LuCiD
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The role of information structure in children's comprehension of complex sentences – testing two hypotheses

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Background

Background

- Complex sentences:
  - here: main clause + adverbial clause
  - express a specific relationship between two (or more) situations
  - can occur in two different clause orders

Situation A	Situation B	Relationship
After I put the kettle on	I ate a piece of toast.	Temporal
The girl patted the horse	**before** she jumped the gate	Temporal
The cup broke	**because** it fell off the table.	Causal
If you don't pay the money	I'll turn you in.	Conditional
Although they love Greece	they've never been to Athens.	Concessional

Background

- Theoretical debate – which factors influence comprehension?
  - Semantics (iconicity, adverbial type)
  - Syntactic structure
  - Non-linguistic factors (e.g., memory)
  - Input frequency
  - Information structure (context)

- Practical implications
  - Complex sentences central aspect of academic language
  - Important in educational settings

Project

- Goal: Get a more comprehensive picture by
  - looking at different types of adverbial clauses
  - studying the properties of complex sentences in the input
  - testing the relative influence of different factors
- So far completed:
  - Study 1: corpus analysis of child-directed speech (CDS)
  - Study 2: comprehension study (isolated sentences)

Project

- But: Children don't usually hear sentences out-of-the blue!
- Sentences occur in context.
- **Study 3: The role of information structure**

Study 3: The role of information structure

Information structure

- Not about **what** is being said, but **how** it's being said.
- Speakers use information structure to optimise the message in the communicative situation.

Justin Bieber is bad singer.

[We're talking about Justin Bieber.]
He is a bad singer.
Given information: You know who "he" is.
New information: That person is a bad singer.

I don't like raisins.

[I like nuts.]
What I don't like are raisins.
Given information: I like/dislike things.
New information: I don't like raisins.

Information structure

- How does information structure affect children's processing of complex sentences?
  - Hypothesis 1: Sentences are easier if they occur in *given-before-new* order.

    [Sue paints the old fence.] After she paints the old fence she hoovers the house.

    [Sue hoovers the house.] She hoovers the house after she paints the old fence.

    Haviland & Clark (1974)

  - Hypothesis 2: Sentences are easier if the given information is contained in the subordinate clause:

    [Sue paints the old fence.] After she paints the old fence she hoovers the house.

    [Sue paints the old fence.] She hoovers the house after she paints the old fence.

    Gorrell, Crain, & Fodor (1989)

Design

- If hypothesis 1 (*given-before-new*) is correct, we should find an interaction of Clause Order and Clause Given:

Clause Given	Clause Order: Main-subordinate	Clause Order: Subordinate-main
Main given	Sue hoovers the house. She hoovers the house after she paints the old fence	Sue hoovers the house. After she paints the old fence, she hoovers the house.
Subordinate given	Sue paints the old fence. She hoovers the house, after she paints the old fence.	Sue paints the old fence. After she paints the old fence, she hoovers the house.

Design

- If hypothesis 2 (*given-in-subordinate*) is correct, we should find a main effect of Clause Given.

