item order and ambiguity)

-----.

The -----
-----.

--- experienced -----
----- -- -----.

--- ----- soldiers -----
----- .

----- warned -----
-----.

----- about --- -----
----- .

----- the -----
-----.


----- dangers
-----.

conducted --- -----.

----- the -----.

----- --- midnight ----.

----- raid.

conducted the midnight ----.


Following MacDonald et al. (1992), we designate this the “disambiguating region”, and will focus our analyses on this region of the sentence.

Collinearity

- What is collinearity?
 - Collinearity (or multicollinearity) arises when two or more predictors in a model are (almost) linear transformations of each other
 - This causes several problems (practically speaking):
 - Standard errors of collinear predictors tend to get *inflated* (leading to Type II errors)
 - The math that underlies estimating coefficients can give VERY different results given very small changes to the data

Collinearity

- How can we avoid collinearity?
 - Simple step: center predictors. Why does this help? (see “CenteringExample”)
 - Residualization: regress one predictor against another. We’ll cover that if we have time.
 - PCA: if you have a bunch of super-collinear predictors that are all kind of conceptually related, consider doing something like PCA (the function in R is called `princomp()`, for those of you who are curious)

Describing this model

- Fixed effects:
 - “full factorial design” of ambiguity and item order
 - Plus a main effect of log stimulus order
 - All main effects were centered to reduce collinearity with interaction terms
 - Collinearity remained low ($<.2$), with the exception of item order and log stimulus order ($r = .XX$)

Describing this model

- Random effects:
 - The model contained the maximal random effects structure justified by the design of the experiment that would converge (report which version of R, which version of lme4, etc.)

Interpreting the model

- There was a main effect of ambiguity ($\beta=X$, $SE=X$, $p < .05$): length-corrected RTs during the disambiguating region were greater for ambiguous relative to unambiguous sentences

Interpreting the model

- There was a main effect of log stimulus order ($\beta=X$, $SE=X$, $p < .05$): length-corrected RTs decreased significantly over the course of the experiment.