**Surprised by locality: An eye-tracking study of Danish double-object constructions**

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### Sentence processing

- Sentence comprehension affected by multiple factors: givenness, pronoun definiteness, animacy, length/locality
  - local syntactic relations easier to process
  - preference for adjacent heads
  - Processing cost for change in probability
  - Measured through entropy of probability distribution at word \( n \) relative to distribution at word \( n-1 \)

### Predictions

- **Length/locality account:** adjacent heads = local relations \( \rightarrow \) faster processing globally for short-before-long, increasing with difference
- **Surprisal account:** longer NP1 = NP2 more expected = smaller change in probability \( \rightarrow \) faster processing of NP2 for long-before-short, increasing with difference

### Method

- 15 sets of 6 stimulus sentences using same lexical material. Each set manipulated
  - Order: Short-before-long vs. long-before-short
  - Length difference: 2 vs. 4 vs. more words
  - Split on two lists: 3 versions of a sentence set per list
  - All target sentences followed by coordinated main clause to reduce wrap-up effects
  - 71 sentences: 45 stimulus items, 3 training items, 22 fillers
  - Ten filler items followed by two-choice comprehension question
  - Participants: 30 students at Copenhagen Business School
  - Eye-tracking using Eyelink 1000
  - Analysis with Ime4 (Bates et al. 2014) and ImerTest (Kutznesova et al. 2014)

### Surprisal only on verb in verb-final?

- Anti-locality/surprisal effects in literature: for verbs in verb-final languages German (Konieczny 2000; Konieczny & Düring 2003) and Hindi (Vasishth & Lewis 2006)
- Verbs are special
  - more restricted by arguments than vice versa
  - must be anticipated in verb-final languages (Van Besien 1999)
- Surprisal effects occur here because
  - The verb may/must be anticipated
  - The longer the verb has been anticipated, the better the prediction

### Global reading time

- Reading of entire sentences: interaction order * length difference: order effect only significant for difference > 4
- Dwell time on VP (V, NP1, NP2): main effects of order and length difference
- Faster processing for local relations \( \rightarrow \) support for length/locality

### Local reading time: dwell time, first pass dwell time & regressions out of NP

- No interaction, no effect of length difference on dwell time and first pass dwell time
- Main effect of order: short-before-long always faster than long-before-short for reading of NP
- No support for surprisal account, compatible with length/locality

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### References


Global reading time

<table>
<thead>
<tr>
<th>Difference</th>
<th>Order</th>
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<tbody>
<tr>
<td>Short-before-long</td>
<td>Long-before-short</td>
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<tr>
<td>2 words</td>
<td>Butiksindehaveren, gave, [en brudepige fra Italien] NP1/IO [en kjole fra Italien] NP2/DO</td>
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<td></td>
<td>[The shopkeeper] gave, [a bridesmaid] from Italy [a dress from Italy] NP1/IO [a dress] NP2/DO</td>
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<tr>
<td>4 words</td>
<td>Butiksindehaveren, gave, [en brudepige fra Italien] NP1/IO [en meget flot kjole fra Italien] NP2/DO</td>
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<td></td>
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<td>&gt; 4 words</td>
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For comments and questions, please contact lwb.ibc@cbs.dk.