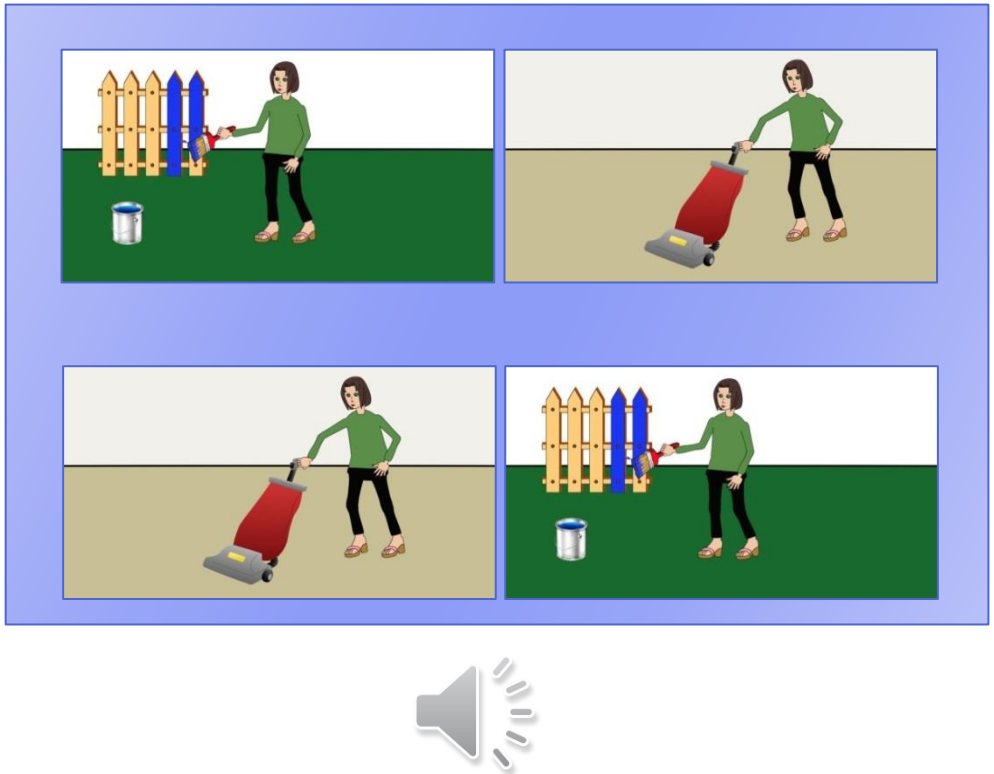
CLAUSE ORDER

CLAUSE GIVEN

	Main-subordinate	Subordinate-main
Main given	Sue hoovers the house. She hoovers the house after she paints the old fence	Sue hoovers the house. After she paints the old fence, she hoovers the house.
Subordinate given	Sue paints the old fence. She hoovers the house, after she paints the old fence.	Sue paints the old fence. After she paints the old fence, she hoovers the house.

Design

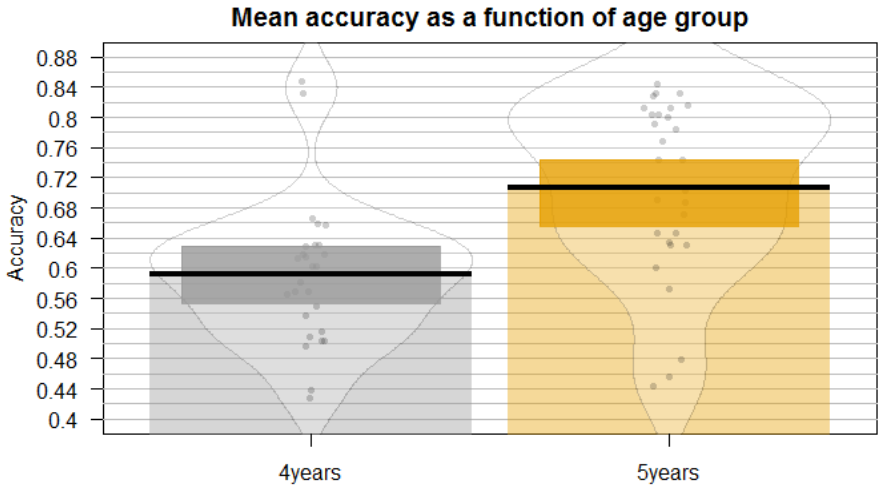
- Forced-choice picture selection task
  - Instruction: *Touch the matching story after the beep!*



Design

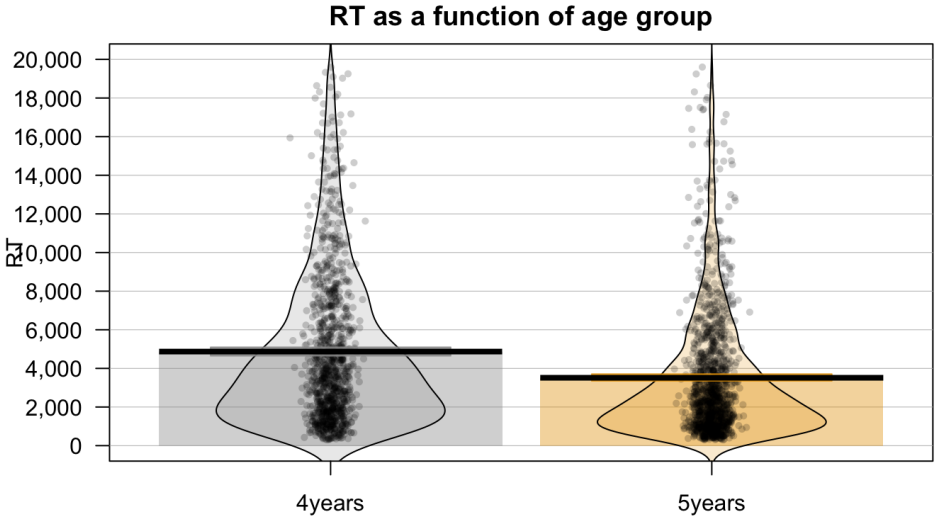
- Factors:
  - 4 x adverbial clause type (*after, before, because, if*)
  - 2 x clause order (main-sub, sub-main)
  - 2 x clause given (main given, subordinate)
- Measurements:
  - Accuracy
  - Reaction Time
- Other measures:
  - Working memory
  - Executive function
  - Language ability
  - Vocabulary
- Participants:
  - 80 3.5- to 5.5-year-old children
    - 40 children 4-year-olds (∅ 48 months)
    - 40 children 5-year-olds (∅ 60 months)

