# Adjunct control in children is predicted by working memory (but not inhibitory control)

Juliana Gerard and Dana McDaniel

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# Adjunct control

John called Bill after ____ leaving the store.

Chomsky (1981)

# Adjunct control

John called Bill after PRO leaving the store.

Chomsky (1981)

# Acquisition of adjunct control

John called Bill after PRO leaving the store.

Available interpretation(s):

Adults: Subject control (John)

4-7 year olds: Subject control (John)

Object control (Bill)

Sentence internal (John or Bill)

Free reference (anyone)

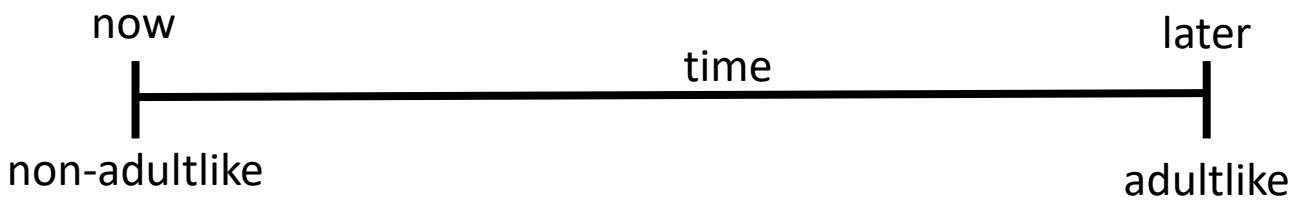
**Why?**

Goodluck (1981), Hsu, Cairns, & Fiengo (1985), McDaniel, Cairns, & Hsu (1991), Cairns, McDaniel, Hsu, & Rapp (1994), Broihier & Wexler (1995), Goodluck (2001), Adler (2006), Gerard et al (2017, 2018), Gerard (2022)

# Non-adult behavior: Why?

John called Bill after PRO leaving the store.

- Behavior:




- Sources:
  1. Non-adult grammar —(specific) input→ adult grammar

| Non-adult grammar | adult grammar |
|---|---|
| ✓ Subject control (John) | ✓ Subject control (John) |
| ✓ Object control (Bill) | ✗ Object control (Bill) |
| ✓ Sentence internal (John or Bill) | ✗ Sentence internal (John or Bill) |
| ✓ Free reference (anyone) | ✗ Free reference (anyone) |

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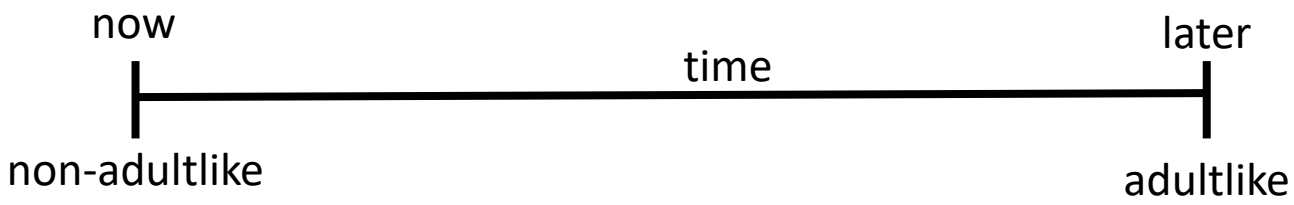


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  2. Non-adult pragmatics

The security guard stopped the woman$_i$ [before PRO$_i$ boarding the plane]. (Green 2018: 73)

Potatoes are tastier after PRO boiling them. (Ackema & Schoorlemmer 1995:182)

pragmatic preference → John called Bill after PRO leaving the store.

Landau (2021)

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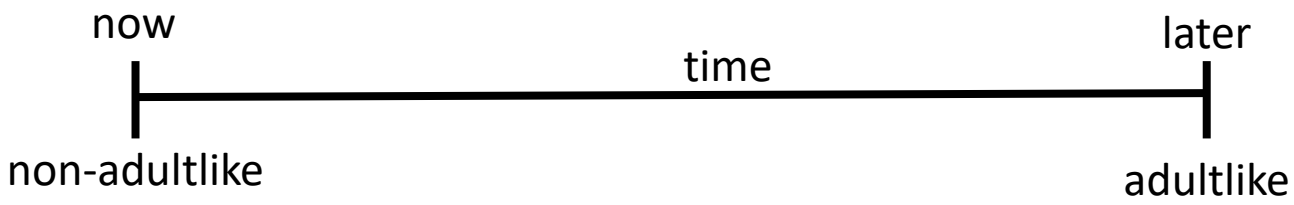


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~~pragmatic preference~~

pragmatic preference →

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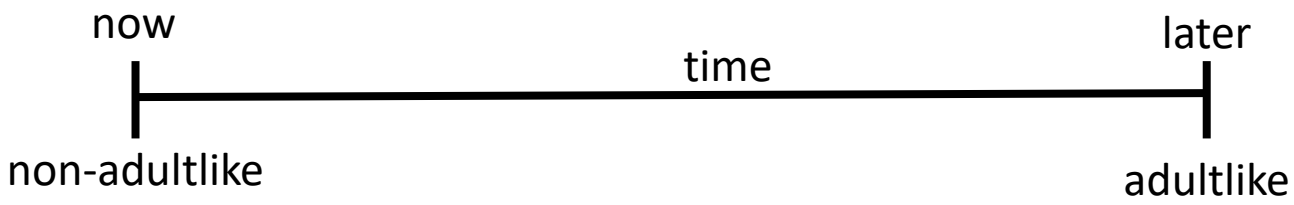


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} **language-specific**

Wexler (1992, 2019)

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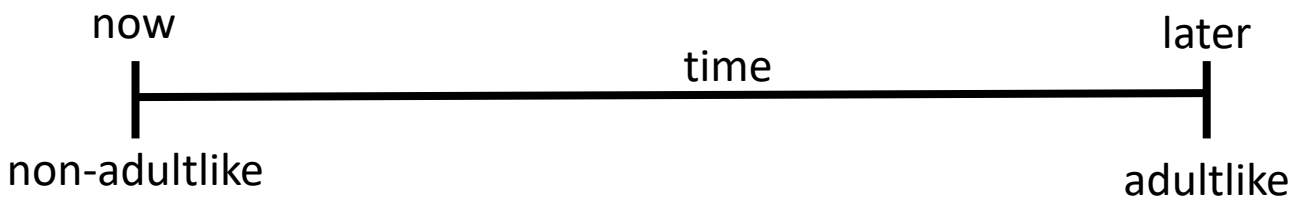


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  3. Non-adult processing —(processes develop)→ adult processing **domain-general**

Gerard et al (2017, 2018), Gerard (2022)

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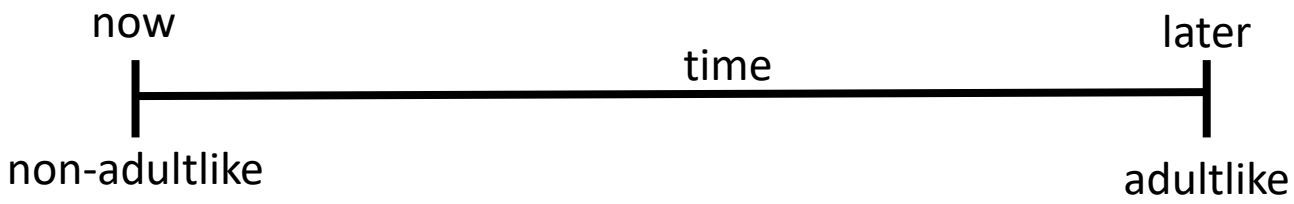


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**Current study: ???**

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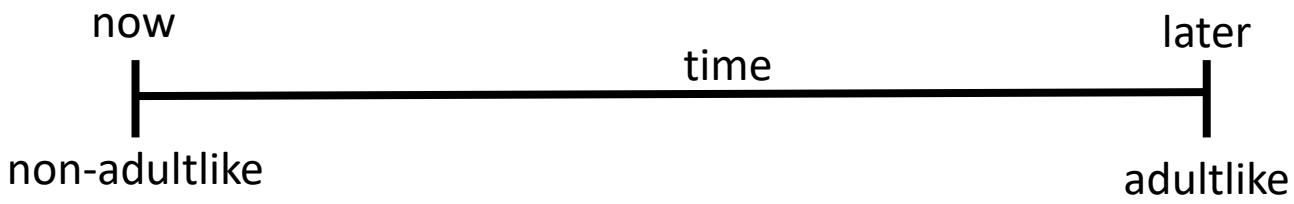


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  } **language-specific**

  3. Non-adult processing —processes develop→ adult processing **domain-general** ✓

**Current study:**
- **working memory** ✓
- **inhibitory control**

Implications
- WM → interpretations
- Acquisition

# Hypotheses: non-adult behavior

John called Bill after PRO leaving the store.

