When and how do children decide “who’s he?”
A visual world eye-tracking study of information structure in pronoun resolution

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Background: Child pronoun resolution

“The dragon scratches the lion when he is…”

-> who is he?
Background: Child pronoun resolution

“The dragon scratches the lion when he is…”
-> who is he?

• Discourse and structural factors (Arnold et al., 2005, 2007; Pyykkönen et al., in press; Song & Fischer, 2005, 2007)
  • Grammatical role -> preference for subject/agent
  • Order-of-mention -> preference for 1st mentioned
Background: Child pronoun resolution

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- Semantic factors (Pyykkönen et al., in press; Serratrice & Kidd, in prep.)
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  - Order-of-mention -> preference for 1st mentioned

- Semantic factors (Pyykkönen et al., in press; Serratrice & Kidd, in prep.)

- General conclusion: (at least some) salience-increasing factors have similar effects in adults and children
Background: Information structure

- Another way of making referents salient in discourse: explicit information structural markings
  - Experimental evidence from the influence of focusing (cleft-constructions) on adult pronoun resolution (Foraker & McElree, 2007):
  - Higher **probability** of successful retrieval, but
  - No influence on the **speed** of the resolution process
    (see also Colonna, Schimke, Hemforth, Konieczny and Pynte, 2005)
The current study

- Are German children aged 4 sensitive to grammatical role and order-of-mention? Which of the factors is of (more) influence when the two can be disentangled?
- How do additional information-structural markings interact with these factors? Is there an influence on the time course or the preferences?
- Method: Visual World eye-tracking
Linguistic stimuli

Introductory sentence: Da sind der Drache/Löwe und der Löwe/Drache
'There are the dragon/lion and the lion/dragon'

<table>
<thead>
<tr>
<th></th>
<th>Der Löwe kratzt den Drachen…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'The lion (SUBJ) scratches the dragon (OBJ)…'</td>
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… in der Nähe von dem Blatt, als er…'
… near the leaf, when he…’
### Linguistic stimuli:
**Grammatical role + order of mention**

**Introductory sentence:** Da sind der Drache/Löwe und der Löwe/Drache
'There are the dragon/lion and the lion/dragon'

<p>| | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>SVO</strong></td>
<td>Der Löwe kratzt den Drachen…</td>
<td>'The lion (SUBJ) scratches the dragon (OBJ)…'</td>
</tr>
<tr>
<td><strong>OVS</strong></td>
<td>Den Drachen kratzt der Löwe …</td>
<td>'The dragon (OBJ) scratches the lion (SUBJ)…'</td>
</tr>
</tbody>
</table>

… in der Nähe von dem Blatt, als **er**…‘
… near the leaf, when **he**…’
Linguistic stimuli: Dislocation

Introductory sentence:  Da sind der Drache/Löwe und der Löwe/Drache
'There are the dragon/lion and the lion/dragon'

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>SVO, no dislocation</td>
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<td>SVO, dislocation</td>
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<td></td>
<td>'The dragon (OBJ) scratches the lion (SUBJ)…</td>
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<td>OVS, dislocation</td>
<td>Den Drachen, den kratzt der Löwe …</td>
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… in der Nähe von dem Blatt, als **er**…‘
… near the leaf, when **he**…’
Experimental details

- 32 children / 24 adults
- 20 experimental stories (5/condition), 10 fillers
- Animated videos
- Cross-spliced spoken stimuli /pronoun onsets measured from the videos
- Tobii T120
- Passive task
- Loglinear analyses from onset of pronoun
## Predictions

<table>
<thead>
<tr>
<th>Structure</th>
<th>German</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SVO, no dislocation</strong></td>
<td>Der Löwe kratzt den Drachen…</td>
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<td>Den Drachen, den kratzt der Löwe…</td>
<td>'The dragon (OBJ), him scratches the lion (SUBJ)</td>
</tr>
</tbody>
</table>
### Predictions: Subject-preference

| Subject          |  
|------------------|--------------------------------------------------|
| **SVO, no dislocation**  |
| Der Löwe kratzt den Drachen…  |
| 'The lion (SUBJ) scratches the dragon (OBJ)'  |
| **Lion (SUBJ)**  |
| **SVO, dislocation**  |
| Der Löwe, der kratzt den Drachen…  |
| 'The lion (SUBJ), he scratches the dragon (OBJ)'  |
| **Lion (SUBJ)**  |
| **OVS, no dislocation**  |
| Den Drachen kratzt der Löwe…  |
| 'The dragon (OBJ) scratches the lion (SUBJ)'  |
| **Lion (SUBJ)**  |
| **OVS, dislocation**  |
| Den Drachen, den kratzt der Löwe…  |
| 'The dragon (OBJ), him scratches the lion (SUBJ)'  |
| **Lion (SUBJ)**  |
### Predictions: First-mention-preference

