Alignment, Reanalysis & (Re-)encoding

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Investigations to date on verb-initial languages

- **Austronesian**
  - **Chamorro**
    Wagers, Borja & Chung, 2022; Chung & Wagers, 2021, Wagers, Borja & Chung 2018; Wagers, Borja & Chung 2015
  - **Tagalog**
    Tanaka 2016; Sauppe 2016; Pizarro-Guevara 2014; Pizarro-Guevara & Wagers 2020; Bondoc et al. 2019; Garcia et al. 2019
  - **Polynesian**
    Niuean: Longenbaugh & Polinsky 2016; Tollan & Heller, 2018
    Tongan: Ono et al. 2019, Otaki et al. 2021
  - **Formosan**
    Seediq: Sato et al. 2018, Ono et al. 2020, Yano et al. 2019
- **Oto-Manguean**
  - **Zapotec** (today)
- **Mayan**
  - **Kaqchikel** Kiyama et al. 2013; Koizumi et al. 2014; Yasunaga et al. 2015; Koizumi & Imamura 2016; Koizumi & Kim, 2016; et al.
  - **Tseltal** Norcliffe et al. 2015
  - **Chol, Q'anjob'al** Clemens et al. 2015

Ergativity

S/O Asymmetry

Voice Morphology

Word Order

Event Semantics

Have there been any consistent lessons?

- **Production**. Verb-initial clauses appear to be challenging to produce, compared to alternatives with an initial NP —
    - Perhaps because they require early processing of event representations (Norcliffe et al. 2015 for Tseltal; Sauppe 2016 for Tagalog)
    - In VOS clauses, there is a conflict between **linearization** (O > S) and the **accessibility of agents** (Ag > Pat) (Koizumi et al. for Kaqchikel; Bondoc et al., and Garcia et al. for Tagalog)
- **Comprehension.** Less to say yet specifically about verb-initiality.
    - Comprehension/production asymmetry? **SVO** is easier to produce, but **VOS** is easier to comprehend in Kaqchikel; the same may be true about **VSO** v. **VOS** in Tagalog

What could be special about verb-initial RC processing?

1. **N - V - N** will often be ambiguous

2. **Early verbs** = **early argument structure constraints**

3. **V-initial languages** are often constrained by **prominence hierarchies** that **regulate post-verbal argument realization** (Minkoff, 2000; cf. Clemens & Coon, 2018)

Today

The **N - V - N** configuration in V-initial languages and encoding interference

Can we find evidence for encoding interference in N - V - N configurations, of the sort familiar from N - N - V configurations?

1. **Defining encoding interference in N - N - V orders:**
    - When and why? New evidence from English
2. **Evidence from N - V - N orders**
    - Zapotec: gender/noun class
    - Chamorro: DP type or size

Part 1

Encoding interference
N - N - V

The reporter the politician the commentator met trusts said the president won’t resign.

Bever (1974)

The **reporter** the **politician** the **commentator met trusts said** the president won’t resign.

Bever (1974)

... nested constructions should become difficult to understand even when they are, in principle, within the capacity of a finite device, since **available memory (i.e., number of states) is clearly quite limited for real-time analytic operations** ... from these observations we are led to conclude that sentences of natural languages containing nested dependences **or self-embedding beyond a certain point should be impossible** for (unaided) native speakers to understand.

Miller & Chomsky (1963) Finitary models of language users. In R. Luce, R. Bush, E. Galanter, (Eds.) *Handbook of Mathematical Psychology, Vol II*. John Wiley.

The **reporter** the **politician** the **commentator met trusts said** the president won't resign.

Bever (1974)

The **reporter** the **politician** the **commentator met trusts said** the president won’t resign.

The **reporter everyone I met trusts said** the president won’t resign.

Bever (1974)

Memory interference during language processing

Gordon, Hendrick, & Johnson (2001) *et seq*

Experiment 1

ORC The **banker** that the **barber** praised climbed the mountain.