H1: **domain-general**

adult grammar + non-adult processing

predicts: adjunct control ~ domain general process

- working memory
- inhibitory control

H2: **language-specific**

non-adult grammar, pragmatics

predicts: free reference for PRO

John called Bill after PRO leaving the store. → John or Bill left

John called Bill after he left the store. → John or Bill left

Hsu et al (1985), McDaniel et al (1991), Cairns et al (1994), Sherman & Lust (1993)

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| ✗ | **Ambiguous pronouns** |

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# Current study: method

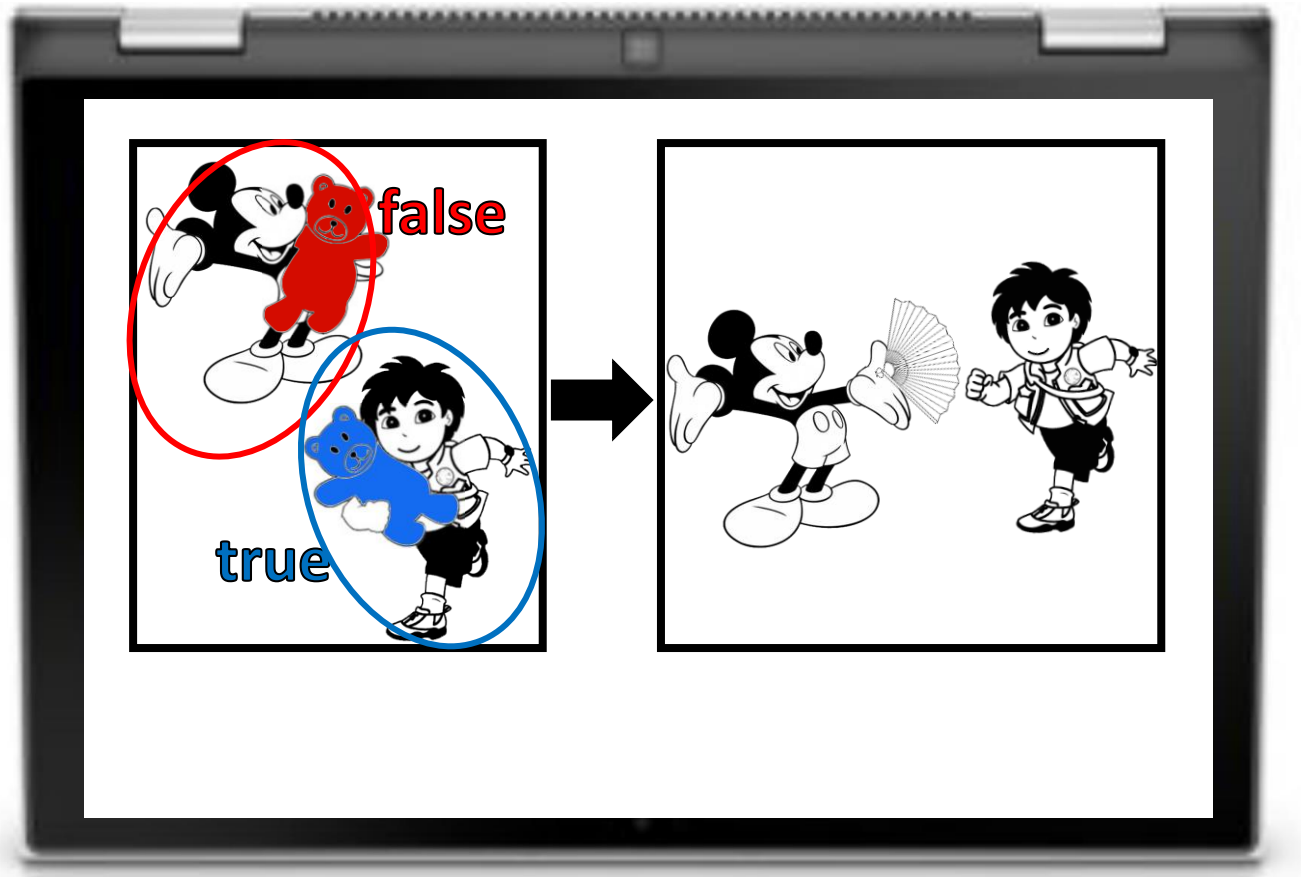
- Adjunct control vs ambiguous pronouns (TVJT)
  - John called Bill after PRO leaving the store
  - John called Bill after he left the store
- Working memory
- Inhibitory control

72 adults

81 children, 4;0-7;10, m=5;6

# Truth value judgment task (TVJT)

**Mickey** fanned **Diego** after ___ hugging the blue bear

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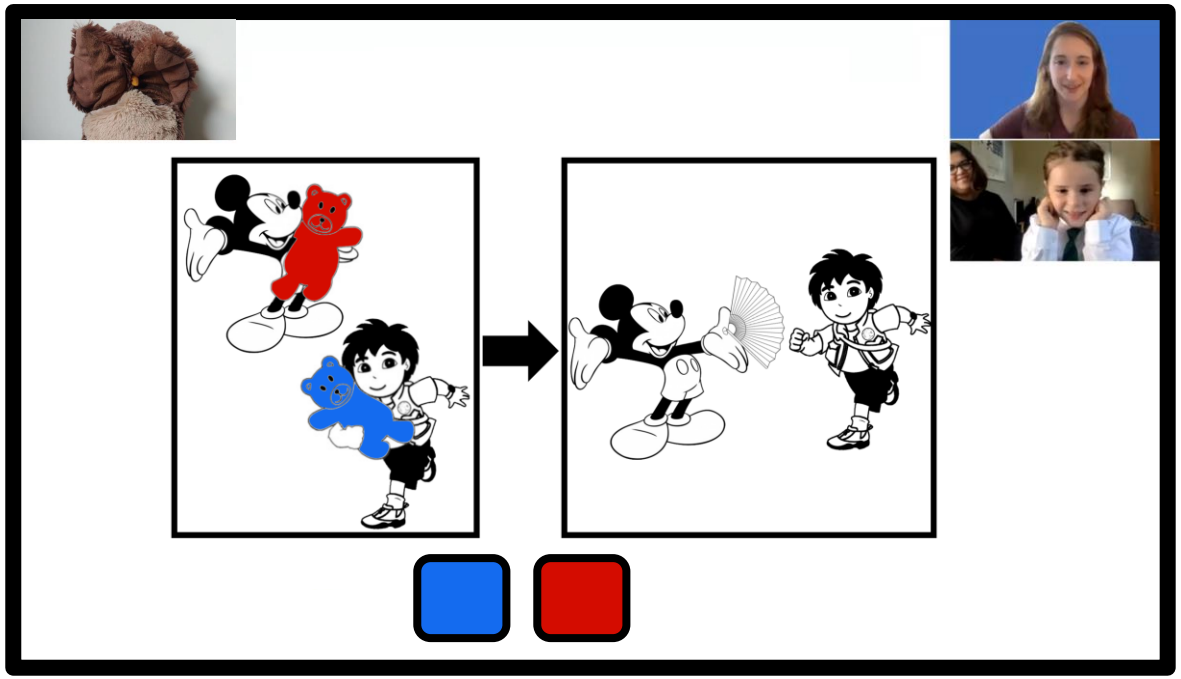
# TVJT



