“It’s alive!”
Animacy-based structural predictions update with context

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Complicating animacy

- +/- animacy distinction is an oversimplification:
    - Languages that grammatically encode animacy may encode many levels
    - Polysemous words can have senses that differ in animacy
    - Inanimate objects are regularly anthropomorphized in common speech

Contextual animacy online

- Nieuwland & Van Berkum (2006):
  - With sufficient context, no mismatch penalty between real-world inanimate and animate argument

    `The psychotherapist advised {the yacht / the soldier}`

  - Penalty for a continuation that matches the real word meaning, rather than animacy-mismatch

    `The peanut was {salted / in love}`

Open questions

- What do these penalties reflect?
  - Updated representation of the entity
  - Re-encoding in memory
  - Updated predictions about lexical probability (see poster5, session 8b Nisene Marks)
  - Updated expectations about connections between NPs and structural positions?

- Can contextual information influence lower-level parsing decisions?

Animacy in language processing

- The robust ORC penalty is attenuated for inanimate RC heads
- Expectation-based explanation: animate RC heads lead to an expectation for SRCs over ORCs
    - Replicates production data
    - Relates to structural roles more commonly held by animates

(Traxler et al., 2002, 2005; Gennari & MacDonald, 2008; Lowder & Gordon, 2014, 2015; Wagers & Pendleton, 2016)

Research questions

If a noun is treated contextually as animate, but known in the real-world to be inanimate, will the parser update expectations on a structural level?

Will it lead to more expectations for SRCs?

Or are structural expectations dependent on a more stable lexical representation?

Hypotheses

Is the parser more likely to posit a subject RC gap for a contextual animate?

1. **Contextually sensitive animacy:** Contextual cues for animacy alter the representation of the entity that is recruited for parsing.
   → ORC penalty for contextual animates.

2. **Strict lexical animacy:** Animacy recruited for parsing is strictly lexical and contextually independent.
   → No ORC penalty for contextual animates.

Overview of design

Target sentence w/ RC, following biasing contexts

- Maze task, recording response times (RT) at each word
- Manipulating:
  - Pre-target-sentence context: cartoon, real-world (between subjects)
  - RC head: real-world animate, real-world inanimate (within subjects)
  - Target sentence structure: ORC, SRC (within subjects)
- 48 items, 74 subjects
- 48 fillers with contexts: ⅓ SRC, ⅓ ORC, ⅓ other, mixed animate/inanimate RC heads

Example Item

Cartoon Context:

In a recent episode of a television show about struggling restaurants, the host went to the kitchen of a local seafood restaurant and interviewed some of the employees: a chef, a bowl, and a plank of wood. Relationships among the employees were strained after a recent violent episode where the chef insulted the bowl, and the bowl tried to hit him in the face. The bowl was visibly upset when the host asked about what happened, and after a little bit of conversation, fists started flying again while the cameras were rolling. Even the host got involved in the fray.

Real-word Context:

In a recent episode of a television show about struggling restaurants, the host went to the kitchen of a local seafood restaurant and interviewed some of the employees: a chef, a server, and a social media intern. Relationships among the employees were strained after a recent violent episode where the chef insulted the server, and the server started throwing dishes. The server was visibly upset when the host asked about what happened, and after a little bit of conversation, dishware began being thrown at various faces again while the cameras were rolling. Even the host got involved in the fray.

ORC: It was tense when the { $\text{host}_{\text{RW-anim}}$ / $\text{bowl}_{\text{RW-inanim}}$ } that the chef struck __ in the kitchen fell onto the floor.