SRC The **banker** that praised the **barber** climbed the mountain.

Experiment 2

ORC The **banker** that **you** praised ...

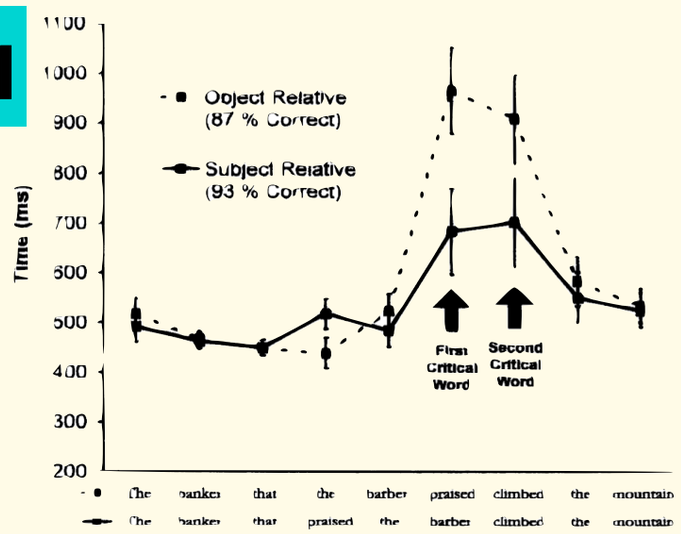
SRC The **banker** that praised **you** ...

Experiment 3

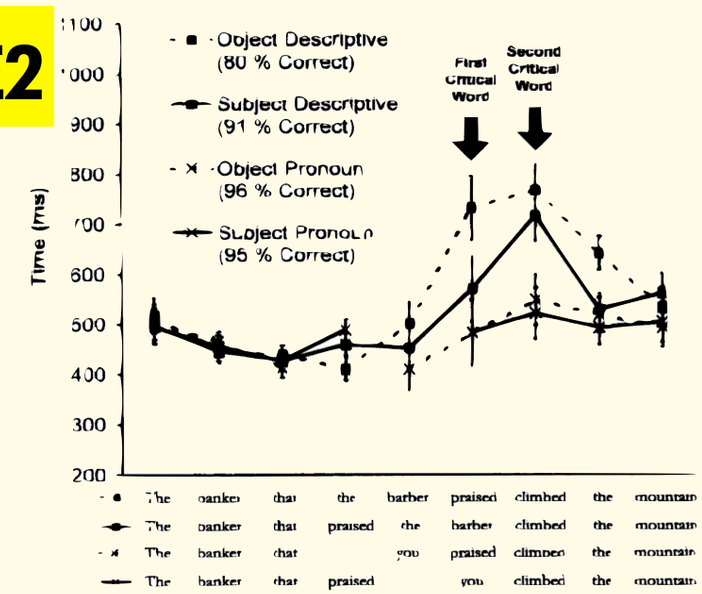
ORC The **banker** that **Ben** praised ...

SRC The **banker** that praised **Ben** ...