Results: Age Group

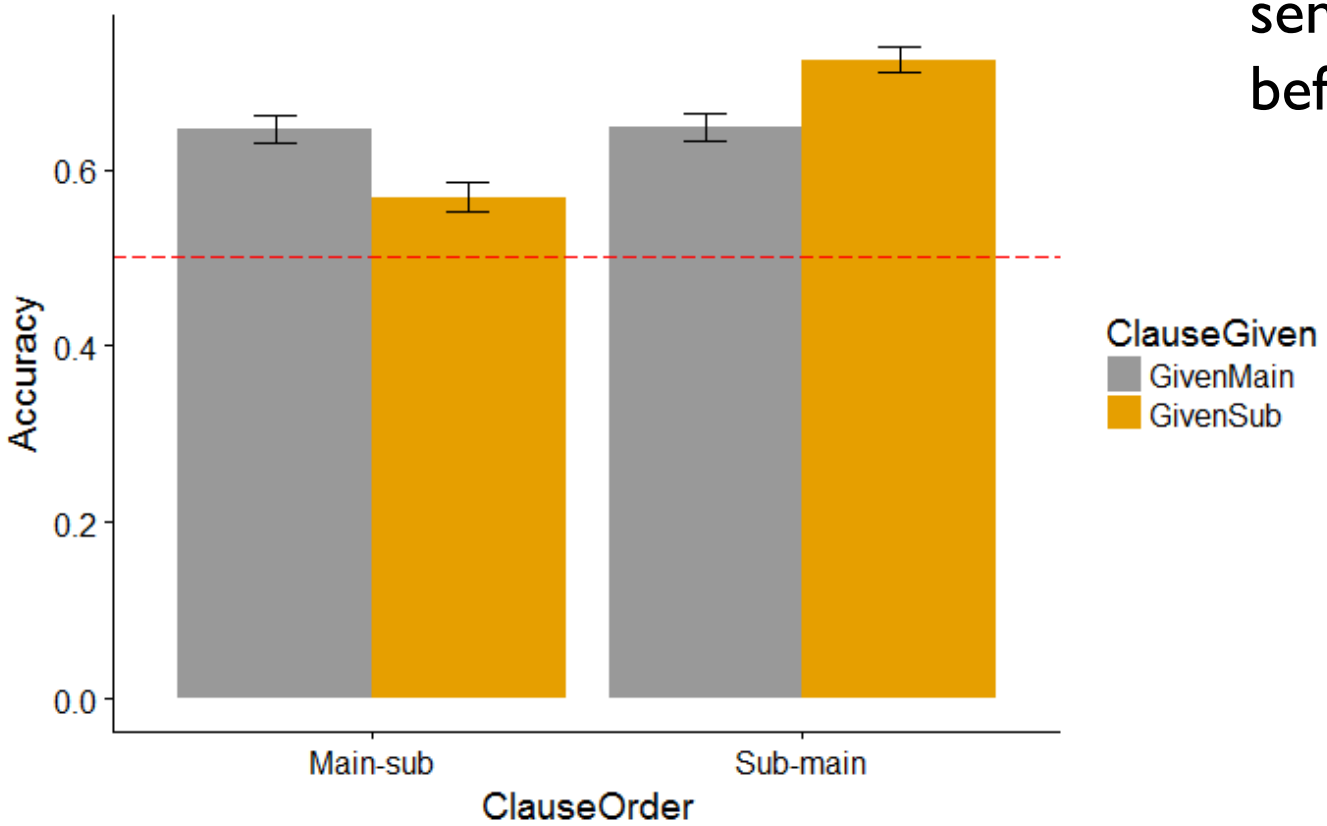


- Higher accuracy in 5-year-olds

- Shorter reaction times in 5-year-olds