<table>
<thead>
<tr>
<th></th>
<th>Subject</th>
<th>First-mention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SVO, no dislocation</strong></td>
<td></td>
<td></td>
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<tr>
<td>Der Löwe kratzt den Drachen…</td>
<td>Lion (SUBJ)</td>
<td>Lion (SUBJ)</td>
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<tr>
<td>'The lion (SUBJ) scratches the dragon (OBJ)</td>
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<td><strong>SVO, dislocation</strong></td>
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<td>Lion (SUBJ)</td>
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<tr>
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<tr>
<td>Den Drachen kratzt der Löwe…</td>
<td>Lion (SUBJ)</td>
<td>Dragon (Obj)</td>
</tr>
<tr>
<td>'The dragon (OBJ) scratches the lion (SUBJ)</td>
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</table>
## Predictions: Dislocation

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<tr>
<th></th>
<th>Subject</th>
<th>First-mention</th>
<th>Dislocation</th>
</tr>
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<tr>
<td><strong>SVO, no dislocation</strong></td>
<td>Lion (SUBJ)</td>
<td>Lion (SUBJ)</td>
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<td>'The lion (SUBJ) scratches the dragon (OBJ)'</td>
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<tr>
<td><strong>SVO, dislocation</strong></td>
<td>Lion (SUBJ)</td>
<td>Lion (SUBJ)</td>
<td>Different timing/preferences?</td>
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<td>Der Löwe, der kratzt den Drachen…</td>
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<td></td>
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</table>
Results children:
Subject advantage scores, 0 – 2800 msec

SVO

OVS
Time windows

SVO

The lion (SUBJ) scratches the dragon (OBJ)

The lion (SUBJ), he scratches the dragon (OBJ)

OVS

The dragon (OBJ) scratches the lion (SUBJ)

The dragon (Obj), him scratches the lion (SUBJ)
Average subject advantage scores: 0 - 800 msec

**SVO**

- no dislocation
  The lion (SUBJ) scratches the dragon (OBJ)
- dislocation
  The lion (SUBJ), he scratches the dragon (OBJ)

**OVS**

- no dislocation
  The dragon (OBJ) scratches the lion (SUBJ)
- dislocation
  The dragon (Obj), him scratches the lion (SUBJ)
Average subject advantage scores: 0 – 800 msec

SVO

- no dislocation
  - The lion (SUBJ) scratches the dragon (OBJ)
- dislocation
  - The lion (SUBJ), he scratches the dragon (OBJ)

OVS

- no dislocation
  - The dragon (OBJ) scratches the lion (SUBJ)
- dislocation
  - The dragon (OBJ), him scratches the lion (SUBJ)

First mention effect:
- Subject-preference in SVO
- Object-preference in OVS
Average subject advantage scores: 800 – 2000 msec

**SVO**
- **no dislocation**: The lion (SUBJ) scratches the dragon (OBJ)
- **dislocation**: The lion (SUBJ), he scratches the dragon (OBJ)

**OVS**
- **no dislocation**: The dragon (OBJ) scratches the lion (SUBJ)
- **dislocation**: The dragon (OBJ) scratches the lion (SUBJ)

**Interaction effect:**
- Dislocation highlights 2nd referent:
  - weakens subject-preference in SVO
  - facilitates subject-preference in OVS
Average subject advantage scores: 2000-2800 msec

**SVO**

- **no dislocation**
  - The lion (SUBJ) scratches the dragon (OBJ)

- **dislocation**
  - The lion (SUBJ), he scratches the dragon (OBJ)

**OVS**

- **no dislocation**
  - The dragon (OBJ) scratches the lion (SUBJ)