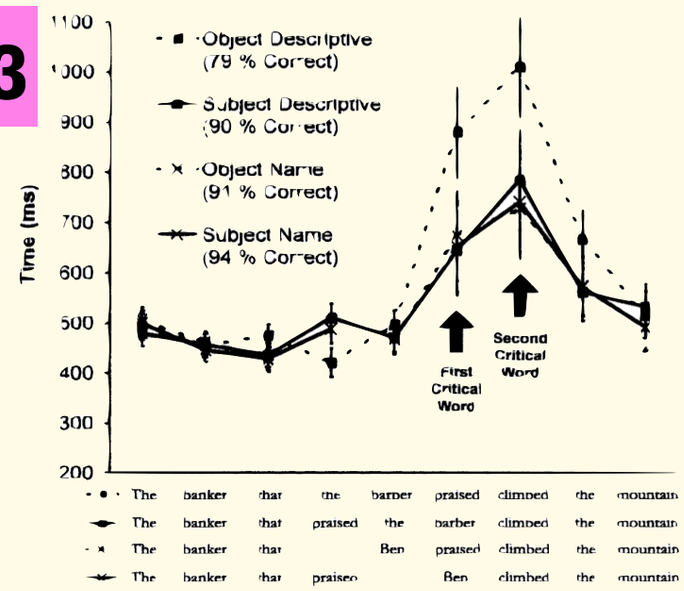
E1



E2



E3



RC × DP Match interactions

Reduced/eliminated ORC>SRC penalty when DPs mismatch

The parsing and semantic interpretation of a sentence **require** that **intermediate representations be held in memory and addressed during comprehension**.

Object-extracted constructions impose greater demands of this sort than do subject-extracted constructions because **they require that two NPs be stored and subsequently accessed while subject-extracted constructions do not**.

N - N - V

The different functions of those two NPs **are specified by the order** in which they appear in the sentence.

Memory for order information is impaired when items to be remembered are similar **because the similarity of the items causes interference in retrieving the order information** (Lewandowsky & Murdock, 1989; Murdock & Vom Saal, 1967; Nairne, 1990)

Why?

Gordon, Hendrick, & Johnson (2001), p. 1420

Villata, Tabor & Franck (2018) for Italian gender (and English number). Belletti et al. 2012 for Hebrew gender

Given the classes of NPs that we have contrasted (descriptions, names, and pronouns), possible sources of similarity-based interference exist on both **syntactic** and **semantic** levels of representation. Possible syntactic features of NPs that could contribute to similarity include **gender, number**, **case** and **person**. Other syntactic correlates that distinguish names and pronouns from descriptions could also provide a basic of similarity[^fn].

[^fn]: For example, on one syntactic analysis, a description has two distinct morphemes for the specifier (determiner) position and the common noun position, whereas proper names and pronouns only have a single morpheme for these two syntactic classes.

Gordon, Hendrick, & Johnson (2001), p. 1422

CASE
Lewis & Nakayama (1999); Uehara & Bradley (2002); cf. Miyamoto (2002); Vasishth (2003)

ANIMACY
Gennari & MacDonald (2008); cf. Wagers & Pendleton (2016); McCloskey (2017), Ness & Meltzer-Asscher (2019) ++++++

PERSON
× Maybe not: Clothier-Goldschmidt & Wagers (2017)

Memory interference during language processing

Villata, Tabor, & Franck (2018); Italian gender

TABLE 1 | Example of item in the four experimental conditions of Experiment 1.

Experimental conditions	
Masculine object	
Match (MM)	Il/ballerino/che/il/cameriere/ha/sorpreso/beveva/un/cocktail/alcolico *The/dancer-MASC/that/the/waiter-MASC/has/surprised-Ø/drank/a/cocktail/with alcohol*
Mismatch (MF)	Il/ballerino/che/la/cameriera/ha/sorpreso/beveva/un/cocktail/alcolico *The/dancer-MASC/that/the/waiter-FEM/has/surprised-Ø/drank/a/cocktail/with alcohol*
Feminine object	
Match (FF)	La/ballerina/che/la/cameriera/ha/sorpreso/beveva/un/cocktail/alcolico *The/dancer-FEM/that/the/waiter-FEM/has/surprised-Ø/drank/a/cocktail/with alcohol*
Mismatch (FM)	La/ballerina/che/il/cameriere/ha/sorpreso/beveva/un/cocktail/alcolico *The/dancer-FEM/that/the/waiter-MASC/has/surprised-Ø/drank/a/cocktail/with alcohol*