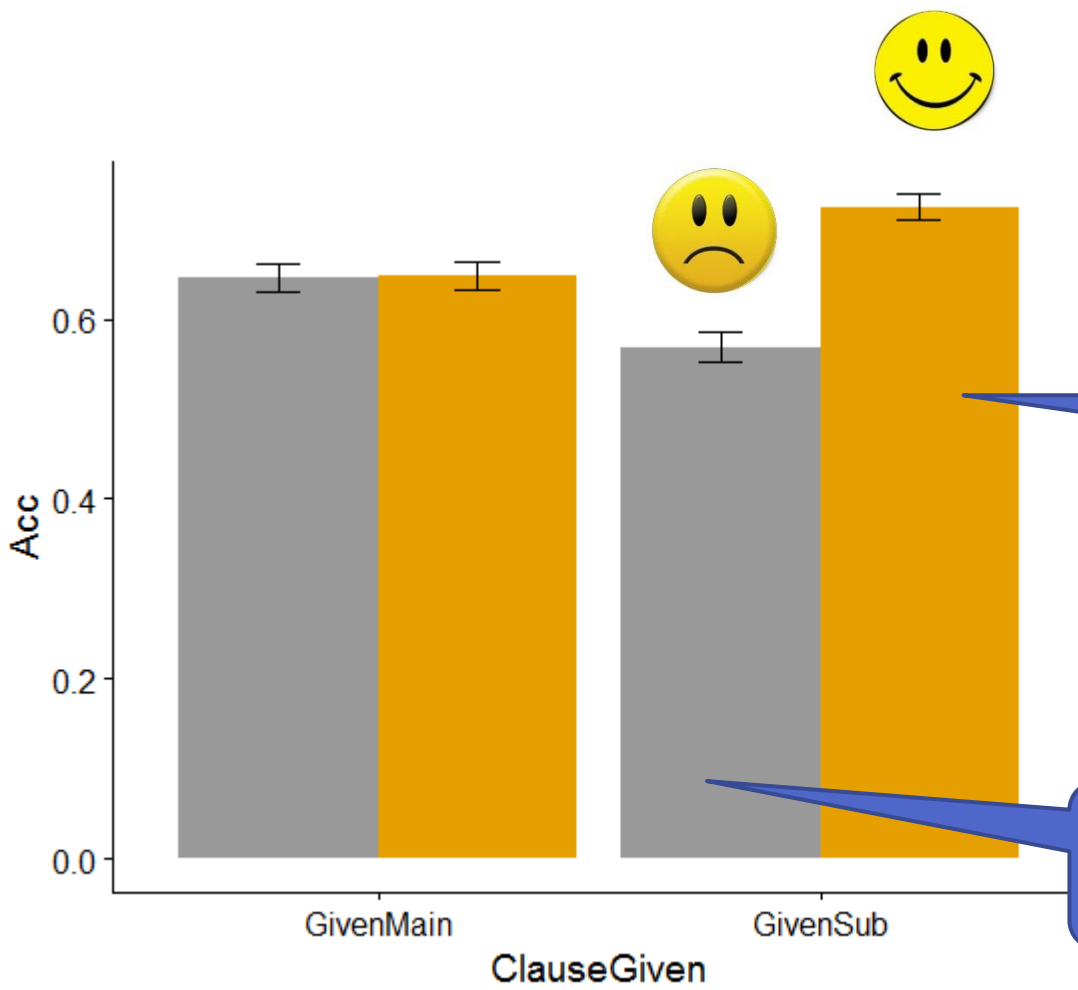


Results: Clause Order and Clause Given



- Comprehension seems better when sentence is "given-before-new"