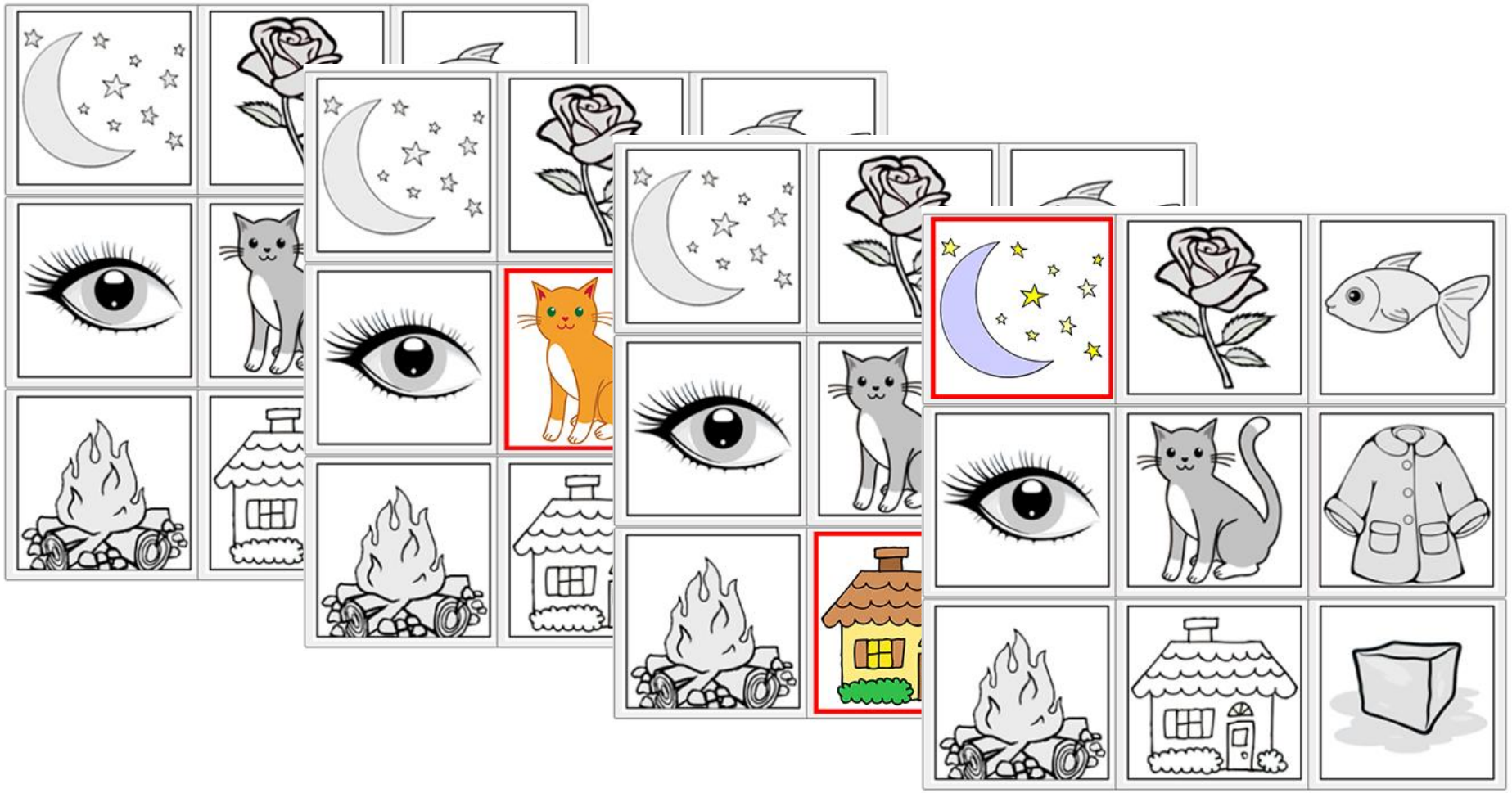
- Over Zoom (Lookit)
- 3 types of sentences:

1. Mickey fanned Diego after __ hugging the blue bear (adjunct control)
2. Mickey fanned Diego after he hugged the blue bear (ambiguous pronoun)
3. Dora fanned Diego after he hugged the blue bear (control)

Dependent variable: proportion subject interpretations

72 adults
81 children, 4;0-7;10, m=5;6

# Working memory task (Backwards span)



Van de Weijer-Bergsma et al (2016)

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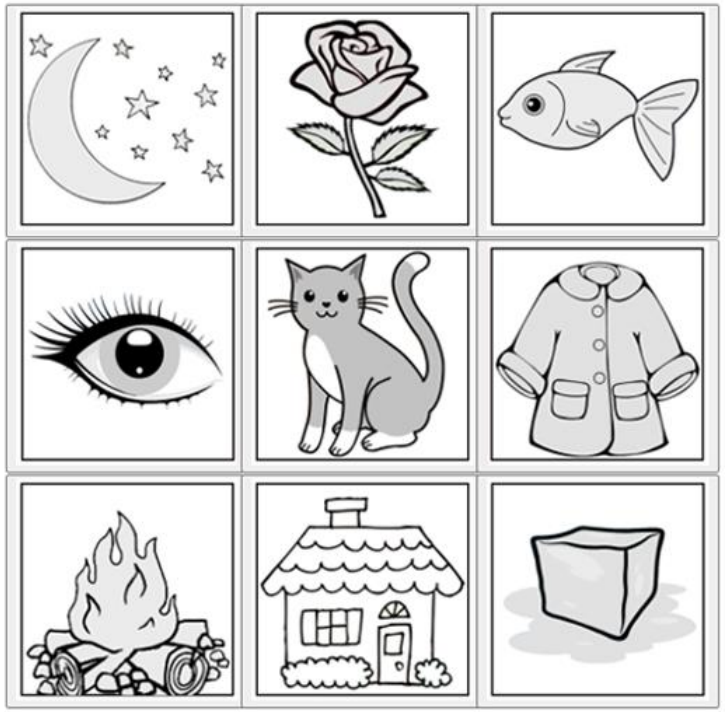
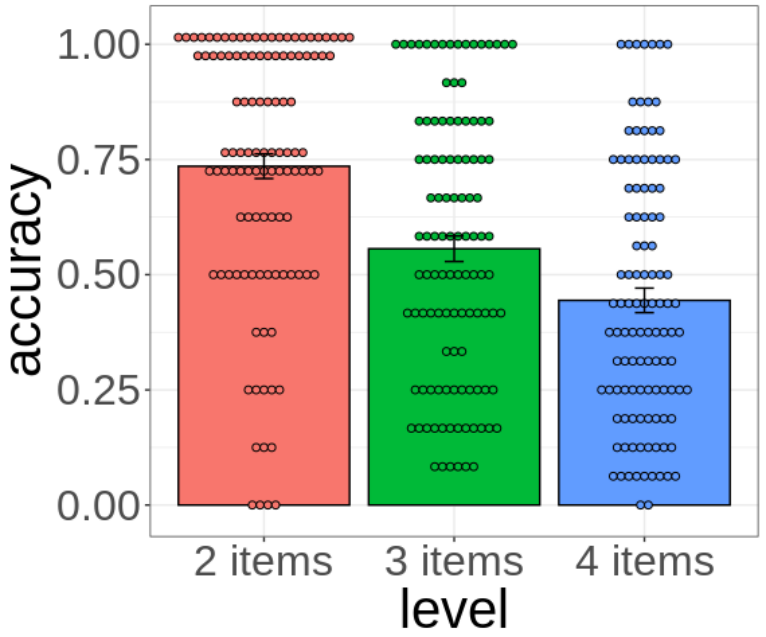
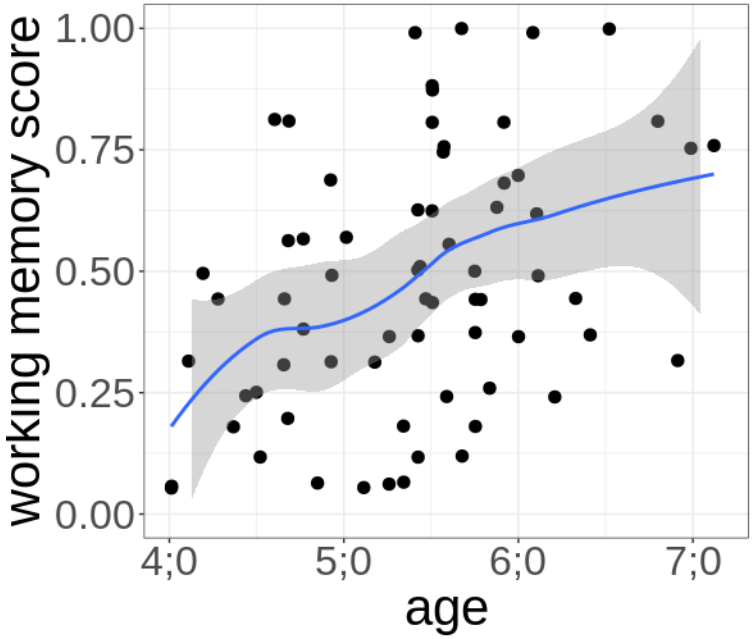


3 levels:
- 2 items (4 reps)
- 3 items (4 reps)
- 4 items (4 reps)

Scoring:

$$\frac{\text{average accuracy} + \text{average accuracy} + \text{average accuracy}}{3}$$



