

Partial use of available information in the early stages of verb prediction

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PREDICTION STEP-BY-STEP

Comprehenders use **contextual information** to anticipate upcoming input.^[1-6]

We isolate different sources of contextual constraints and examine how they impact predictive computations in real time.^[9-12]

Goal: To spell out the steps and timing of predictive computations.

CASE STUDY: VERB PREDICTION

The N400 is sensitive to a word's predictability.

- More expected words → smaller N400s^[7]

However, the same difference in offline predictability (cloze probability) can lead to very different N400 outcomes **depending on the source of the constraint**.^[9-12]

Our proposal: Initial verb predictions are affected by what words precede the verb in the sentence, but not by the structural roles of the arguments.^[12]

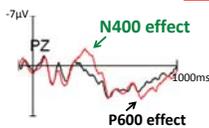
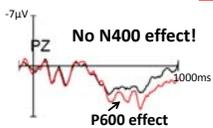
Evidence #1: Substituting different words has an immediate impact on the N400, whereas reversing the same words does not.^[8,12]

Argument Role Reversals

The restaurant owner forgot...
which customer the waitress had **served** ...
which waitress the customer had **served** ...

Argument Substitution

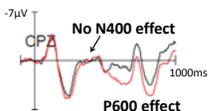
The secretary confirmed...
which **illustrator** the author had **hired**...
which **readers** the author had **hired**...



Evidence #2: Reversing the same words (the arguments) impacts the N400 only when the verb is further away.^[10,11]

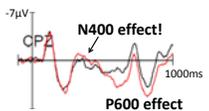
Short Distance (600ms)

[last week.] police_{SUBJ} BA suspect_{OBJ} **arrest** suspect_{SUBJ} BA police_{OBJ} **arrest**



Long Distance (1800ms)

[last week.] police_{SUBJ} BA suspect_{OBJ} [ZAI last week] **arrest** suspect_{SUBJ} BA police_{OBJ} [ZAI last week] **arrest**



RESEARCH QUESTION

Initial verb predictions are based on somewhat superficial information – but how superficial?

If initial verb predictions are based on ...

- a bag-of-words mechanism
→ argument substitution should elicit an N400 effect ONLY when the sentences contained different sets of words ("different words" conditions).
- the arguments of the verb (or words in the local clause)
→ argument substitution should elicit an N400 effect even when the sentences contained an identical sets of words.

METHODS

n = 24, 30 trials / condition + 120 fillers
RSVP (530ms SOA), binary plausibility judgment
Average cloze probability of the target verb:
• 22% vs. <1%
All nouns in the sentence context are animate.

We have two pairs of conditions, which have

- an **identical** change in the **local clause** (argument substitution)
- **different** changes in the **whole sentence** (they contained the same vs. different sets of words)

→ The same / different ERP effects can tell us whether the local clause vs. the whole sentence is to blame.

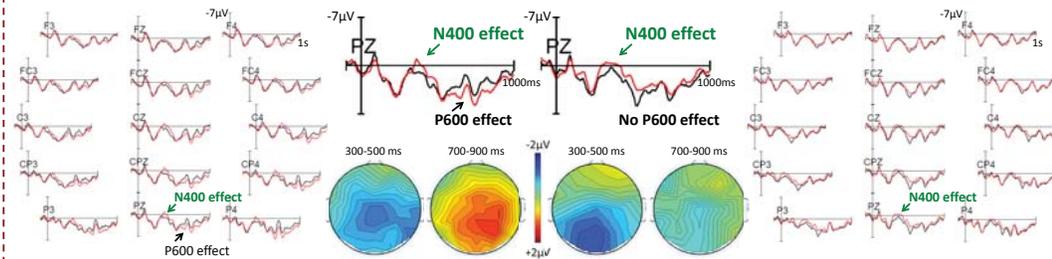
RESULTS

"Different words" argument substitution

The tenant inquired [which *exterminator* the landlord had **hired**]...
The tenant inquired [which *neighbor* the landlord had **hired**]...

"Same words" argument substitution

The *neighbor* inquired [which *exterminator* the landlord had **hired**]...
The *exterminator* inquired [which *neighbor* the landlord had **hired**]...



SUMMARY AND DISCUSSION

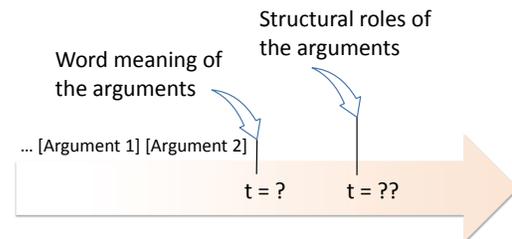
Argument substitution had the same effects on the N400 regardless of whether the sentences contained identical sets of words.
→ Initial verb predictions are based on the meaning of the words in the local clause.

Future work will need to examine the role of argumenthood – *Do initial verb predictions distinguish arguments from adjuncts in the same clause?*

A note on the late positivity:

- A P600 effect was observed only in the "different words" conditions.
- Potentially due to a more sustained N400 effect in the "same words" conditions.

Towards an explicit model of verb prediction



Many more questions to ask:

- *How do comprehenders identify the arguments?*
- *Why does information about the arguments' structural roles have a delayed impact on verb predictions?*

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