Results: Clause Order and Clause Given

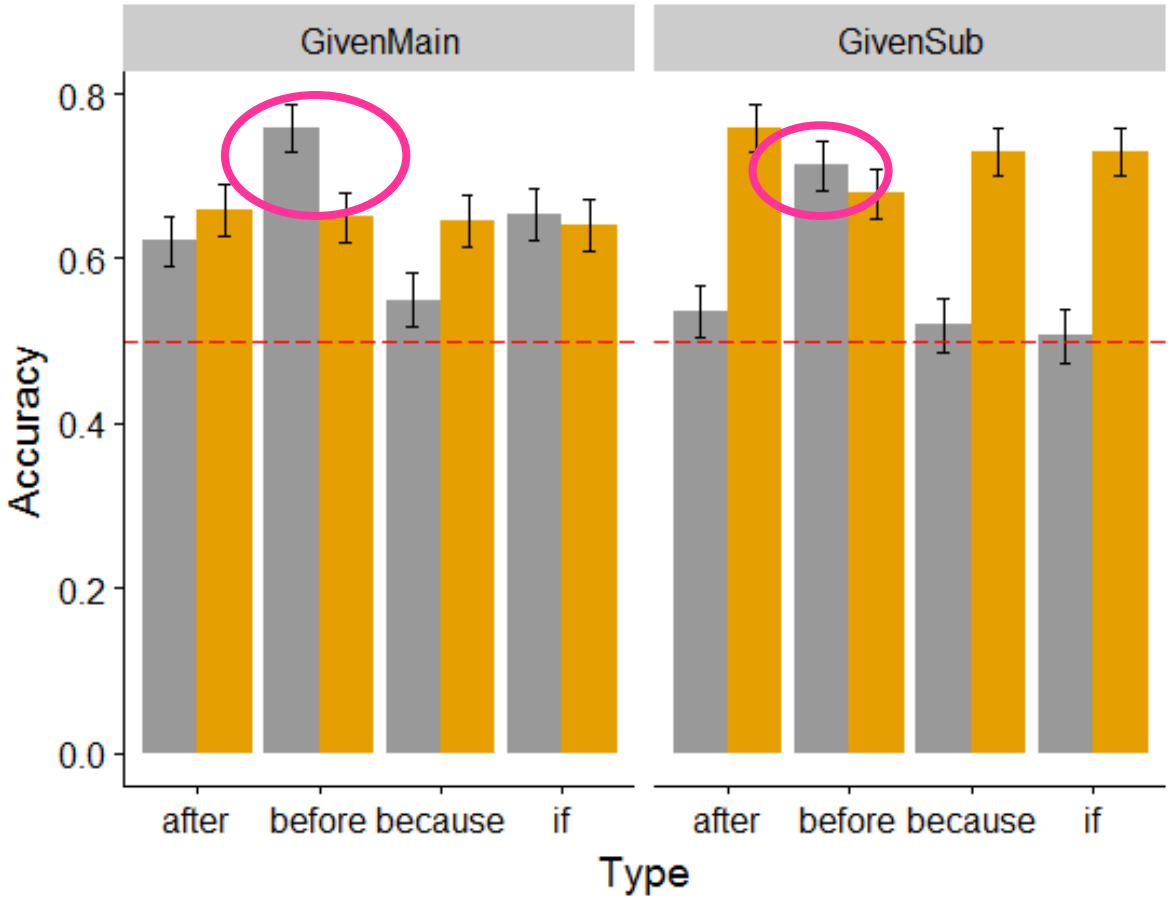


- Clause Order only matters when the subordinate clause is given.

Sue paints the old fence. After she paints the old fence, she hoovers the house.

Sue paints the old fence. She hoovers the house, after she paints the old fence.