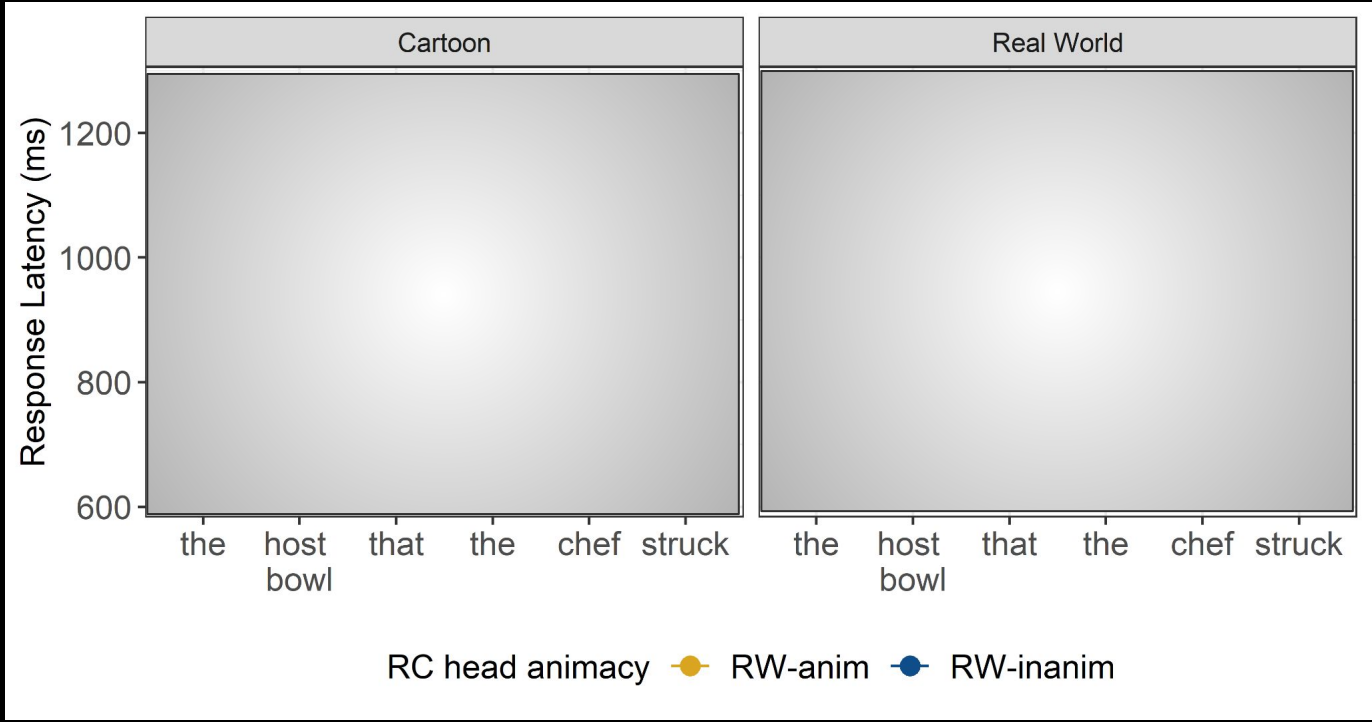
SRC: It was tense when the { $\text{host}_{\text{RW-anim}}$ / $\text{bowl}_{\text{RW-inanim}}$ } that __ struck the chef in the kitchen fell onto the floor.

Example Item

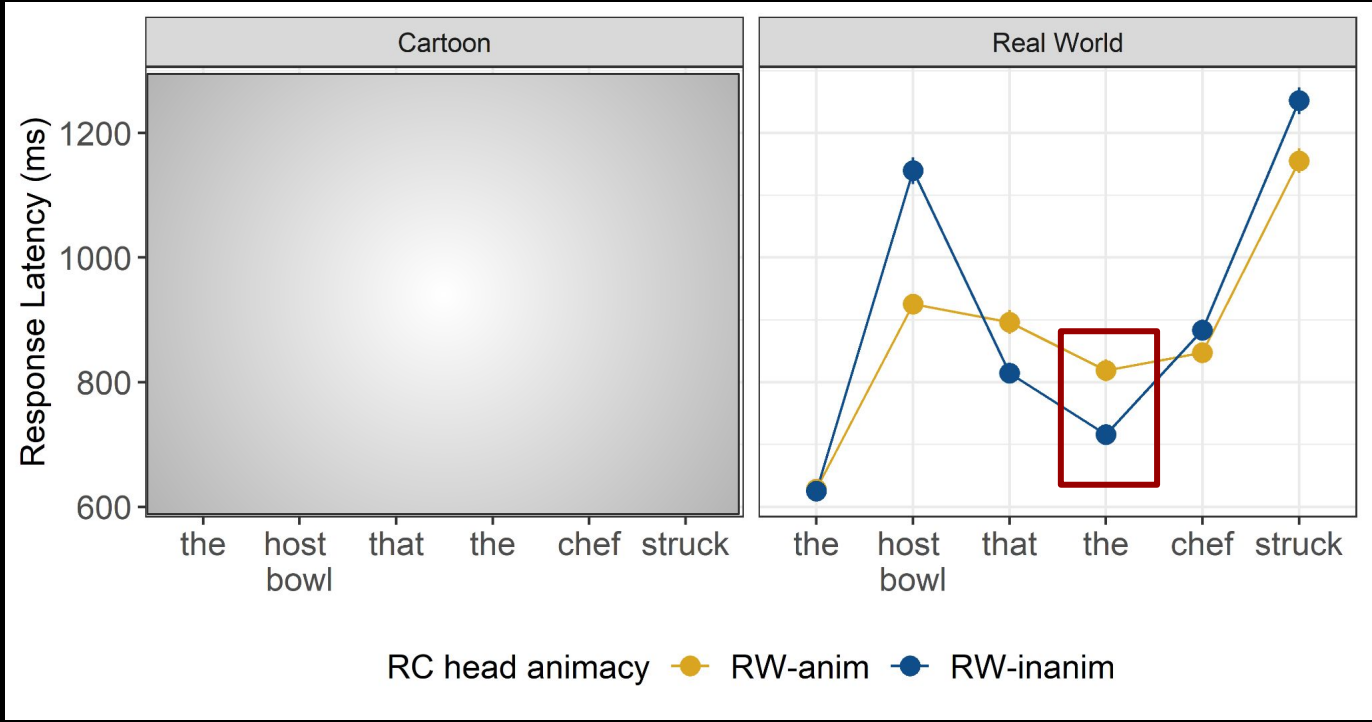
Cartoon Context:

In a recent episode of a television show about struggling restaurants, the host went to the kitchen of a local seafood restaurant and interviewed some of the employees: a chef, a bowl, and a plank of wood. Relationships among the employees were strained after a recent violent episode where the chef insulted the bowl, and the bowl tried to hit him in the face. The bowl was visibly upset when the host asked about what happened, and after a little bit of conversation, fists started flying again while the cameras were rolling. Even the host got involved in the fray.

Results


Cartoon
Real World
Response Latency (ms)
1200
1000
800
600
the
host
bowl
that
the
chef
struck
RC head animacy
RW-anim
RW-inanim

Results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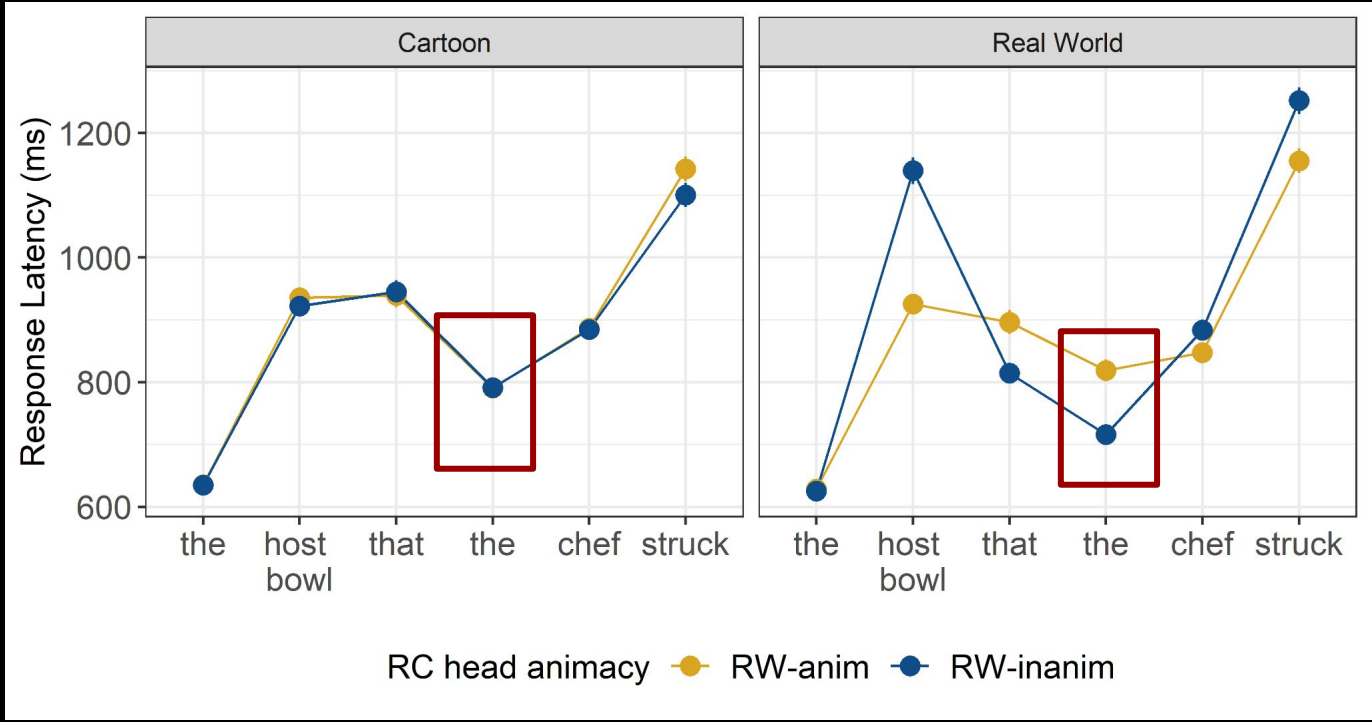
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Takeaways

