Storage and Computation in Syntax: Evidence from relative clause priming

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July 21, 2011

Research question

• What is the nature of syntactic representations?
  – What is stored vs. what is computed on-the-fly?
  – Syntactic priming: A way to investigate this question
• Experiment: Two web-based studies (replicating previous findings from lab studies)

Definition of lexicon: “the vocabulary of a language, an individual speaker or group of speakers, or a subject”

The lexicon

Words

Morphology

The lexicon

Definition of lexicon: “the vocabulary of a language, an individual speaker or group of speakers, or a subject”

Bitter, Spiteful, Resentful, Envious, Angry, Jealous, Upset, Sour, Savory, Spicy, Piquant, Beer, Lager, Wine, Sherry, Cheese, Aperitif
**Definition of lexicon**: “the vocabulary of a language, an individual speaker or group of speakers, or a subject”

**Research Question**

- Which syntactic representations can be stored in long-term memory?

- Test case: object-extracted relative clauses (ORCs)

**Object relative clauses**

- Exhibit large production frequency differences dependent upon:
  - The type of noun in the embedded subject position
  - Embedded pronouns > embedded definite NPs (Hawelka et al., 2007)
  - The type of relative pronoun (e.g., that vs. who)
  - That > who
Storage vs. computation

- (a) Maximally combinatorial
- (b) Stores all lexical information with abstract syntactic structure
- (c) Intermediate case, with some variability but also some lexical content

Investigating syntactic representations

- **Syntactic priming:** Speakers are more likely to produce a given syntactic structure if they have just produced that same syntactic structure.
- Bock, 1986: Showed this was the case for short syntactic variants (Give the ball to the girl vs. Give the girl the ball)
- Scheepers, 2003: Showed this for larger, more abstract chunks of syntax.
- Current work: look at frequent vs. infrequent types of ORCs to investigate whether common lexical items may be stored directly with abstract structures.
- Two comparisons:
  - the relative pronoun (who < that)
  - the type of embedded NP (definite NPs < personal pronouns) (you and I)

Experiment

- Two-part experiment:
  - Part 1 (who as the relative pronoun): 111 participants
  - Part 2 (that as the relative pronoun): 109 participants
- Experiment run on Amazon.com's Mechanical Turk
- Sentence completion task; prime-target pairs interleaved with fillers

Experiment

**Prime types:**
- Definite-NP baseline
- Pronominal baseline
- Definite-NP complement clause
- Pronominal complement clause
- Definite NP ORC
- Pronominal ORC

**Targets (choice of RC type):**
- The...
- You...
- The screenwriter said that the...
- The screenwriter said that you / I...
- The screenwriter (who / that) the...
- The screenwriter (who / that) you / I...
- The marine (who / that) ...
Predictions

Pronominal vs. definite NP embedded subject

- This...
- You/I...
- The screenwriter said that the...
- The screenwriter said that you / I...
- The screenwriter (who / that) the...
- The screenwriter (who / that) you / I...
- The marine (who / that) ...

Predictions

Who vs. that as the relative pronoun

- Who = That
- Who < That
- Who > That

Method

Sentence completion task

- The cat didn’t like.................................................................
- The entrance to the lab was.............................................
- The nurse assisted the child because..............................
- The supplier knew that....................................................
- The screenwriter who the...........................................
- The marine who............................................................
- The coach talked to the player because...........................
- The mosquito.....................................................................
- The shopper enraged the saleswoman because...............
- The bread in the supermarket...........................................
Sample completions

Def. NP Baseline: The... donor saved the dying child's life.
Target: The manicurist who... did my nails was talkative.
Pronom. ORC: The valet who you... gave your car to was very helpful.
Target: The servant who... cleaned the house was very nice.
Def. NP ORC: The guru who the... actress relied on was a fraud.
Target: The hostage who... had been released went home to his family.

Results

Results: Summary

<table>
<thead>
<tr>
<th>Do we see priming of ORCs?</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do we see more priming for pronominal ORCs than definite-NP ORCs?</td>
<td>✓</td>
</tr>
<tr>
<td>Do we see more priming for that vs. who as the relative pronoun?</td>
<td>✓</td>
</tr>
<tr>
<td>Do we see increased production of ORCs to other complicated structures w/ pronouns?</td>
<td>✗</td>
</tr>
</tbody>
</table>

Summary

• First evidence for priming of object relative clauses, which are complex and abstract syntactic structures
• The priming is sensitive to type of NP in embedded subject position and the relative pronoun used
• First evidence that specific lexical items (e.g. that or you) are stored together with abstract structure
**Summary**

- First evidence that specific lexical items (e.g., *that* or *you*) are stored together with abstract structure

**Representation of syntactic structure and its relation to comprehension**

- Processing complexity effects comparing ORCs and Subject-extracted relative clauses (SRCs) are reversed when the embedded subject is a pronoun (Reali & Christiansen, 2008)
  - I.e., more frequent types of ORCs are processed more quickly
  - Our findings predict that ORCs with *that* vs. *who* as the relative pronoun would also be processed more quickly

**Open questions**

Which structures are stored and why?
- Storage vs. computation decision as the result of optimization of a tradeoff
- Time computing vs. cost of space in memory (cf. Baayen et al., 2007)
- Optimal predictions about productivity and reuse (cf. O’Donnell, 2011)
- Future research should investigate fine-grained distinctions in ORCs or other structures using priming with large subject pools

**Acknowledgements**

Tedlab members (present and past)
- Steve Piantadosi
- Melissa Kline
- Leon Bergen
- John Kraemer
- Mike Frank
- Diane Rak

Members of the CUNY Sentence Processing 2009 audience