- **dislocation**
  - The dragon (Obj), him scratches the lion (SUBJ)

**Subject effect:**

- Subject preferred in SVO and OVS
Summary children

- Early first-mention preference
- Effect of dislocation: highlights second-mentioned referent
  - Inhibites subject-preference in SVO
  - Facilitates subject-preference in OVS
- Late subject/agent-preference

-> children are sensitive to both order-of-mention and grammatical role, but at different times.
    Process of switching is influenced by dislocation.
Results adults:
Subject advantage scores, 0 – 2800 msec

SVO

OVS

no dislocation
The lion (SUBJ) scratches the dragon (OBJ)

dislocation
The lion (SUBJ), he scratches the dragon (OBJ)

no dislocation
The dragon (OBJ) scratches the lion (SUBJ)

dislocation
The dragon (OBJ), him scratches the lion (SUBJ)
Time windows

SVO

- no dislocation
  - The lion (SUBJ) scratches the dragon (OBJ)
- dislocation
  - The lion (SUBJ), he scratches the dragon (OBJ)

OVS

- no dislocation
  - The dragon (OBJ) scratches the lion (SUBJ)
- dislocation
  - The dragon (OBJ), him scratches the lion (SUBJ)

800 msec 2000 msec
Average subject advantage scores: 0 - 800 msec

**SVO**

- **no dislocation**
  - The lion (SUBJ) scratches the dragon (OBJ)

- **dislocation**
  - The lion (SUBJ), he scratches the dragon (OBJ)

**OVS**

- **no dislocation**
  - The dragon (OBJ) scratches the lion (SUBJ)

- **dislocation**
  - The dragon (OBJ), him scratches the lion (SUBJ)

Subject effect:
- Subject preferred in SVO and OVS
Average subject advantage scores: 800 – 2000 msec

**SVO**
- **no dislocation**
  - The lion (SUBJ) scratches the dragon (OBJ)
- **dislocation**
  - The lion (SUBJ), he scratches the dragon (OBJ)

**OVS**
- **no dislocation**
  - The dragon (OBJ) scratches the lion (SUBJ)
- **dislocation**
  - The dragon (OBJ), him scratches the lion (SUBJ)

**Interaction effect:**
- Inhibition of subject-preference in SVO
- Clear facilitation in OVS
Average subject advantage scores:
2000 – 2800 msec

**SVO**
- **no dislocation**
  - The lion (SUBJ) scratches the dragon (OBJ)
- **dislocation**
  - The lion (SUBJ), he scratches the dragon (OBJ)

**OVS**
- **no dislocation**
  - The dragon (OBJ) scratches the lion (SUBJ)
- **dislocation**
  - The dragon (Obj), him scratches the lion (SUBJ)

**Subject-preference:**
- Subject preferred in SVO and OVS
Summary: adults

- No effect of order of mention
- Strong subject/agent preference
- Similar effect of dislocation, but less stable and strong than in children
Comparison children/adults

- First mention preference in children, but not in adults
- Similar subject/agent preference but stronger and earlier in adults
- Similar effect of dislocation, but stronger and longer lasting in children

-> children are similar to adults in many respects, but the relative weight of factors differs
Conclusions

- Are German children aged 4 sensitive to grammatical role and order-of-mention?
  -> Yes

- How do additional information-structural markings interact with these factors?
  -> Dislocation highlights the second referent, modulating the observed preferences
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- Tilman Harpe

Saarbrücken
- Carolin Schmid
- Maria Staudte

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BACK-UP SLIDES
Effect of dislocation

SVO, no dislocation
Der Löwe kratzt den Drachen…
'The lion (SUBJ) scratches the dragon (OBJ)

SVO, dislocation
Der Löwe, der kratzt den Drachen…
'The lion (SUBJ), he scratches the dragon (OBJ)

OVS, no dislocation
Den Drachen kratzt der Löwe…
'The dragon (OBJ) scratches the lion (SUBJ)

OVS, dislocation
Den Drachen, den kratzt der Löwe…
'The dragon (OBJ), he scratches the lion (SUBJ)

Subject-preference is weakened
Subject-preference is facilitated
Results children: overall pattern

Total number of looks from pronoun onset
Results adults: overall pattern

Total number of looks from pronoun onset