- Animacy-based differences in processing collapse in the presence of anthropomorphizing context

- Contextually manipulating animacy affects more than just lexical expectations, structural expectations as well

Come talk to us more!

- More in depth discussion of the design and results across all regions
- Consequences of these results for theories of animacy and (RC) processing
- More examples of anthropomorphization
- More about the grant funding this work, NSF #2019804: *Animacy and resumption at the border of cognition and grammar*

… and whatever questions you have!

Thank you!

Extra slide links

- More in depth discussion of the design and results
  - Maze
  - Items
  - SRC + ORC, ORC only, sentence at a glance
- Consequences of these results
  - Our original hypotheses
- More examples of anthropomorphization, more on Nieuwland & Van Berkum, why we should care about animacy
- More about the grant funding this work, NSF #2019804: *Animacy and resumption at the border of cognition and grammar*

… and whatever questions you have!

Contextual animacy

But I wait for my car

She's getting her mani and pedi

"Is anyone gonna take the outside line? It looks like the Flash does, but is that going to be a slower pathway **for him, he's** gonna lose several spots over this."

Chloe Kim @ChloeKim · Jul 28, 2018

This is my Roomba. There is no cliff it was referring to the stairs in my room. We love a dramatic queen.

IROBOT now

Chloe requires your attention

Chloe is stuck near a cliff.

Animacy: not a binary concept

- Grammatical distinctions demonstrate more complex animacy distinctions than +/- animacy

  eg. Santiago Laxopa Zapotec, 4-way distinction: elder-human, non-elder human, animal and inanimate

- “Grammatically” inanimate objects can be treated as having agency (e.g. natural forces, Lowder & Gordon, 2015).

- Polysemous words may be animate or inanimate depending on their context

  The newspaper {fired the journalist / tore in half}.

Animacy: beyond grammar

- Possible to anthropomorphize inanimate objects
  - Children's TV + Adult Animation: many cartoons feature anthropomorphized objects

- Everyday attributions of agency or volition to inanimate objects
  - Anecdotal Evidence:
    - Seeing a tornado on the news → `"That guy's heading our way"`
    - Sharp/dangerous objects → `"That thing's out to get me"`
    - Appliances malfunctioning → `"My fridge was acting up"`

  - Affection and intimacy towards inanimate objects
    - Robots: intentionally anthropomorphized (Sung et. al. 2007)
    - Vehicles (boats, cars) often referred to with she/her pronouns
    - New in language today: "she" referring to a wider variety of inanimate objects
      [video of fresh-baked focaccia]: `"She's crispy outside. She's soft inside. She's a lil' spicy. I love this focaccia."`

Attenuating an animacy mismatch penalty

- Expected: animacy mismatch penalty for inanimate object of verb requiring animate arguments

Nieuwland & Van Berkum (2006)