Memory interference during language processing

Villata, Tabor, & Franck (2018); Italian gender

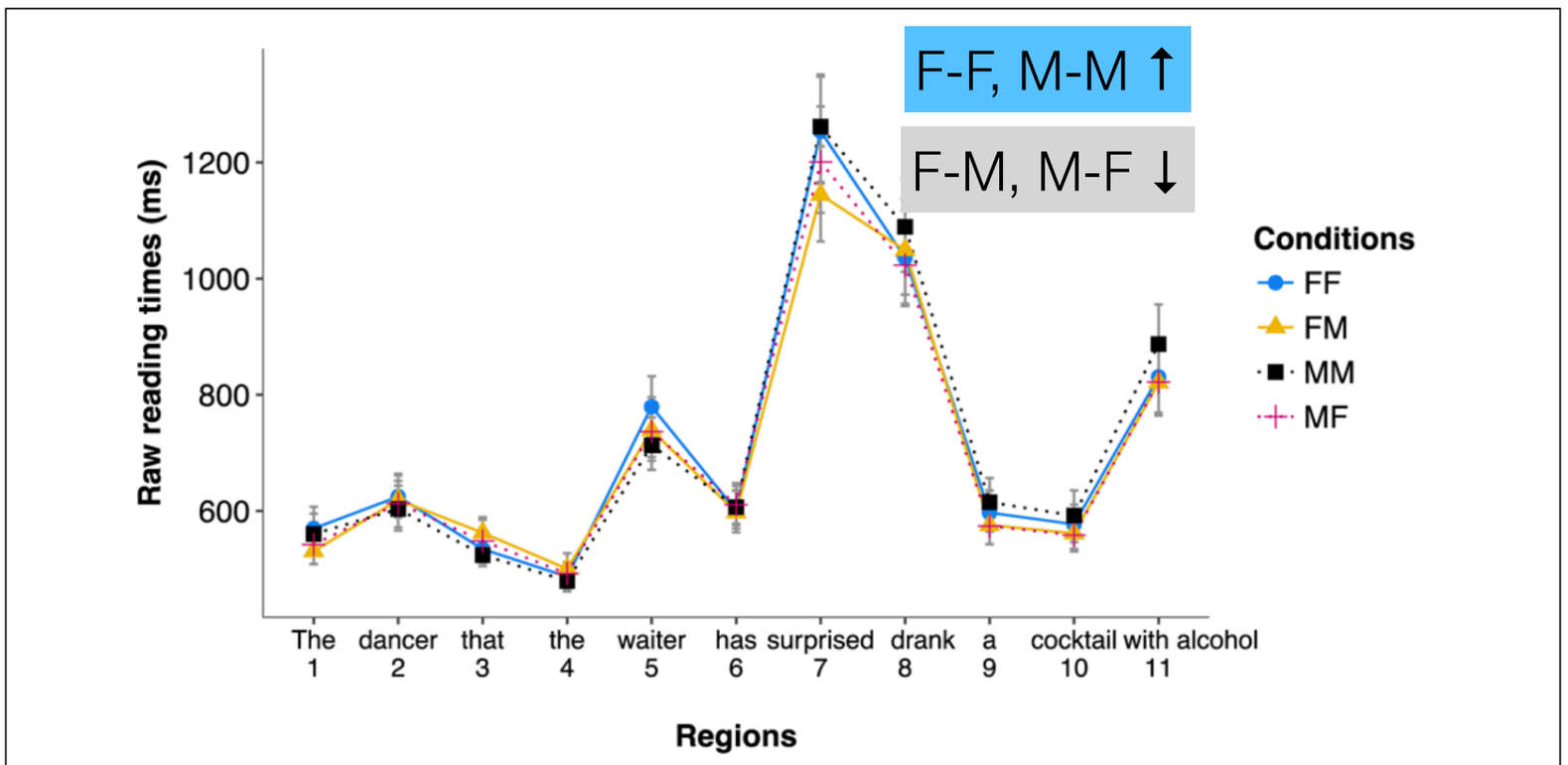


FIGURE 1 | Distribution of reading times (in ms) in the four experimental conditions for the different regions of Experiment 1 (correct trials only).