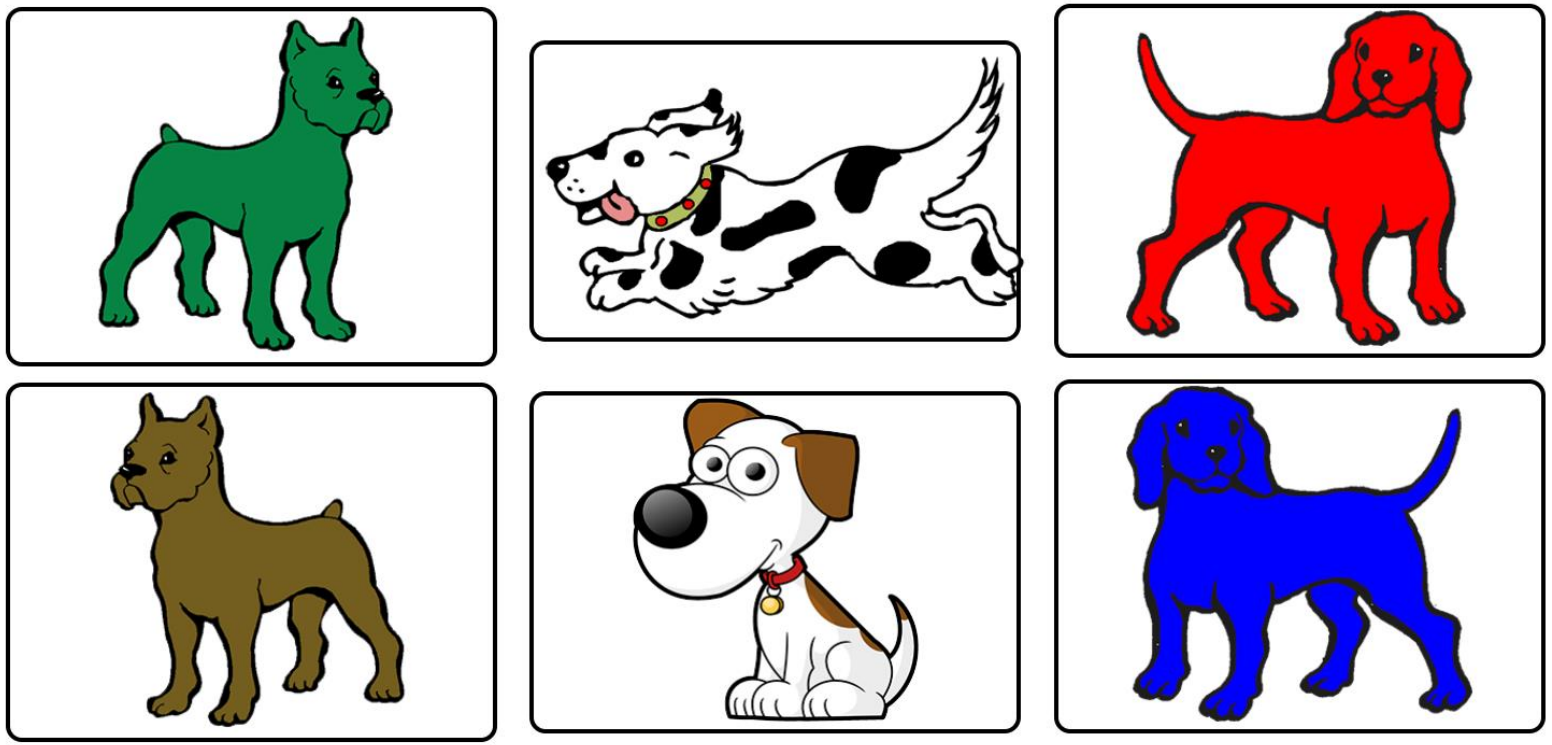




Van de Weijer-Bergsma et al (2016)

# Inhibitory control

non-conflict

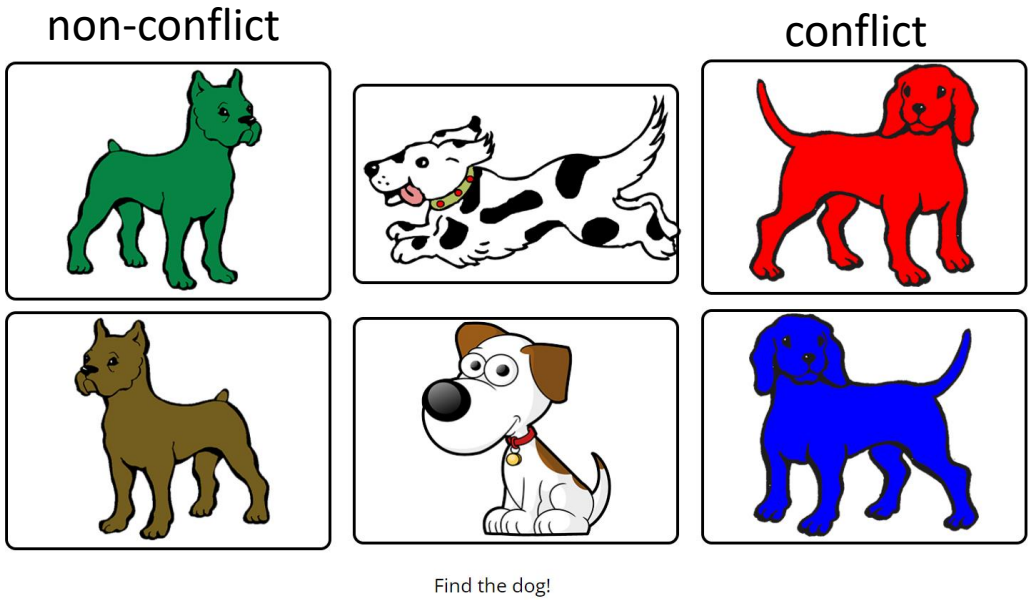
conflict

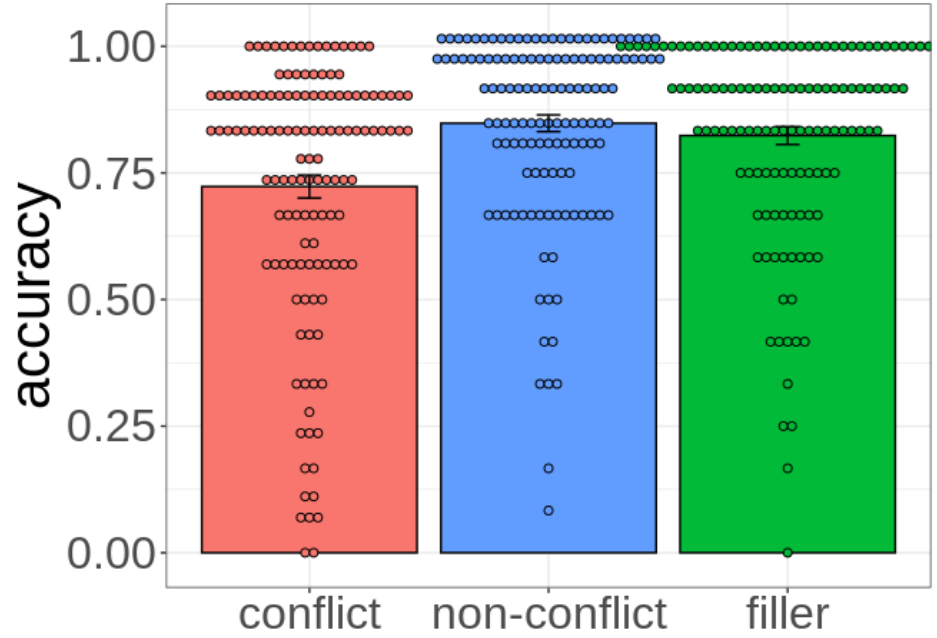


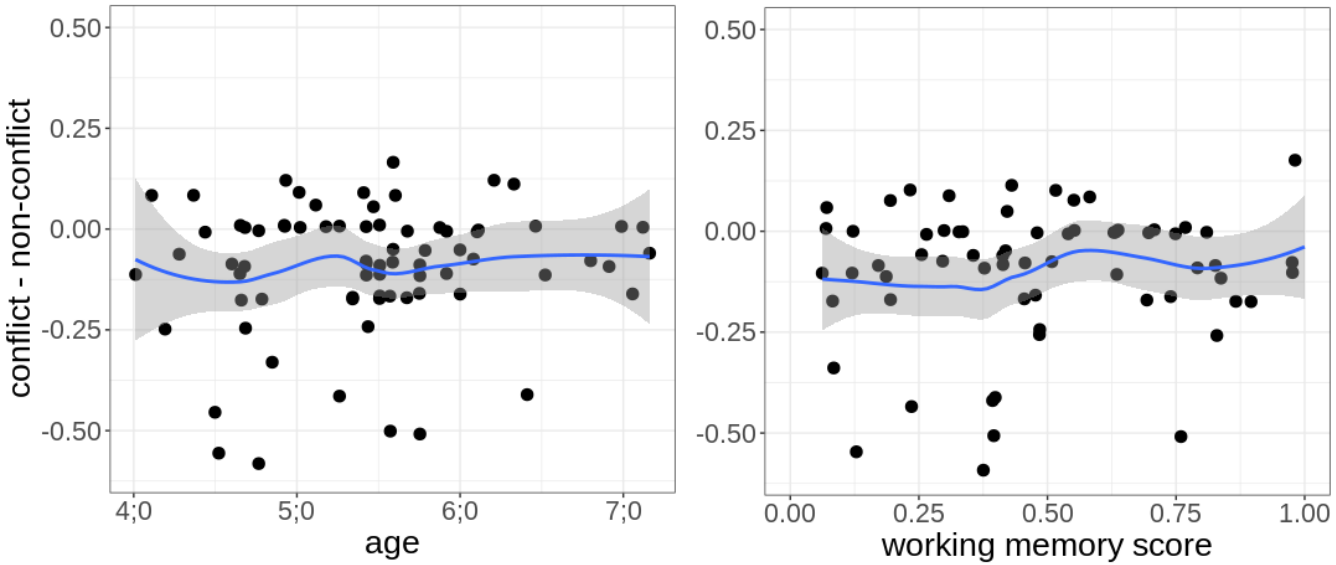
Find the dog!