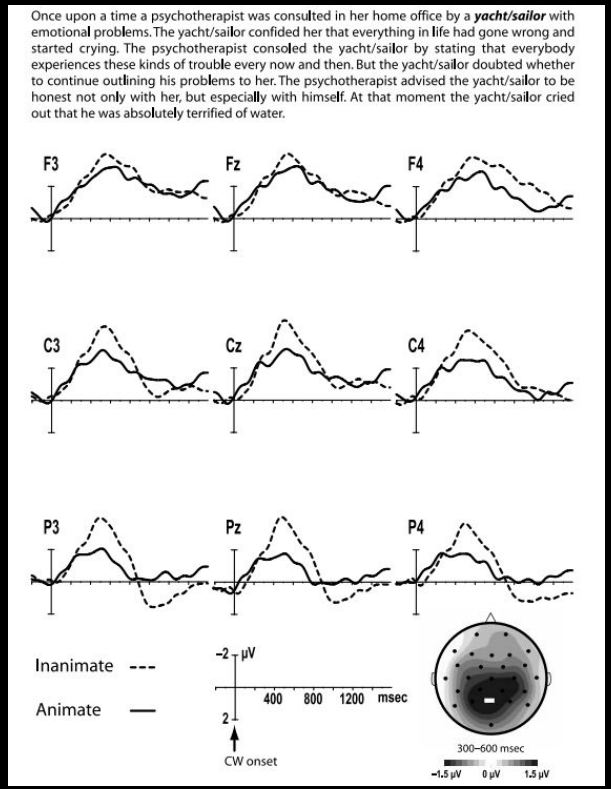
1 Once upon a time, a psychotherapist was consulted in her home office **by a yacht/sailor** with emotional problems.

2 The yacht/sailor confided in her...

3 The psychotherapist **consoled the yacht/sailor**...

4 But the yacht/sailor doubted...

5 The psychotherapist **advised the yacht/sailor** to be honest...



Attenuating an animacy mismatch penalty

- After 5 sentences of context, no N400 difference between yacht/sailor after “advised”

Nieuwland & Van Berkum (2006)

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2 The yacht/sailor confided in her...

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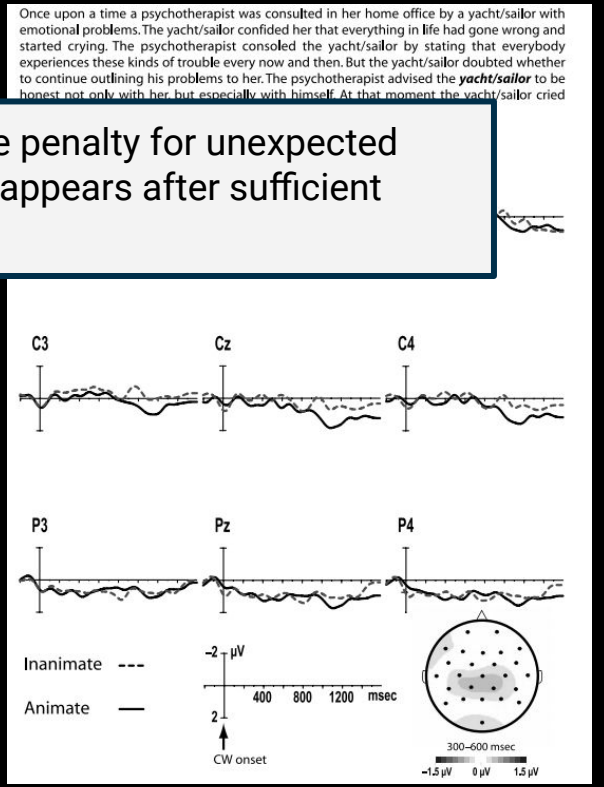
4 But the yacht/sailor doubted...

5 The psychotherapist **advised the yacht/sailor** to be honest...

Any baseline penalty for unexpected animacy disappears after sufficient exposure

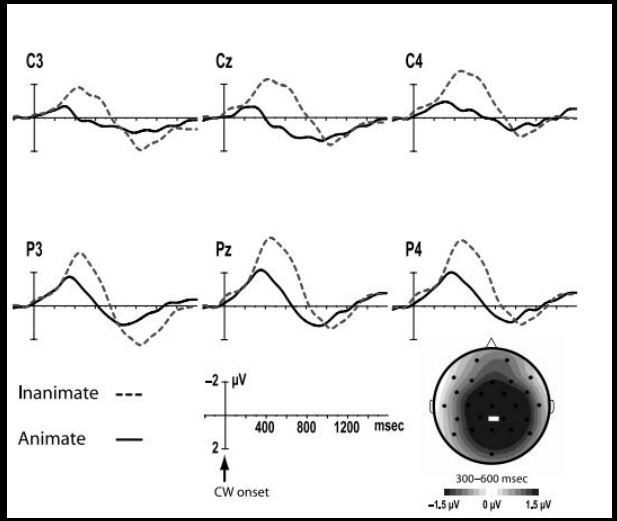


Anthropomorphizing inanimate objects:

- Animacy-mismatch effects not just subdued, but reversed
- Greater penalty for real-world consistent continuation (salted) than contextually appropriate continuation (in love)

Nieuwland & Van Berkum (2006)

A woman saw a dancing peanut who had a big smile on his face. The peanut was singing about a girl he had just met. And judging from the song, the peanut was totally crazy about her. The woman thought it was really cute to see the peanut singing and dancing like that. The peanut was ***salted / in love***, and by the sound of it, this was definitely mutual. He was seeing a little almond.



Lingering questions

1. What do the Van Berkum & Nieuwland studies reveal about incremental processing?
    - Interpreting the N400 is complicated…
    - Generally not considered to be an index of parsing/structural decisions.
    - What does it mean to accommodate?

2. Are people updating:
    - … expectations about event likelihood?
    - …how NPs are encoded wrt animacy?
    - …links between the NPs and likely structural positions?

Animacy in cognition

- Attention (New, Cosmides, Tooby, 2007)
  - Increased performance in visual change detection for animates
  - Animate nouns can detract from recall of an inanimate target

- Memory (Nairne et al., 2013)
  - Better recall of animate nouns
  - Interference in sentence comprehension on the basis of overlapping animacy cues

Hypotheses

Is the parser more likely to posit a subject RC gap for a contextual animate, enough so to observe an ORC penalty?

1. **Contextually sensitive animacy:** Contextual cues for animacy alter the representation of the entity that is recruited for parsing operations.
   → ORC penalty for contextual animates.

2. **Strict lexical animacy:** Animacy recruited for parsing is strictly lexical and contextually independent; contextual cues do not alter representation used during parsing.
   → No ORC penalty for contextual animates.

The Maze

Participants read the final sentence of each item one word at a time.

The first word is always given to them.

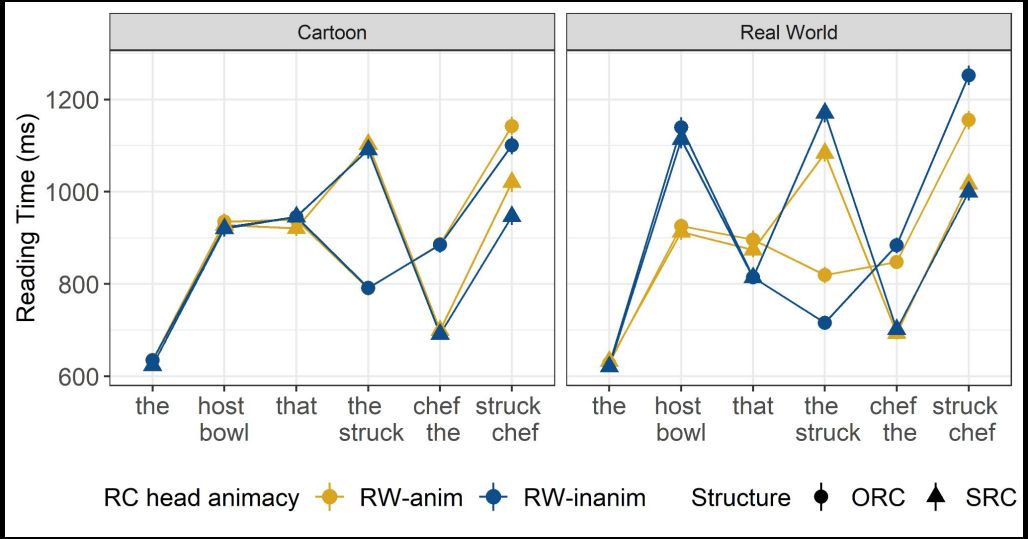
The Maze

Each successive position in the sentence is a choice between two words.