Region 7 (*surprised*). Results attested to a significant effect of gender match ($\beta = 0.031$, $SE = 0.014$, $t = 2.253$, $p = 0.025$), with faster reading times for mismatch conditions ($M = 1197$ ms) than match conditions ($M = 1316$ ms). No other effect was significant ($t_s < 1$).

Region 8 (*drank*). No effect was significant ($t_s < 1$).

Region 5 (*waiter*). Results attested to a marginally significant effect of the gender of the object ($\beta = -0.020$, $SE = 0.010$, $t = -1.921$, $p = 0.068$), attesting to longer reading times at the second noun phrase region for feminine objects ($M = 763$ ms) than for masculine objects ($M = 728$ ms). Further models attested that this difference was entirely driven by the condition with two feminine noun phrases, which had marginally significant longer reading times as compared to the condition with two masculine noun phrases ($\beta = -0.053$, $SE = 0.028$, $t = -1.901$, $p = 0.057$), while all other conditions were on a par.

No other effect was significant ($t_s < 1$).

Where do similarity effects come from?

INTERFERENCE FROM ENCODING AND RETRIEVAL

Two "memory-based" mechanisms: **encoding** and **retrieval**

Retrieval

$$P(M_i \mid Q_j) = \frac{s(Q_j, M_i)}{\sum_i^N s(Q_j, M_i)}$$

← **Match** between the **CUE** and the **MEMORY**

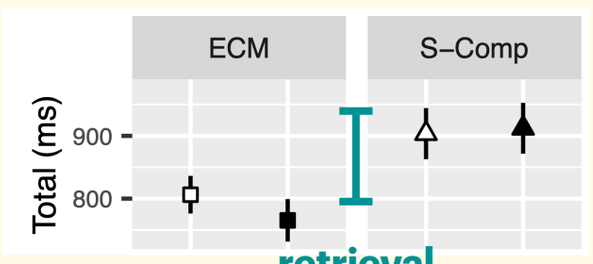
← **Selectiveness** of **CUE** for the **MEMORY**

Optimal:

A **strong**, **unique** cue

Nairne (1990, 2007)

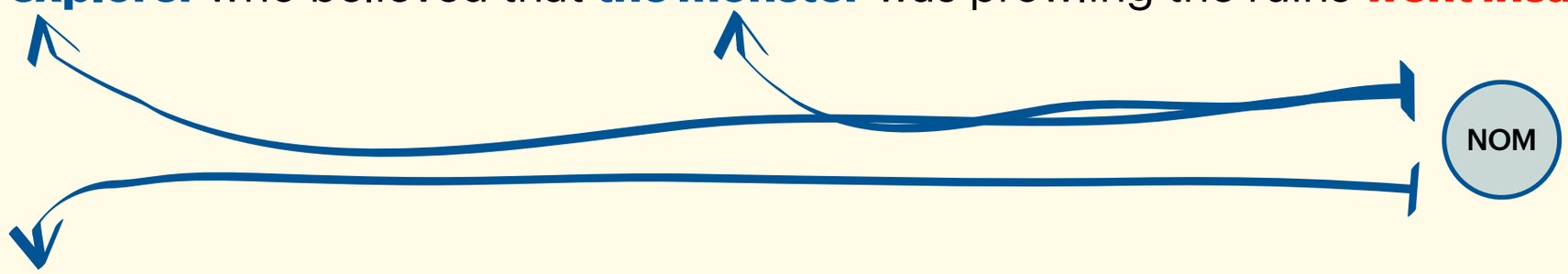
Arnett & Wagers (2017)
cf. Van Dyke & Lewis (2003)
Et seq.



retrieval interference

S-COMP

the explorer who believed that **the monster** was prowling the ruins **went insane** ...