Huang & Hollister (2019)

# Inhibitory control



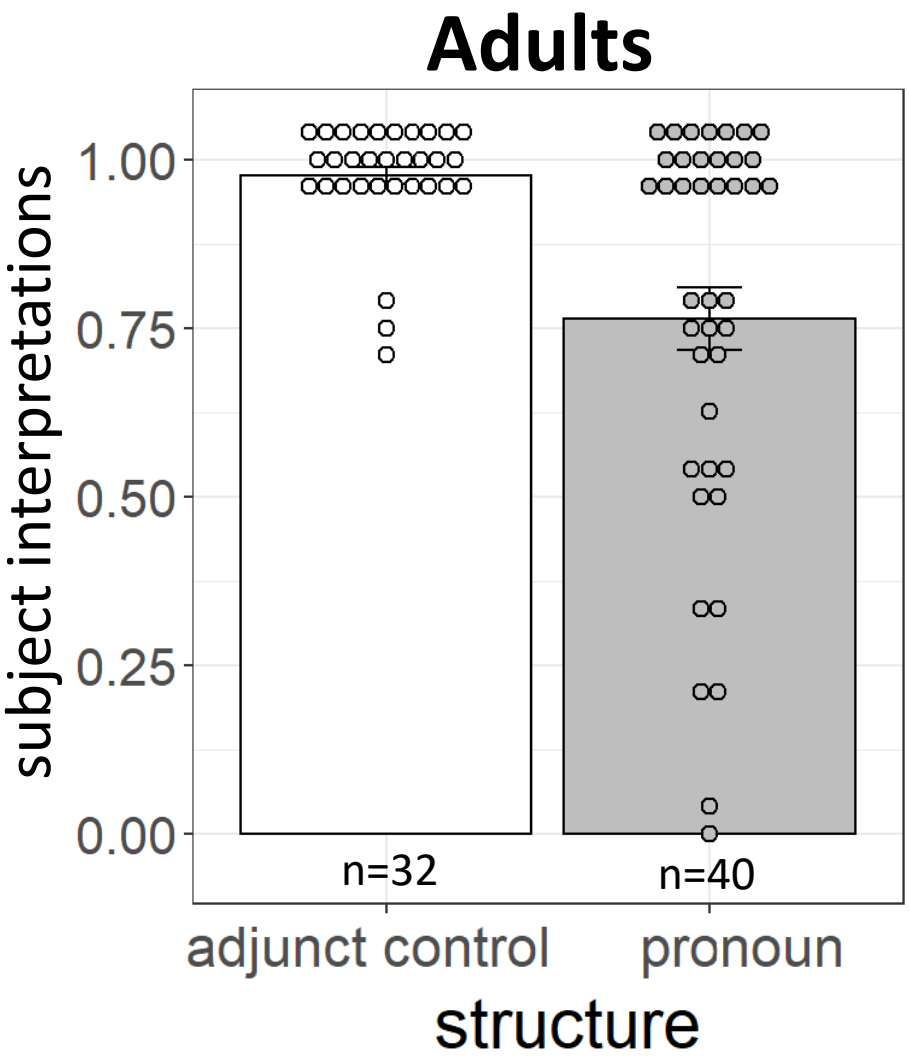



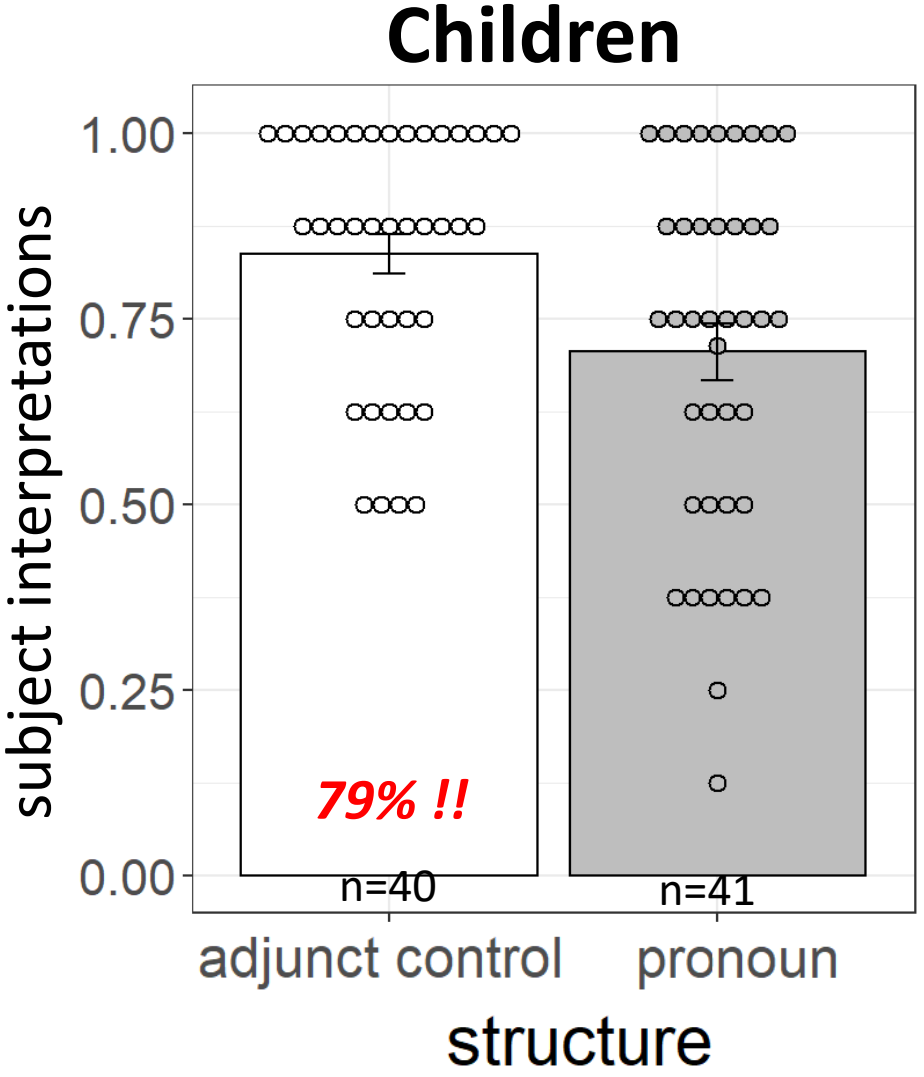




Huang & Hollister (2019)

adjunct control: Mickey fanned Diego after hugging the blue bear
pronoun: Mickey fanned Diego after he hugged the blue bear

