Before and after the acquisition of adjunct control

Juliana Gerard
Jeffrey Lidz

contact: j.gerard@ulster.ac.uk
Adjunct control

John bumped Mary after tripping on the sidewalk
Adjunct control

John bumped Mary after ___ tripping on the sidewalk
Adjunct control

John bumped Mary \( \{ \begin{array}{c}
\text{after} \\
\text{before} \\
\text{while} \\
\text{without} \\
\text{...}
\end{array} \) PRO tripping on the sidewalk

Chomsky (1981)
Why adjunct control?

**Learning problems:**

John bumped Mary **after** PRO tripping on the sidewalk

---

*syntactic* dependency
(closest c-commanding NP)
Non-adultlike behavior in previous studies

John bumped Mary after PRO tripping on the sidewalk

Available interpretation(s):

Adults: Subject control (John)
4-6 yo: Subject control (John)
Object control (Mary)
Sentence internal (John or Mary)
Free reference (anyone)

Today: source of non-adultlike behavior for adjunct control

• Relevance of event order
  • Retrieve antecedent + remember event order →
  • Retrieve antecedent + remember event order →

• General implications for memory development
  • What develops, and when?

Example: John bumped Mary after PRO tripping on the sidewalk
Non-adultlike behavior in previous studies

John bumped Mary after PRO tripping on the sidewalk

Available interpretation(s):

Adults: Subject control (John)

4-6 yo: Subject control (John)
  Object control (Mary)
  Sentence internal (John or Mary)
  Free reference (anyone)

Reasons for non-adultlike behavior?

Source of error?

- Non-adultlike grammar
- Non-adultlike deployment
Reasons for non-adultlike behavior?

Several different non-adultlike grammars proposed
- Variable Attachment
- Nominalization
- Agent Control

Variation across studies hard to account for

Reasons for non-adultlike behavior?

Non-adultlike deployment

- Parsing mechanisms
- Task effects
Source of error?

- Non-adultlike grammar
  - ✗

- Non-adultlike deployment

- Parsing mechanisms (✓)

Task effects ?

Reasons for non-adultlike behavior?

- For adjunct control: retrieve antecedent of PRO
  - Non-adultlike behavior in previous studies
- Previous tasks: remembering event orders while retrieving PRO

Example: John bumped Mary after PRO tripping on the sidewalk

Adjunct control tasks

**Truth Value Judgment Task (TVJT)**

- **Context:**
  - Described using a sentence with adjunct control
  - Sentence is true or false wrt the context
  - PRO interpretation determines true/false answer
    - “false” $\rightarrow$ subject control
    - “true” $\rightarrow$ object control

Example: John bumped Mary after PRO tripping on the sidewalk

Crain & Thornton (1998)
TVJT example

1. Set up a context
TVJT example

1. Set up a context

- Context with three events
  \[ \rightarrow \text{describe with adjunct control} \]

TVJT example

2. Test sentence with adjunct control
   • Previous studies: sentence is true or false depending on event order.

TVJT example

2. Test sentence with adjunct control
   Dora carried Diego after putting on a bandaid.

TVJT example

3. True/false answer

Dora carried Diego after PRO putting on a bandaid.
Meaning 1: Dora put on a bandaid (false/adultlike)
Meaning 2: Diego put on a bandaid (true)
Does the extra cost of remembering event order influence children’s behavior for adjunct control?

- Retrieve PRO + remember events
  Dora carried Diego \textcolor{red}{after}\textcolor{black}{PRO} putting on a bandaid.

true/false
Experiments

• Experiment 1: TVJT based on previous studies
  • truth value dependent on event order
• Experiment 2: new task (Pinto & Zuckerman, 2015)
  • no need to remember event order
• Experiment 3: TVJT
  • no need to remember event order
Experiment 1: Design

**CONTEXT:**

"DORA CARRIED DIEGO..."

...AFTER PUTTING ON A BANDAID"

...BEFORE PUTTING ON A BANDAID"

<table>
<thead>
<tr>
<th></th>
<th>Interpretation of PRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>adultlike</td>
<td>non-adultlike</td>
</tr>
<tr>
<td>(PRO = Dora)</td>
<td>(PRO = Diego)</td>
</tr>
<tr>
<td>false</td>
<td>true</td>
</tr>
<tr>
<td>true</td>
<td>false</td>
</tr>
</tbody>
</table>

n=34, 4;0-5;5, m=4;8
Experiment 1: Results

Dora carried Diego….

<table>
<thead>
<tr>
<th>ADULT</th>
<th>CHILD</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=20</td>
<td>n=34</td>
</tr>
<tr>
<td>4;0-5;5</td>
<td>m=4;8</td>
</tr>
</tbody>
</table>

Proportion acceptance:

- After putting on a bandaid (false)
- Before putting on a bandaid (true)
Experiment 1 summary

• Same pattern for children as for adults, but many object control responses.