- Participants have to keep picking the correct continuation to continue through the sentence

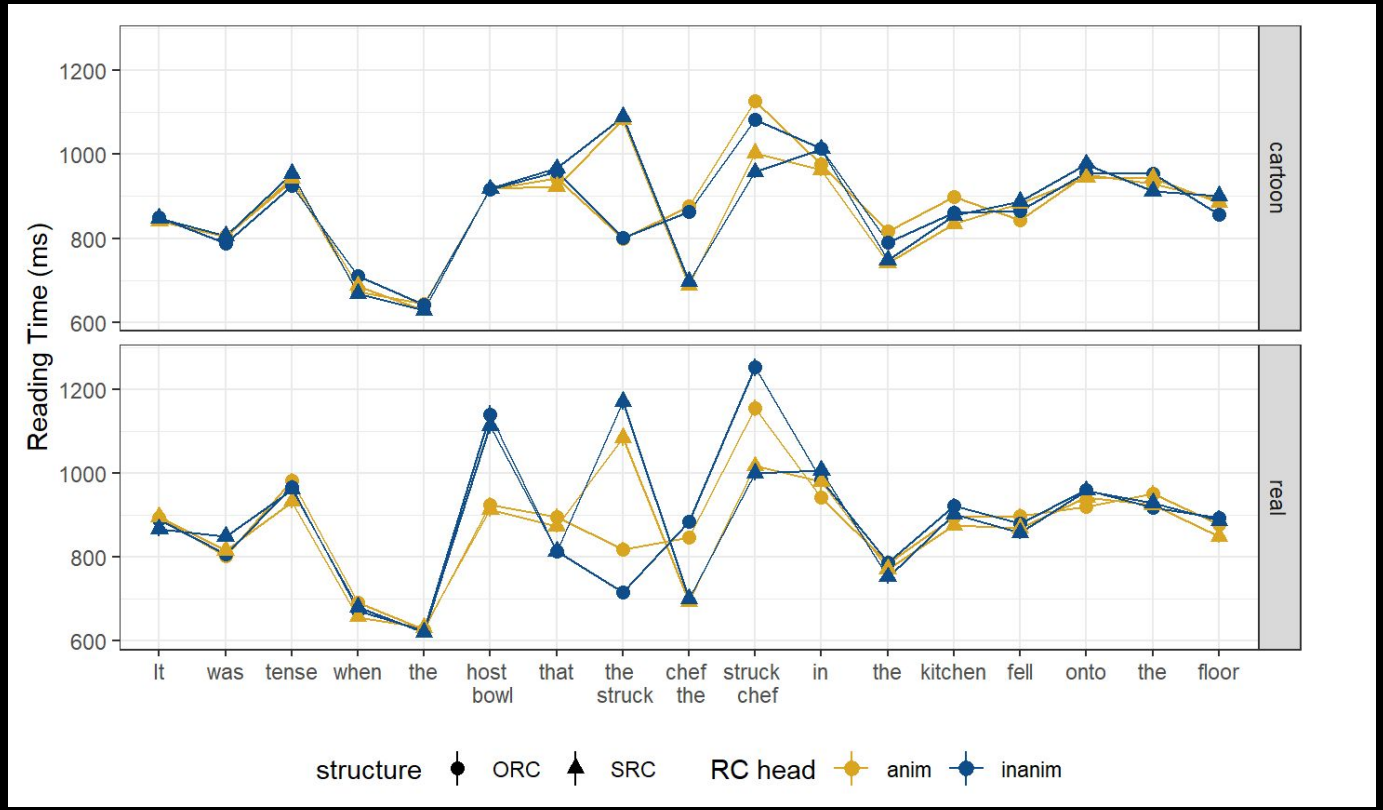
Results: SRC and ORC

- RC head:
  - Interaction: animacy x context, $t = 10.99$, $p < .001$
- Comp (*that*)
  - Interaction, animacy x context, $t = 5.23$, $p < .001$
- RC1
  - 3 way interaction, $t = 4.6$,
  - $p < .001$



	Animate	Inanimate
RC head length	6.33	6.36
RC head lgFreq	2.77	2.68

Results: full sentence



r/lab: Resumption and animacy at the border of cognition and grammar

Who are we?

We're a subgroup of r/lab [animacy, resumption + nominal features], a working group that falls under the NSF grant: **Resumption and animacy at the border of cognition and grammar**, awarded to Maziar Toosarvandani, Matt Wagers, and Ivy Sichel.

The grant proposes a line of research on the connection between resumptive pronouns and animacy, looking at a variety of languages, including Santiago Laxiopa Zapotec (4-way animacy system).

Connection to the grant?

We're interested in how cues to animacy are recruited online in sentence processing.