# Results: sentences



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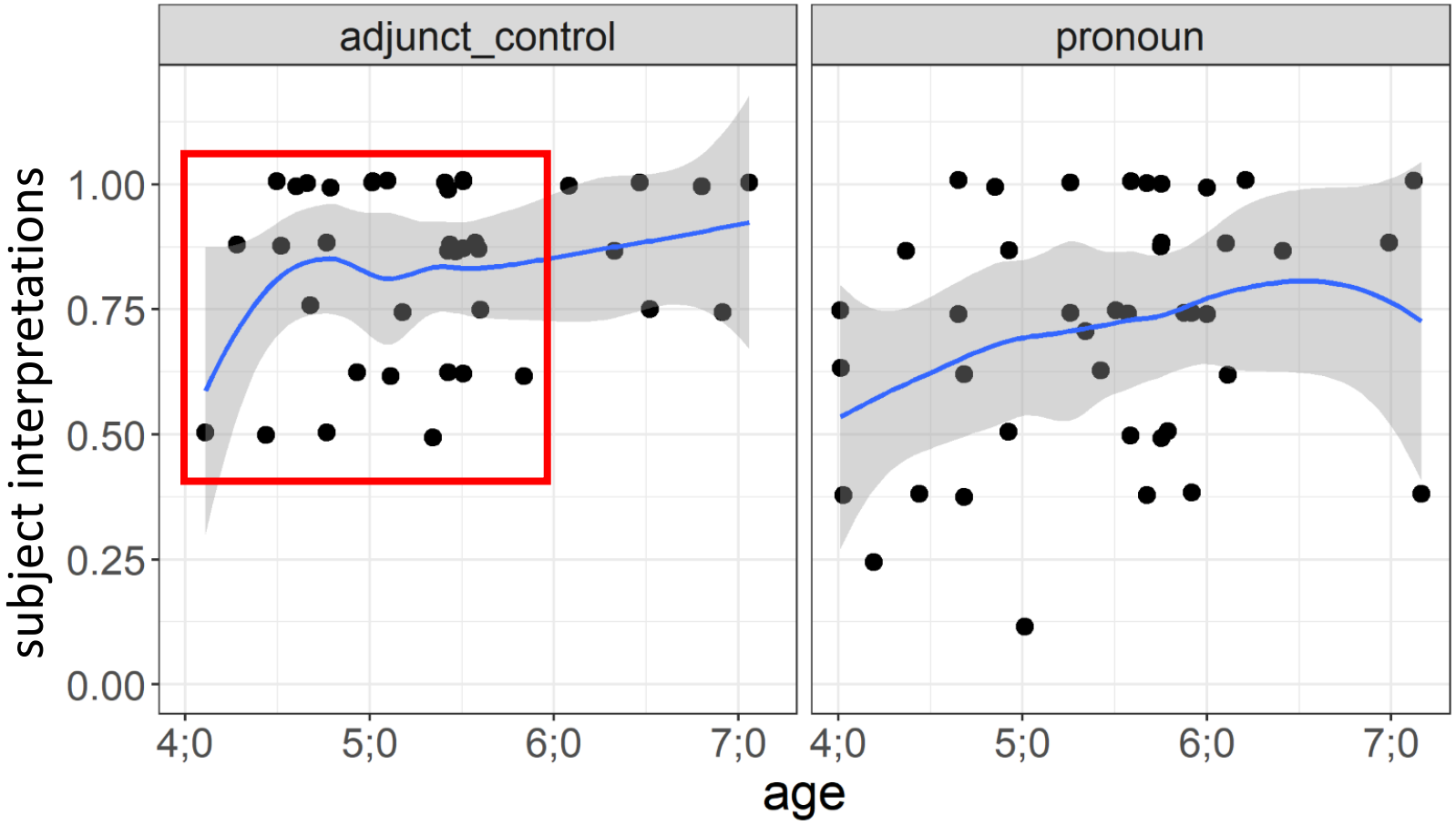
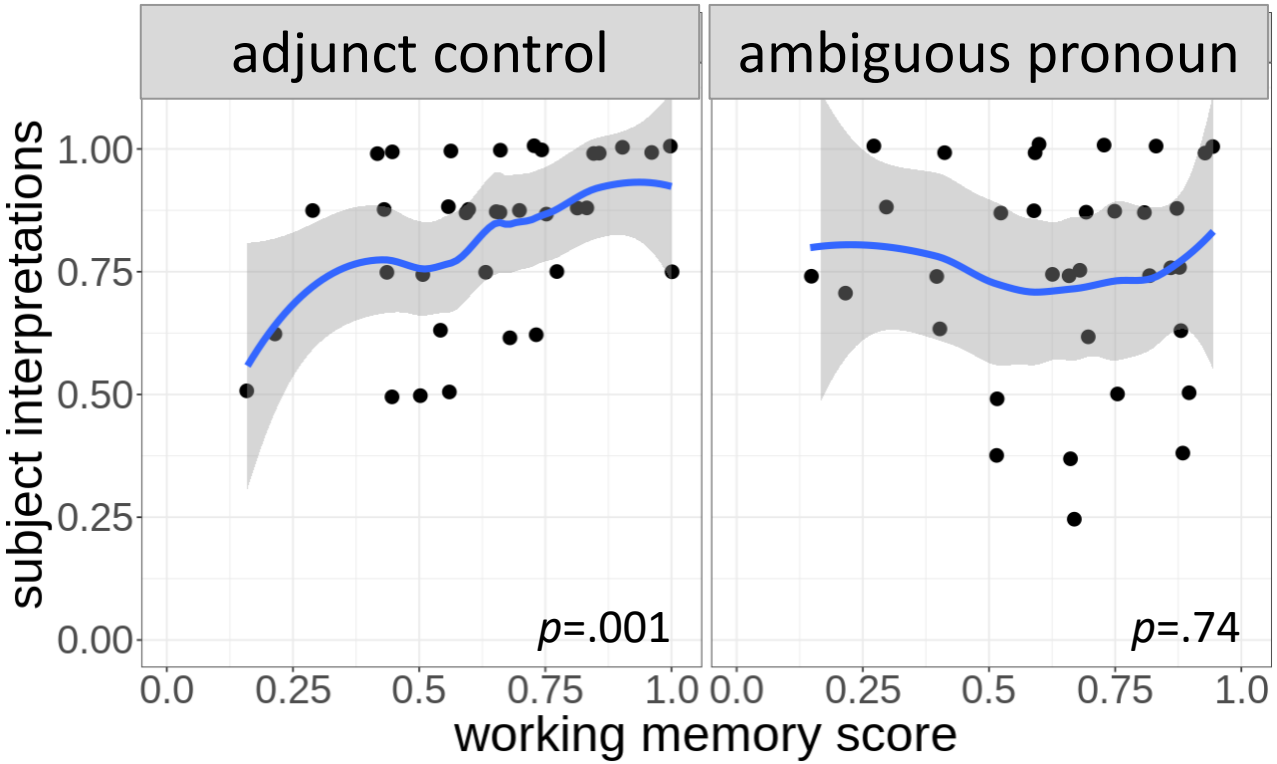


# Results

| | |
|---|---|
| ✓ | Domain-general processes |
| ✗ | Ambiguous pronouns |

*p*=.01

adjunct control/pronoun : working memory

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subject (.5)/non-subject (.5) ~ adjunct control (-.5)/pronoun (.5) * centered working memory * centered conflict - non-conflict

# Results

working memory

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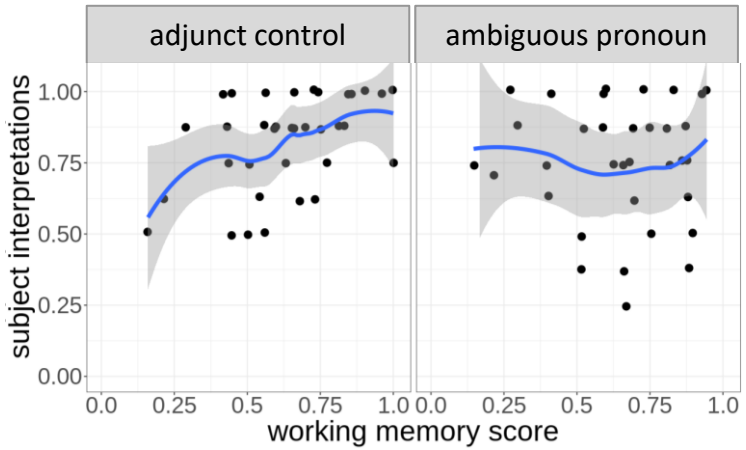
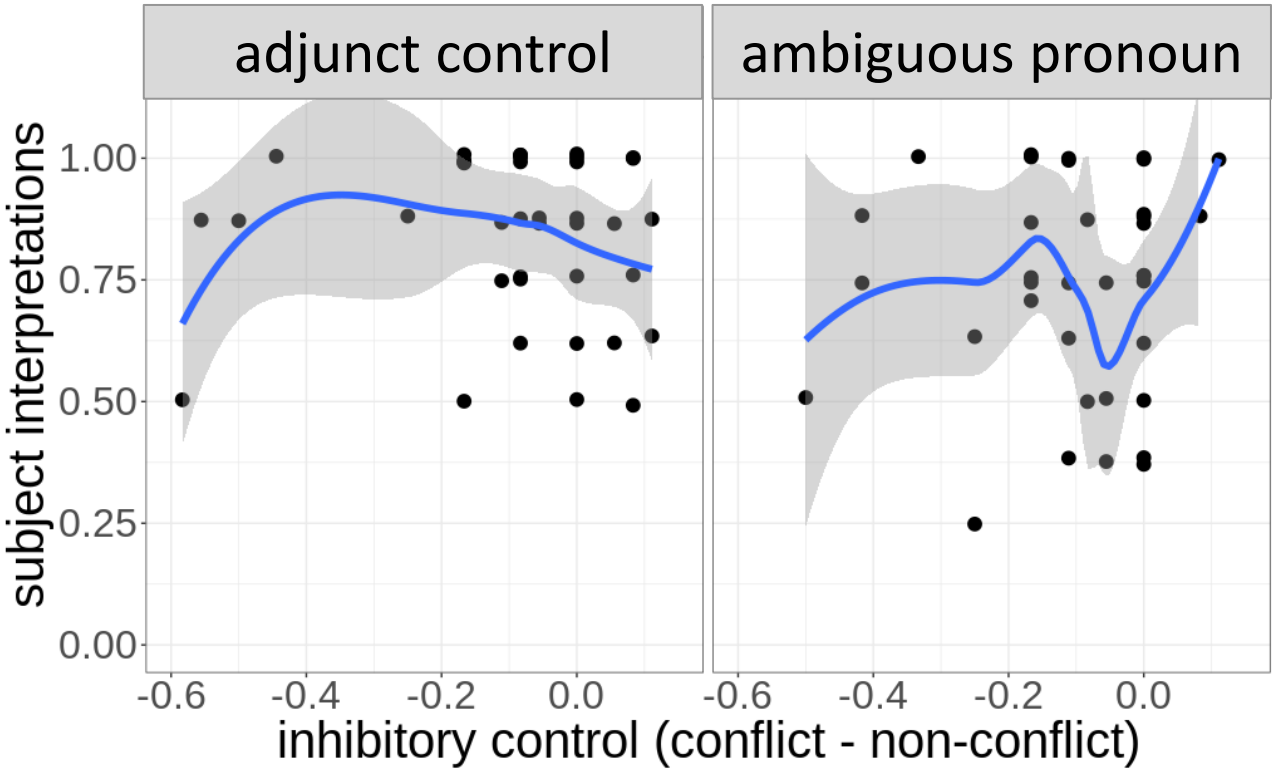