• Was children’s behavior influenced by having to remember events?
  • fewer object responses with no need to remember event order?
Experiment 2: New task, new context

**Coloring book:**
Black and white picture, different interpretation depending on how the picture is colored in.

“Dora kicked the red ball!”

Experiment 2: New task, new context

Coloring book:
Black and white picture, different interpretation depending on how the picture is colored in.

“Dora kicked the red ball!”

Experiment 2: New task, new context

**Coloring book:**
Black and white picture, different interpretation depending on how the picture is colored in.

“Dora kicked the red ball!”

Using Coloring Book with adjunct control

“Dora fanned Diego after hugging the brown bear”
Using Coloring Book with adjunct control

“Dora fanned Diego after hugging the brown bear”
Using Coloring Book with adjunct control

“Dora fanned **Diego** after hugging the brown bear”
Using Coloring Book with adjunct control

“Dora fanned Diego after PRO hugging the brown bear”
Experiment 2: Results

- 32 children, 4;0-5;3, m=4;9
- 85% subject interpretations

“Dora fanned Diego after PRO hugging the brown bear”
Experiment 2 summary

• Much more adultlike overall
• Few object interpretations, unlike Experiment 1

• Experiment 1: TVJT
  Experiment 2: Coloring Book
  • How much of children’s improvement was due to the task itself?

• Experiment 3: TVJT version of Experiment 2
Experiment 3: TVJT, new context

Dora fanned Diego after PRO hugging the blue bear
Experiment 1: Design

<table>
<thead>
<tr>
<th>CONTEXT:</th>
<th>Interpretation of PRO</th>
</tr>
</thead>
</table>
| "DORA CARRIED DIEGO...
...AFTER PUTTING ON A BANDAID” | adultlike (PRO = Dora) |
| | non-adultlike (PRO = Diego) |
| ...BEFORE PUTTING ON A BANDAID” | false | true |
| | true | false |
### Experiment 3: Design

**Context:**

"Dora fanned Diego...

...after hugging the Blue bear"

<table>
<thead>
<tr>
<th>Interpretation of PRO</th>
<th>Adultlike (PRO = Dora)</th>
<th>Non-adultlike (PRO = Diego)</th>
</tr>
</thead>
<tbody>
<tr>
<td>...after hugging the Blue bear&quot;</td>
<td>false</td>
<td>true</td>
</tr>
<tr>
<td>...after hugging the Red bear&quot;</td>
<td>true</td>
<td>false</td>
</tr>
</tbody>
</table>
**Experiment 3: results**

<table>
<thead>
<tr>
<th></th>
<th>Coloring</th>
<th>Before/after</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TVJT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=32</td>
<td></td>
<td>n=32</td>
</tr>
<tr>
<td>4;0-5;2</td>
<td></td>
<td>4;0-5;6</td>
</tr>
<tr>
<td>m=4;6</td>
<td></td>
<td>m=4;9</td>
</tr>
</tbody>
</table>

Interaction (task x context) \( p = .02 \)

Dora fanned Diego after hugging...
- **blue** bear (false)
- **red** bear (true)

Dora carried Diego....
- after putting on a bandaid (false)
- **before** putting on a bandaid (true)
Summary

• Increase in rate of subject control responses with a change in the task
  → Demonstrates how extragrammatical factors can influence children’s interpretations of adjunct control
Source of error?

Non-adultlike grammar

Non-adultlike deployment

(Partly Adult grammar)

Parsing mechanisms

Task effects

✓

✓
Implications

• Task effects with memory demands
• Implications for memory
Implications

• Task effects with memory demands

• Implications for memory
  • Remember events + antecedent retrieval →

  • Remember events + antecedent retrieval →
Implications

• Remember events + antecedent retrieval → 🌟

Quantitative? 📊

Qualitative? 📊

• Remember events + antecedent retrieval → ✔
Implications

• Quantitative vs. qualitative change
• Memory = storage + retrieval
  • Development: ↑ storage? ↑ retrieval?
Implications

• Quantitative vs. qualitative change
• Memory = storage + retrieval
  • Development: ↑ storage? ↑ retrieval?

• Remember events + **antecedent retrieval** → / ✓
  - parsing the sentence
  - planning a response
  - computing a truth value
Conclusion

• Task effects as a source of non-adultlike behavior for adjunct control
  • Added memory demand $\rightarrow$ memory overload
  • Reduced memory demand $\rightarrow$ successful deployment of grammatical knowledge

• “Memory demand”
  • Development?
  • What other factors?
Thanks!

• Project on Children’s Language Learning
• Institute for Research in Social Sciences
• Coloring Book
  • Shalom Zuckerman
  • Manuela Pinto
• Undergraduate research assistants
  • Priyanka Konanur
  • Roxanne Jaffe
  • Alexis Duncan
  • Bradford Salen
  • Arvydas Navickas
• Preschools and children who participated
• Tara Mease
• NSF DDRI grant BCS-1551662

contact: j.gerard@ulster.ac.uk