Similarity-based interference in the acquisition of adjunct control

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Adjunct control

John bumped Mary after tripping on the sidewalk
Adjunct control

John bumped Mary after ___ tripping on the sidewalk

Chomsky (1981)
Adjunct control

John bumped Mary \{ after before while without \} 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)

Chomsky (1981)
Non-adultlike behavior in previous studies

John bumped Mary after PRO tripping on the sidewalk

Available interpretation(s):

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

Current study: source of non-adultlike behavior

- Similarity between antecedent and intervening NP
  - Higher error rates with greater similarity

- General implications for acquisition of dependencies
  - Parallel effects
    - explicit measures in children
    - implicit measures in adults
Non-adultlike behavior in previous studies

John bumped Mary after PRO tripping on the sidewalk

Available interpretation(s):

Adults: Subject control (John)

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Object control (Mary)
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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

Many of the proposed non-adultlike grammars predict the same behavior

Reasons for non-adultlike behavior?

Source of error?

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

- Parsing mechanisms
- Non-adultlike deployment
- Task effects

(Task effects are marked with a checkmark)
Source of error?

- Non-adultlike grammar ✗
- Non-adultlike deployment

- Parsing mechanisms ?
- Task effects ✅
Reasons for non-adultlike behavior?

Parsing mechanisms

John bumped Mary after PRO tripping on the sidewalk.

NP  NP  PRO
  target  intervener

Similarity between target & intervener -> difficulty
Similarity-based interference

- Similar NPs match in specific features
- NPs encoded in memory as feature bundles
- Interference when similar NPs are encoded/stored in memory

Similarity-based interference

- Example: object relative clauses

  The salesman that the accountant contacted ___ spoke very quickly
  target intervenen

- Adults: interference effects in implicit measures
- Children: interference effects in explicit measures

→ same parsing mechanisms, but more easily derailed in children

Similarity-based interference

John bumped Mary after PRO tripping on the sidewalk

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Similarity-based interference

Does the similarity between the target and intervener influence children's behavior for adjunct control?

John bumped Mary after PRO tripping on the sidewalk

- NP +animate
  - name +singular
    - male

- NP +animate
  - name +singular
    - female
Task: Coloring Book

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

“Dora kicked the red ball!”

Task: 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”
Procedure

1. Bring up pictures
2. Describe each action
3. Preamble to balance the salience of each character
4. Test sentence

“In this picture, we have Dora fanning Diego, but first there’s Diego hugging a bear, and there’s Dora hugging a bear too!”

“So here’s how we should color this picture of Dora and Diego:”

“Dora fanned Diego after hugging the brown bear”
Test and control sentences

Test sentences: adjunct control
“Dora fanned Diego after PRO hugging the brown bear”

Control sentences: finite adjunct + overt subject
“Dora fanned Diego after she hugged the brown bear”
   \[=\text{pronoun subject antecedent}\]

“Dora fanned Diego after he hugged the brown bear”
   \[=\text{pronoun object antecedent}\]
Predictions

Generalization:
Dora fanned Diego after PRO hugging the brown bear

Prediction: higher accuracy when target and intervener are less similar to each other
Experiment 1: Gender manipulation

Dora fanned Diego after PRO hugging the brown bear
Mickey fanned Diego after PRO hugging the brown bear

Mismatch  Match

n=24, 3;11-5;3, m=4;8
Experiment 1: Results

Trial type
- Mismatch
- Match
- Control sentences

Pronoun subject antecedent (she hugged...)
Pronoun object antecedent (he hugged...)

n=24
3;11-5;3, m=4;8
Experiment 1 summary

• Effect of interference for gender:
  • Higher accuracy for mismatch than match condition

• Why gender?
  • Similarity-based interference
  • Specific to gender, particular characters, etc
    • Usually see interference effects only with overt marking

→ Other features?

Experiment 2: Number manipulation

The girl fanned the boys after hugging the brown bear

The girl fanned the boy after hugging the brown bear

Mismatch

Match

n=48, 4;0-5;5, m=4;10
Experiment 2: Results

The bar chart shows the proportion correct for different types of sentences and pronoun antecedents. The data points indicate the following:

- **Trial type**:
  - Mismatch
  - Match
  - Control sentences

- **Sentences**:
  - The girl fanned the boys
  - The girl fanned the boy
  - Pronoun subject antecedent (she hugged...)
  - Pronoun object antecedent (he hugged...)

- **Data**:
  - n=48
  - 4;0-5;5, m=4;10
Experiments 1 and 2: Results

![Bar chart showing the proportion correct for different conditions.](chart.png)

**Gender:** n=24, 3;11-5;3, m=4;8
**Number:** n=48, 4;0-5;5, m=4;10
Summary

• Interference effects for gender and number in sentences with adjunct control
  • Demonstrates how extragrammatical factors can influence children’s interpretations of adjunct control

• Implications for non-adultlike behavior at younger ages?
Source of error?

Non-adultlike grammar ✗

Non-adultlike deployment

(Affult grammar)

Parsing mechanisms ✓

Task effects ✓
Implications

• Interference effects for adjunct control at age 4
• Other dependencies?
  • Object relative clauses

The salesman that the accountant contacted spoke very quickly

\[ \text{target interverner} \]

- Effects observed for number, gender, animacy, NP type...
→ Generally attributed to non-adultlike grammar which does not predict interference effects for adjunct control

Implications

• A: different sources for different interference effects
• B: adult grammar + failure to retrieve correct antecedent
  → adults: interference effects in implicit measures
  • more continuous developmental trajectory
Developmental trajectory

Effects in explicit measures: parser derailed with matching intervener

Effects in implicit measures: parser not (usually) derailed by intervener
Future directions

- What is developing?

Effects in explicit measures: parser derailed with matching intervener

Effects in implicit measures: parser not (usually) derailed by intervener
Thanks!

• Project on Children’s Language Learning
• Preschools and children who participated
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