adjunct control/pronoun : inhibitory control

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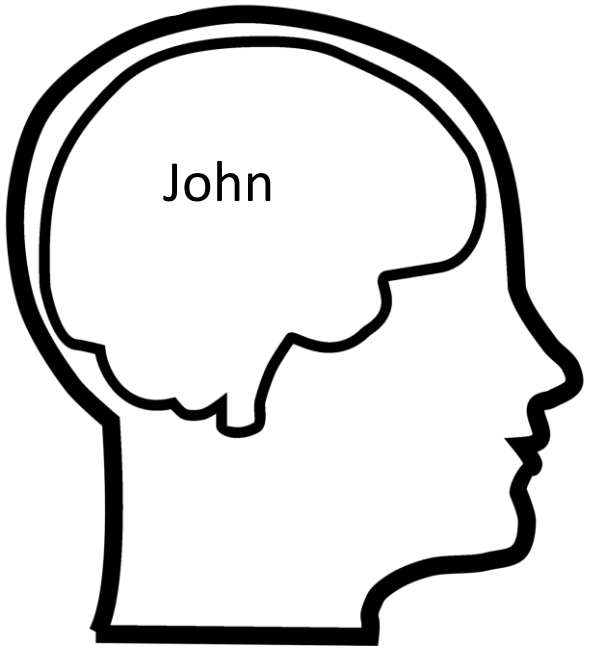
# Conclusions

- Why working memory?
  - How?
- Acquisition

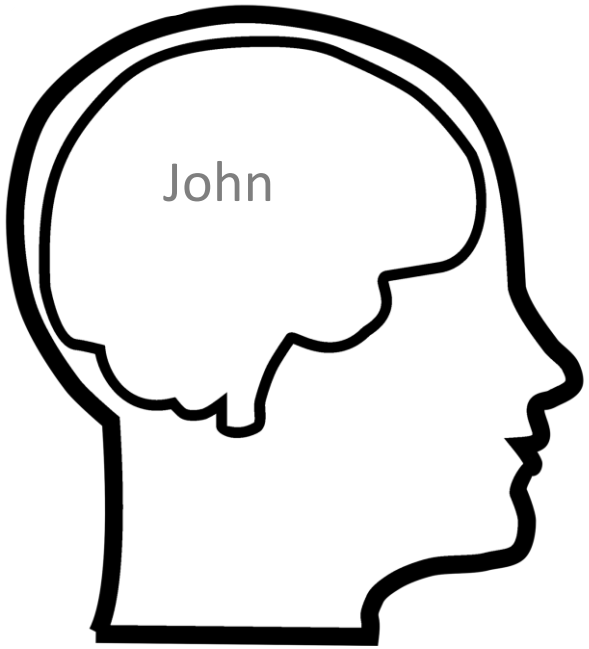
# How: adjunct control in real time

John



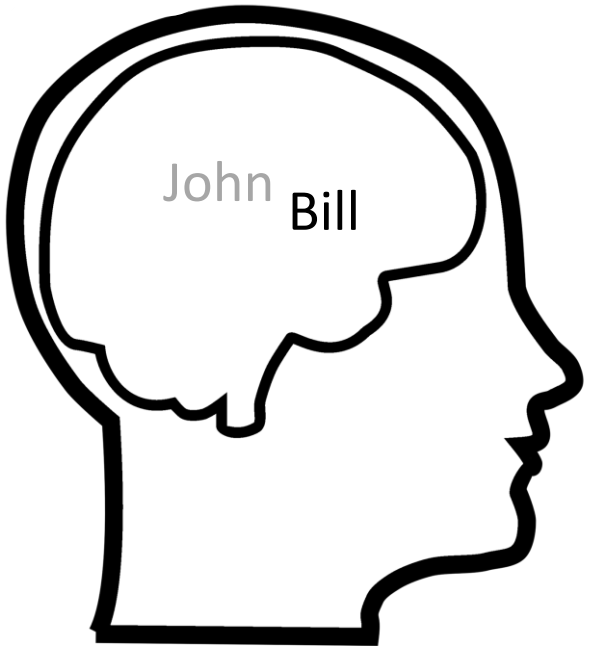
# How: adjunct control in real time

John called



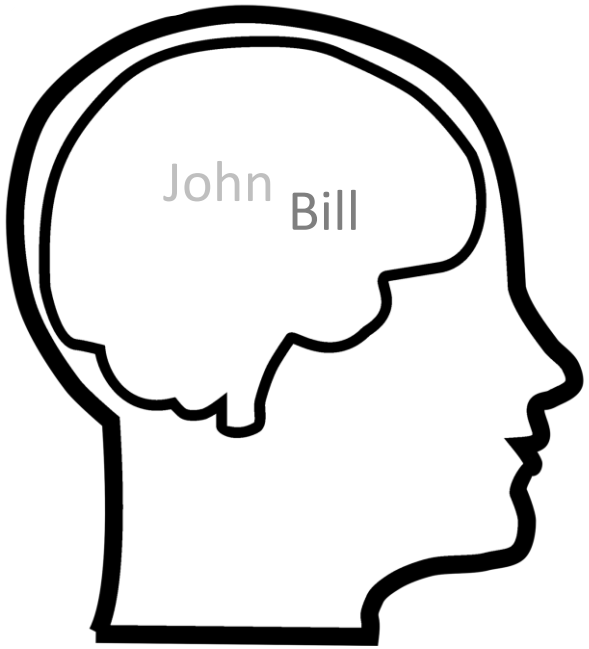
# How: adjunct control in real time

John called Bill



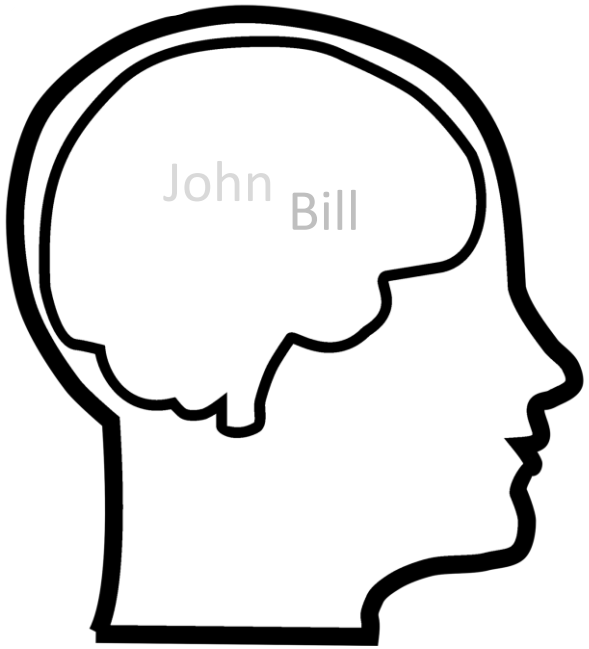
# How: adjunct control in real time

John called Bill after



# How: adjunct control in real time

John called Bill after leaving



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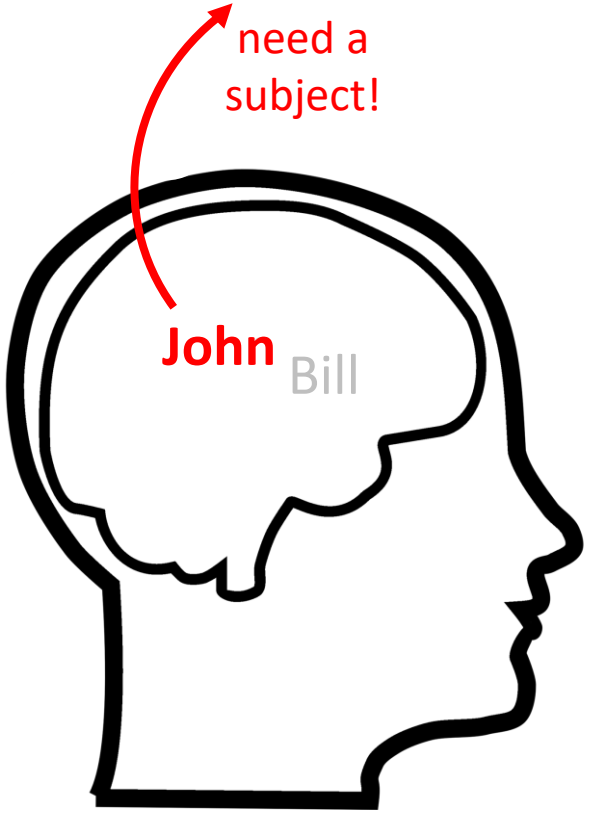
John called Bill after ___ leaving




