Sentence complexity at the boundary of grammatical theory and processing: A special challenge for language acquisition

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Basic

- Active
  *The cow is chasing the dog*
- Subject Question
  *Who is chasing the dog?*
- Subject Relative
  *Look at the cow that is chasing the dog*
- Object Focus
  *The cow is chasing only the dog*

Complex

- Passive
  *The dog is chased by the cow*
- Object Question
  *Whom does the cow chase?*
- Object Relative
  *Look at the cow that the dog is chasing*
- Ambiguous Focus
  *The cow is only chasing the dog*

among many others:
Friederici, Steinhauer, Mecklinger & Meyer, 1998
Just & Carpenter, 1993
Hanne, Burchert & Vasishth, 2015
Dickey, Choy & Thompson, 2007
Workshop Aims

SENTENCE COMPLEXITY

Grammar knowledge

Executive functions

Memory capacity

Task requirements

Children’s understanding of complex sentences is influenced by:

- **Morpho-syntactic properties**
  - Number: Stegenwallner-Schütz & Adani (under review)
  - Case: Özge, Marinis & Zeyrek, 2015, *Language Cognition and Neuroscience*

- **Memory capacities**
  - Haendler, Kliegl & Adani, 2015, *Frontiers in Psychology*

- **Executive functions**

- **Task/response requirements**
  - Adani & Fritzsche, 2015, *Proceedings of BUCLD*
  - Marinis & Saddy, 2013, *Language Acquisition*
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SENTENCE COMPLEXITY

Grammar knowledge: Morpho-syntax
Acquisition of SVO/OVS in German

SVO

Der Löwe jagt den Hasen

The NOM lion chases the ACC bunny

OV S

Den Hasen jagt der Löwe

The ACC bunny chases the NOM lion

See also: Dittmar et al., 2008; Schipke et al., 2012. a.o.
### Number effects in SVO/OVS

#### SVO

<table>
<thead>
<tr>
<th>Number Match</th>
<th>Der Löwe jagt den Hasen</th>
<th>The_\text{NOM} lion chases the_\text{ACC} bunny</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Mismatch</td>
<td>Der Löwe jagt die Hasen</td>
<td>The_\text{NOM} lion chases the bunnies</td>
</tr>
</tbody>
</table>

#### OVS

<table>
<thead>
<tr>
<th>Number Match</th>
<th>Den Hasen jagt der Löwe</th>
<th>The_\text{ACC} bunny chases the_\text{NOM} lion</th>
</tr>
</thead>
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<tr>
<td>Number Mismatch</td>
<td>Die Hasen jagt der Löwe</td>
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</table>

#### Graphs

<table>
<thead>
<tr>
<th>Conditions</th>
<th>3y-olds</th>
<th>4y-olds</th>
<th>5-6y-olds</th>
<th>7-8y-olds</th>
<th>9-10y-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVO</td>
<td><img src="chart1" alt="Graph" /></td>
<td><img src="chart2" alt="Graph" /></td>
<td><img src="chart3" alt="Graph" /></td>
<td><img src="chart4" alt="Graph" /></td>
<td><img src="chart5" alt="Graph" /></td>
</tr>
<tr>
<td>OVS</td>
<td><img src="chart6" alt="Graph" /></td>
<td><img src="chart7" alt="Graph" /></td>
<td><img src="chart8" alt="Graph" /></td>
<td><img src="chart9" alt="Graph" /></td>
<td><img src="chart10" alt="Graph" /></td>
</tr>
</tbody>
</table>

Proportion correct

In line with: Adani et al., 2010; 2014; Contemori & Marinis, 2014
Case effects in Turkish (pre-nominal RC)

<table>
<thead>
<tr>
<th>SR</th>
<th>$[GAP_i \ NP_{\text{Acc}}] V_{\text{Srel}}$</th>
<th>$NP_i \ Nom$</th>
<th>$NP_{\text{Acc}}$</th>
<th>$V_{\text{Past.3Sg}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>gorilla</td>
<td>push</td>
<td>lion</td>
<td>elephant</td>
<td>kiss</td>
</tr>
</tbody>
</table>

The lion [that pushed the gorilla] kissed the elephant.

<table>
<thead>
<tr>
<th>OR</th>
<th>$[NP_{\text{Gen}} \ GAP_i V_{\text{ORel-Poss-Agr}}]$</th>
<th>$NP_i \ Nom$</th>
<th>$NP_{\text{Acc}}$</th>
<th>$V_{\text{Past.3Sg}}$</th>
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The lion [that the gorilla pushed] kissed the elephant.

Children and Adults language processing times in milliseconds for different syntactic structures.
SENTENCE COMPLEXITY

Memory capacity
Memory effects in German relative clauses

OR+2DP  ... the bunny that the horse is chasing
OR+3pro ... the bunny that she is chasing
OR+1pro ... the bunny that I am chasing

Language measure: standardized grammar score (TSVK)
Memory measure: Forward and backward digit span
Results: Eye-tracking data

- OR + 1pro
- OR + DP
- OR + 3pro

Low memory
High memory

HIGH LANGUAGE SKILLS
LOW LANGUAGE SKILLS
SENTENCE COMPLEXITY

Executive functions
Executive functions & language processing

Bilingualism
• Children
  Bialystok, 2011
• Adults
  Costa et al., 2008, 2009

Lesion studies
  Novick et al., 2009

Training studies
  Hussey & Novick, 2012

Executive Functions

Language
Only the elephant has a kite.

- Gaze patterns
  - Children (4-year olds) = adults
  - Looks to the contrast set

- Verbal responses (correct: No):
  - Children ≠ adults
  - Adults: 88%
  - Children: 35%
    - Individual performance depends on EF abilities:

Where participants predominantly look
How could current syntactic theory and memory retrieval mechanisms be used to explain how sentence complexity is acquired and processed?

What are the fundamental divergences and/or points of convergence between the two approaches?

Is there a relation to complexity issues from other linguistic domains, such as the lexicon, semantics, pragmatics and/or phonology?
Another question for all of us

- Which cognitive (e.g., working memory, executive functions) and linguistic (i.e., syntactic, semantic, pragmatic) changes allow the transition between the developing (child) parser and the adult parser?
Organizational

- **Workshop time slots:**
  - Wed 14:00-16:00 & 16:30-18:30
  - Thu 9:00-11:00 & 11:30-13:00
  - Fri 11:30-14:00

- **Regular time slot for presentation is**
  - 20 min + 10 min for discussion

- **Keynote speakers:** 1-hour-slots

- **The 3 top-rated abstracts also have 1-hour-slot**
General

- **Wi-Fi**
  - *User name*: JahrestagungDGFS
  - *Password*: dgfs2016

- **Social events**
  - **Reception**, Wed 19:00 @City Hall
    - Entry only with name tag
    - Address: Kanzleistr. 13/15
  - **Conference Dinner**, Thu 19:00 @Konzil Konstanz
    - Entry only with name tag, Pre-registration necessary (38€)
    - Address: Hafenstr. 2
This workshop organization was supported by the Unit Cognitive Science of the Human Sciences Faculty at the University of Potsdam.


