Individual Differences in Relative Clause Attachment Ambiguities

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Introduction

Relative Clause Attachment Ambiguity

- Unclear whether it is the actor or the chauffeur who wanted to go home.
- Preferences differ across languages (Cuetos and Mitchell, 1988):
  - English speakers prefer to attach the relative clause (RC), *who wanted to go home*, to the second noun phrase (N2), *the actor*.
  - Spanish speakers prefer to attach the RC to the first noun phrase (N1) *the chauffeur*.
- Preferences tend to be weak, especially in on-line studies (Carreiras & Clifton, 1993).
- Prepositions linking the two potential attachment sites, e.g. *of* in *chauffeur of the actor*, influence preferences. (Gilboy et al., 1995).

Compare Linking Prepositions

Two types of *of* (Gilboy et al., 1995):

**Functional:**
- The crowds annoyed the chauffeur *of* the actor who wanted to go home.

**Representational:**
- The artist recognized the sketch *of* the house that was mentioned in the book.

Locatives and *With*:

**Locatives:**
- The tourists went to the store *near* the beach that was hot and crowded.

**With:**
- The personal assistant recommended the dress *with* the lace that was imported from France.

- Locatives and *With* attach as adjuncts and not as arguments.
- Theories that use this distinction to explain a difference in preferences between *of* and *With* (e.g., Frazier & Clifton, 1996; Gibson, 1998) predict that locatives will pattern with *With*.

Individual Differences in Working Memory (WM)

- Individual differences in WM have been found to influence lexical and syntactic ambiguity resolution (e.g. Miyake et al., 1994; Pearlmutter and MacDonald, 1995).
- Individual differences in WM have been considered differences in experience (e.g. Pearlmutter & MacDonald, 1995).
- Exposure to one attachment pattern influenced preferences in children (Mitchell, 1994).
- WM differences might reveal important aspects of this ambiguity.
Experiment 1

Method:

• 10 items of each preposition type (40 items)

• N1 and N2 were both animate or both inanimate and both singular or both plural.

• Free-choice questionnaire: experimental items were followed by a question about the attachment, with space for an answer:

  The crowds annoyed the chauffeur of the actor who wanted to go home.
  Who wanted to go home?_____________

• Used to ensure that subjects were not alerted to alternatives, as opposed to forced-choice used in previous studies

• 60 filler sentences (each followed by a question).

• Items were normed for plausibility.

• Daneman and Carpenter (1980) Reading Span task was used to assess Working Memory.

• Subjects were classified as high span (span ≥ 4) or low span (span < 4).
**Plausibility Norming Studies**

- N1 and N2 versions of the items used in Experiments 1 and 2 were rated for plausibility in separate studies, scale: 1-7 (7 = most plausible).
  
  **N1**: the chauffeur who wanted to go home
  
  **N2**: the actor who wanted to go home

- Exp. 1: 60 fillers, 62 subjects, Exp. 2: 68 fillers, 40 subjects

- No significant differences in plausibility

**Plausibility by Preposition Type**

<table>
<thead>
<tr>
<th>Preposition Type</th>
<th>Experiment 1 Items</th>
<th>Experiment 2 Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N1</td>
<td>N2</td>
</tr>
<tr>
<td>Functional of</td>
<td>5.18 (.47)</td>
<td>5.24 (.82)</td>
</tr>
<tr>
<td>Representational of</td>
<td>5.07 (.49)</td>
<td>5.37 (.43)</td>
</tr>
<tr>
<td>Locatives</td>
<td>4.65 (.85)</td>
<td>5.05 (.47)</td>
</tr>
<tr>
<td>With</td>
<td>5.26 (.43)</td>
<td>5.06 (.63)</td>
</tr>
</tbody>
</table>

Note: Standard deviations in parentheses
Experiment 1 Results
N1 Attachment by Preposition Type

* indicates difference from chance

Error bars indicate 95% confidence intervals for comparing cell means within span
Experiment 1 Results

Span Effects:

• Low span subjects preferred N1 more than high span subjects did.

Preposition Effects:

• *With* elicited N1 attachment preferences less than the other prepositions.

• The difference between *of* and *With* cannot be explained by an argument/adjunct distinction because locatives (also adjuncts) did not pattern with *With*.

Interaction:

• For High span subjects only, functional *ofs* failed to show an N1 attachment preference.

• High span subjects’ lack of N1 preference in functional *ofs* could be due to an ability to use the knowledge that in the N1 case, another (unambiguous) genitive form (e.g. the actor’s chauffeur) is available.

Span Differences:

• Theories that explain these attachment preferences (Mitchell, 1994; Frazier and Clifton, 1996; Konieczny, et al., 1997; Gibson, 1998) do not predict this difference, but could be compatible, given a mechanism to handle span differences.

• Weak preferences in previous studies could be due to varying ratios of high to low span subjects.

Possible Explanation:

• Low span subjects focus on the matrix (main) verb and its arguments (including N1) more than on elements deeper in the structure. So, N1 may be more active than N2, and thus more likely to be considered as an attachment site.

• High span subjects may be able to keep all of the elements relatively active for attachment.
Experiment 2

• Examine span and preposition differences using on-line reading time measures

• Sentences were disambiguated by number agreement: number of N1 and N2 was switched, while the number of the copula in the RC was fixed.

N1 Attachment:

The guide described the painting of the castles that was owned by the tycoon.

N2 Attachment:

The guide described the paintings of the castle that was owned by the tycoon.

Method:

• Eight items in each of the preposition types: Representational of, Functional of, Locatives and With.

• Half of the items had a plural copula in the RC (were) and half were singular (was).

• The noun phrases used were either both animate or both inanimate and were two words long.

• 68 filler items in four lists

• Reading Span task was used to measure WM capacity, as in Experiment 1

• Moving window, word-by-word self-paced reading, with Yes/ No comprehension questions
Experiment 2 Results

Attachment Preference by Preposition Type
Height of column above/below zero indicates N1 / N2 preference

![Bar graph showing attachment preference by preposition type for High Span (N=23) and Low Span (N=112) groups. The height of the columns indicates the preference for N1 or N2 attachment. The graph shows statistically significant differences marked with an asterisk (*).]
Experiment 2 Results

Subjects experienced little difficulty; residual reading times at disambiguation were less than 1 ms in all conditions.

Span Differences:

Low Span Subjects:
• Showed the same pattern of preference across prepositions as in Experiment 1
• Exhibited an overall greater N2 preference than they did in Experiment 1

• This greater N2 preference on-line than off-line could be due to greater WM demands in an on-line task.

High Span Subjects:
• Differed from Low Span subjects, but not enough data to see clear patterns.
• Functional ofs and With no longer patterned together.

Preposition Effects:

• Locatives and With, which both attach as adjuncts, patterned significantly differently.
• Functional and Representational ofs, which both

Argument / Adjunct Distinction:
• The prepositions which attach as adjuncts did not pattern together, nor did those that attach as arguments.
• This poses a problem for theories (e.g., Frazier & Clifton, 1996) that use this distinction to explain a difference in preferences between of and With.

Span Differences:
• High Span and Low Span subjects showed different patterns of attachment preferences.

Task Differences:
• Patterns of attachment preferences in the off-line task differed from those in the on-line task.
Conclusions

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References


Acknowledgement

This research was supported by the National Science Foundation (Grant # SBR-9729007).