Grammar: subject = ‘John’
interpretation: John left

# How: adjunct control in real time

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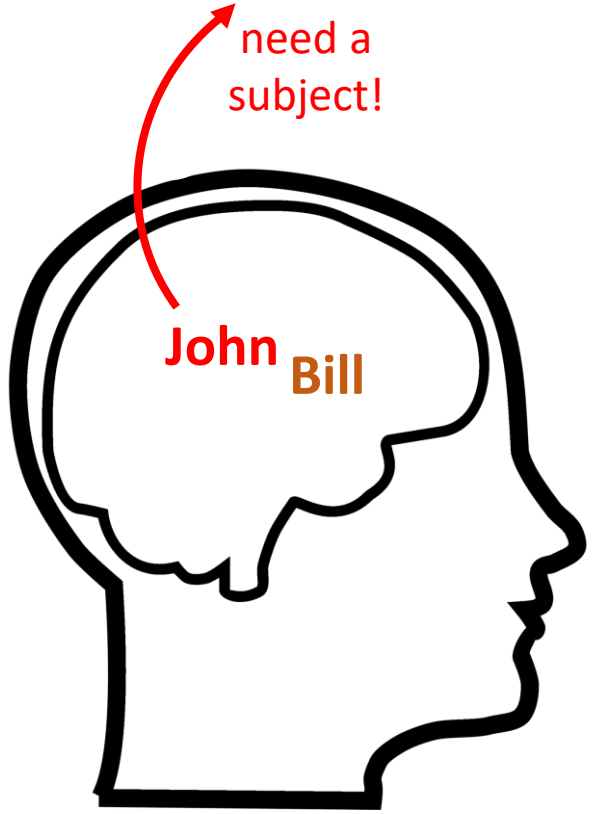



**To retrieve subject:**

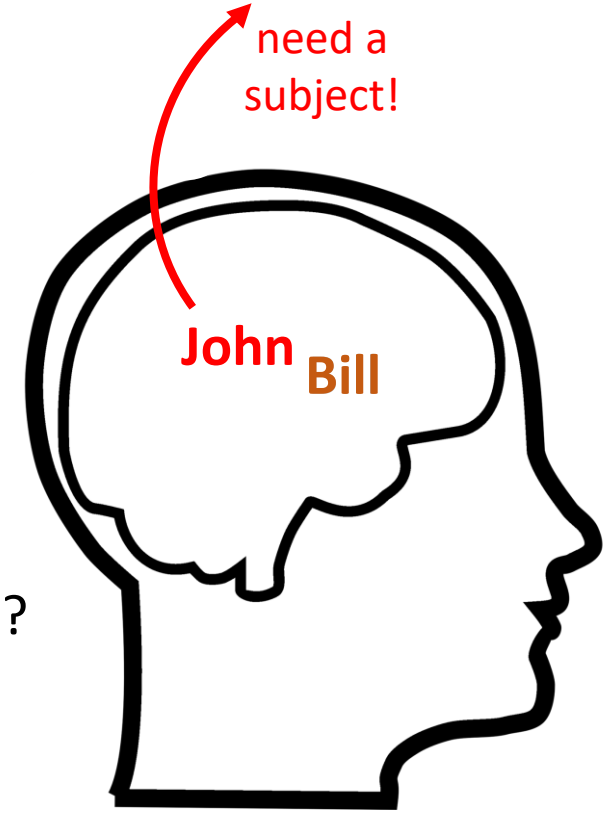
- missing subject
- "leaving" as cue
- activate *John*
  - not *Bill*

→ John left

Gerard et al (2017), Parker et al (2015), Gordon et al (2001, 2004)

# How: adjunct control in real time

John called Bill after ___ leaving

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**Encoding?**

**Next:**

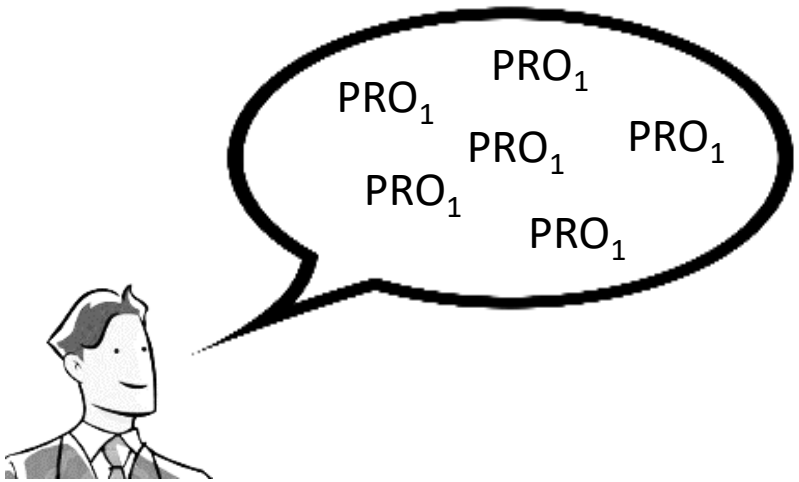
working memory + development?

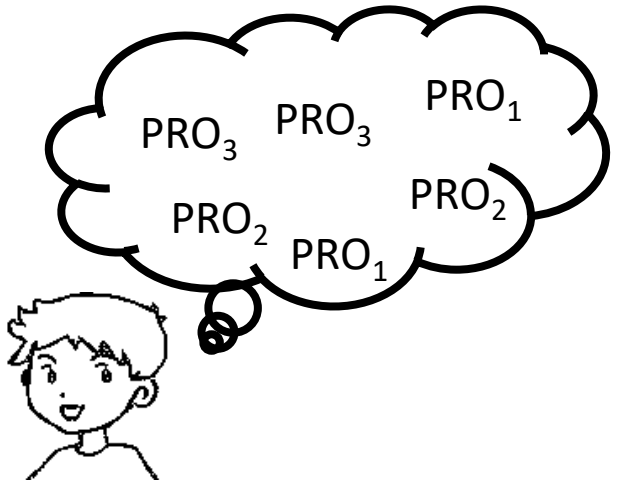
working memory + retrieval?

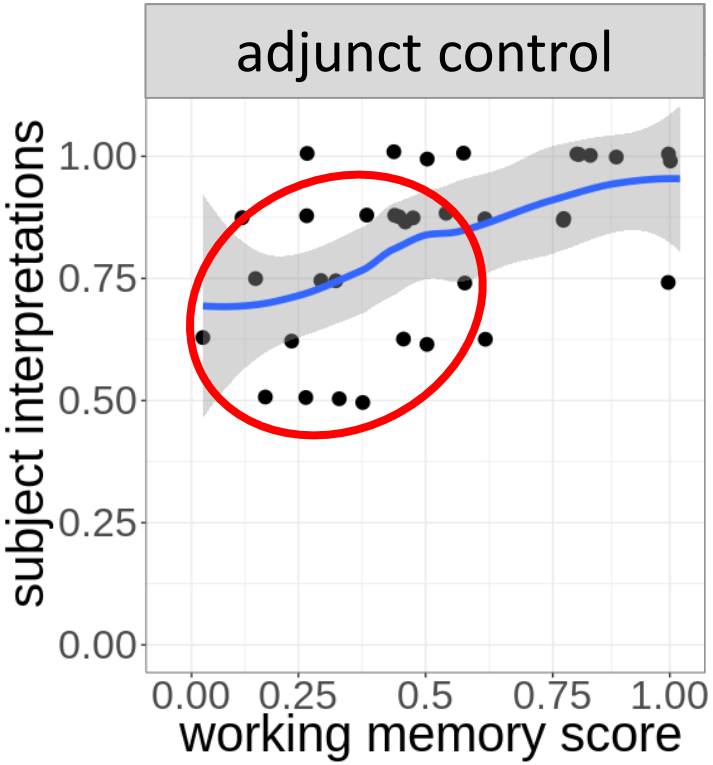
Courage & Cowan (2008)

# Acquisition

John$_1$ called Bill$_2$ after PRO leaving the store.




Fodor (1989)

# Acquisition

Linguistic input ≠ intake

1. Non-adult grammar —(specific) **input**→ adult grammar
2. Non-adult pragmatics —(specific) **input**→ adult pragmatics
3. Non-adult processing —processes develop→ adult processing
   **+ adult grammar**

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3. Non-adult processing **+ adult grammar** —processes develop→ adult processing

→ role of input?

Gerard (2021)

# Thank you!


- HSP conference organizers
- Ulster University Modern Languages and Linguistics
- Lookit
- ChildrenHelpingScience
- SciStarter
- Nuffield Research Placements
- Morgan Macleod


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