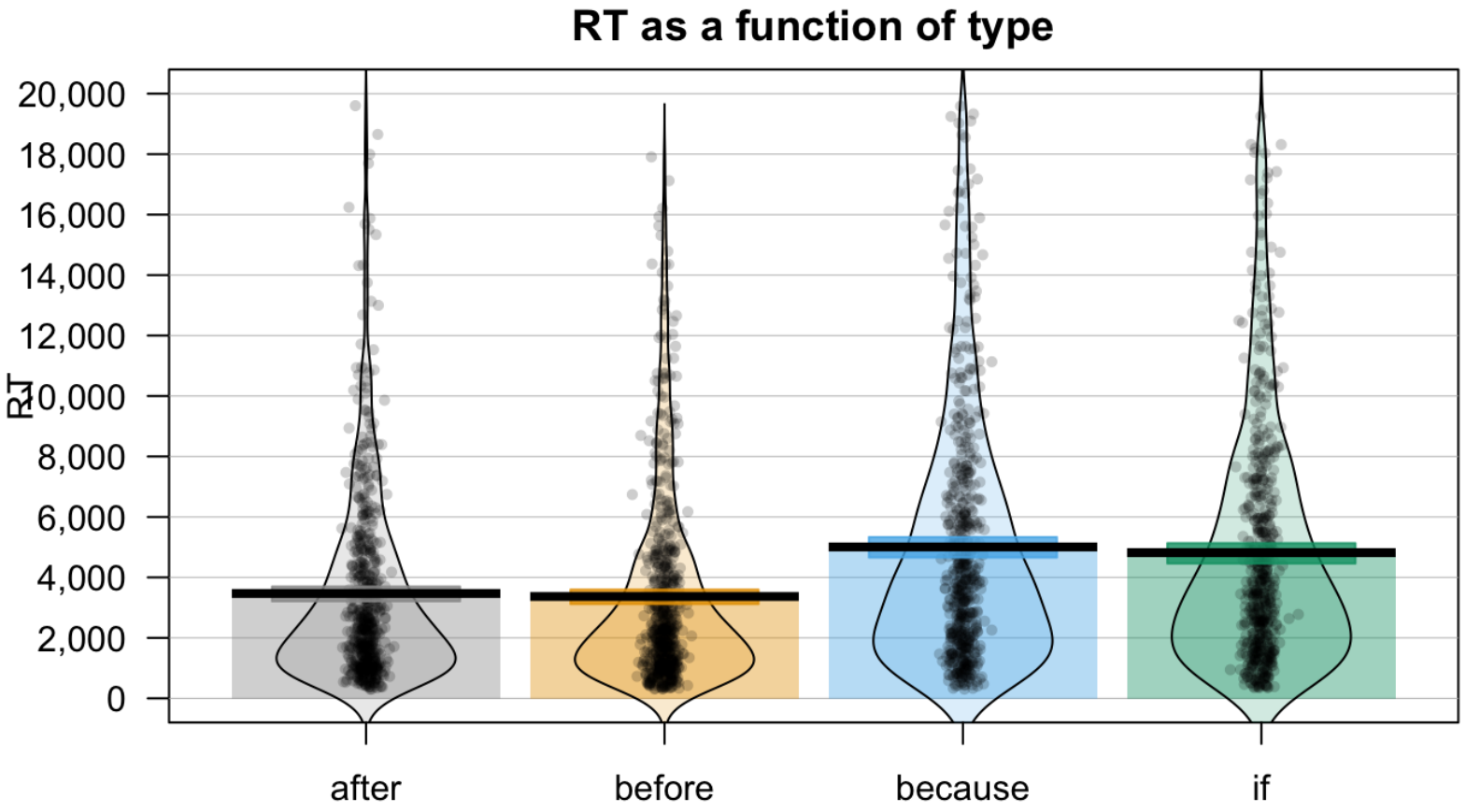
Results: Type-specific differences



- *Before* is special:
  - When main-clause is given, comprehension is better
  - When the subordinate clause is given, comprehension is not much worse.

Results: Reaction times

- Longer RTs with *because* and *if*



Results: other measures

- Accuracy was significantly positively correlated with:
  - Inhibition (Flanker task)
  - Vocabulary
  - Memory
  - General language ability
- But: measures did NOT explain additional variation.
- RTs were significantly negatively correlated with:
  - Vocabulary
  - General language ability
- But again: no additional variation explained by this.

Summary and discussion

Summary

- Comprehension improves with age.
- Adding context improved children's performance overall.
- Comprehension improved with age.
- Results do not support either of the two hypotheses, but actually a combination of the two:
  - *Given-before-new* is better, but only when the given information is contained in the subordinate clause.
- *Before*-sentences in iconic order are easiest, irrespective of information structure.

Summary (2)

- Processing speed increased with age.
- Processing of semantically more complex sentence types (*because/if*) was slower.
- None of the other measures explained variation over and above the experimental manipulations.

Replicates findings from Study 2!

Discussion

- Children integrate all available information to understand complex sentences (even if the presentation is "odd").
- Children are sensitive to information structure:
  - Sentence-initial adverbial clause as "anchors" for main clause (given information)
  - Sentence-final adverbial clauses typically focus/assertion (new information)
- Results in line with linguistic literature claiming that discourse function adverbial clauses varies with relative position (e.g., Chafe 1984, Ford 1993).

Thank you.

References

- Chafe, W. (1984). How people use adverbial clauses. *Berkeley Linguistics Society* 10, 437–49.
- Ford, C. (1993). *Grammar in Interaction. Adverbial clauses in American English conversations*. Cambridge: Cambridge University Press.
- Gorrell, P., Crain, S., & Fodor, J. D. (1989). Contextual information and temporal terms. *Journal of Child Language*, *16*(3), 623–632. https://doi.org/10.1017/S0305000900010758
- Haviland, S. E., & Clark, H. H. (1974). What's new? Acquiring new information as a process in comprehension. *Journal of Verbal Learning and Verbal Behavior*, *13*(5), 512–521.

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