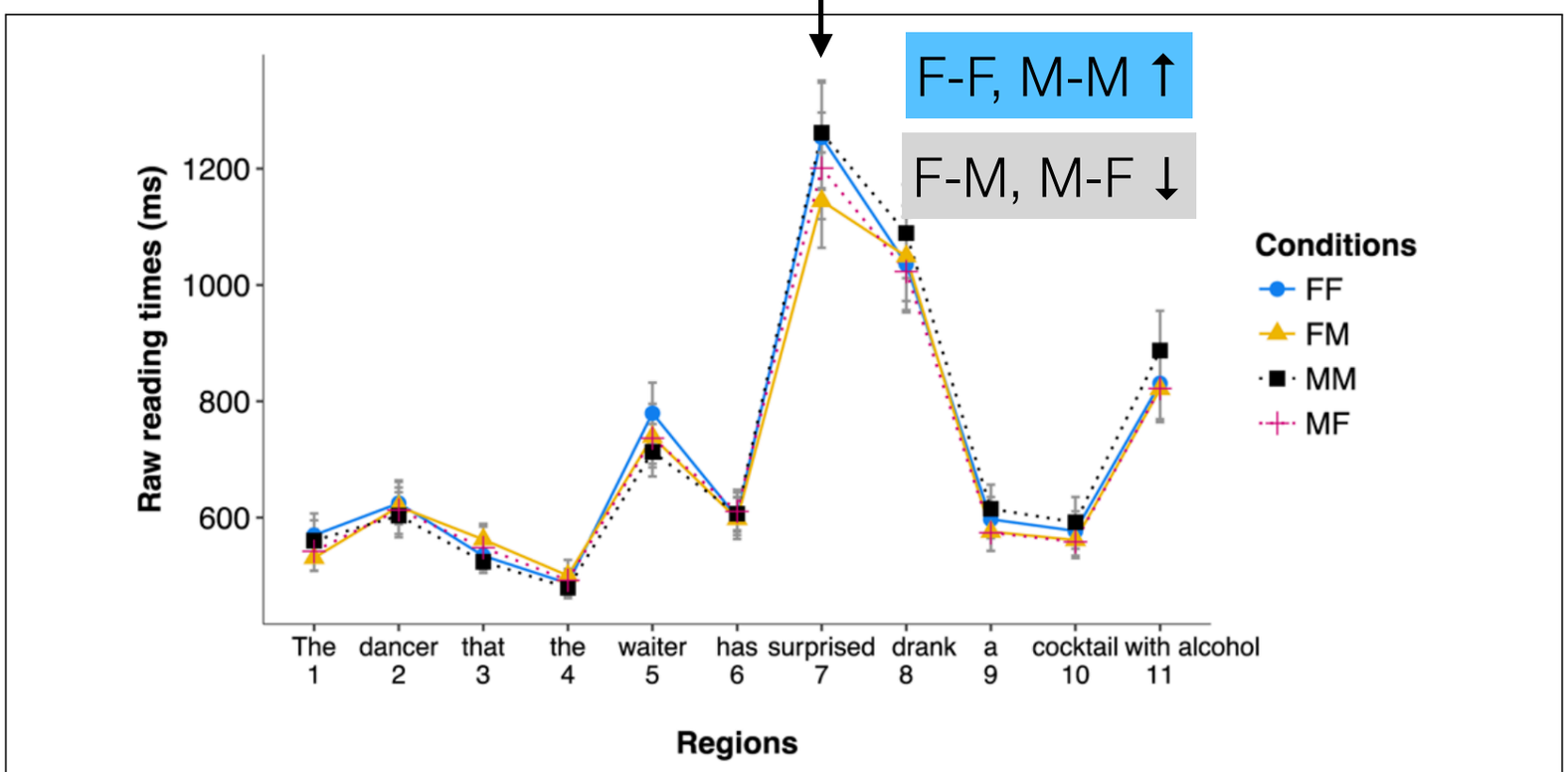
the explorer who believed **the monster** to be prowling the ruins **went insane** ...

ECM

Memory interference during language processing

Villata, Tabor, & Franck (2018); Italian gender

No plausible gender-related cue in these sentences



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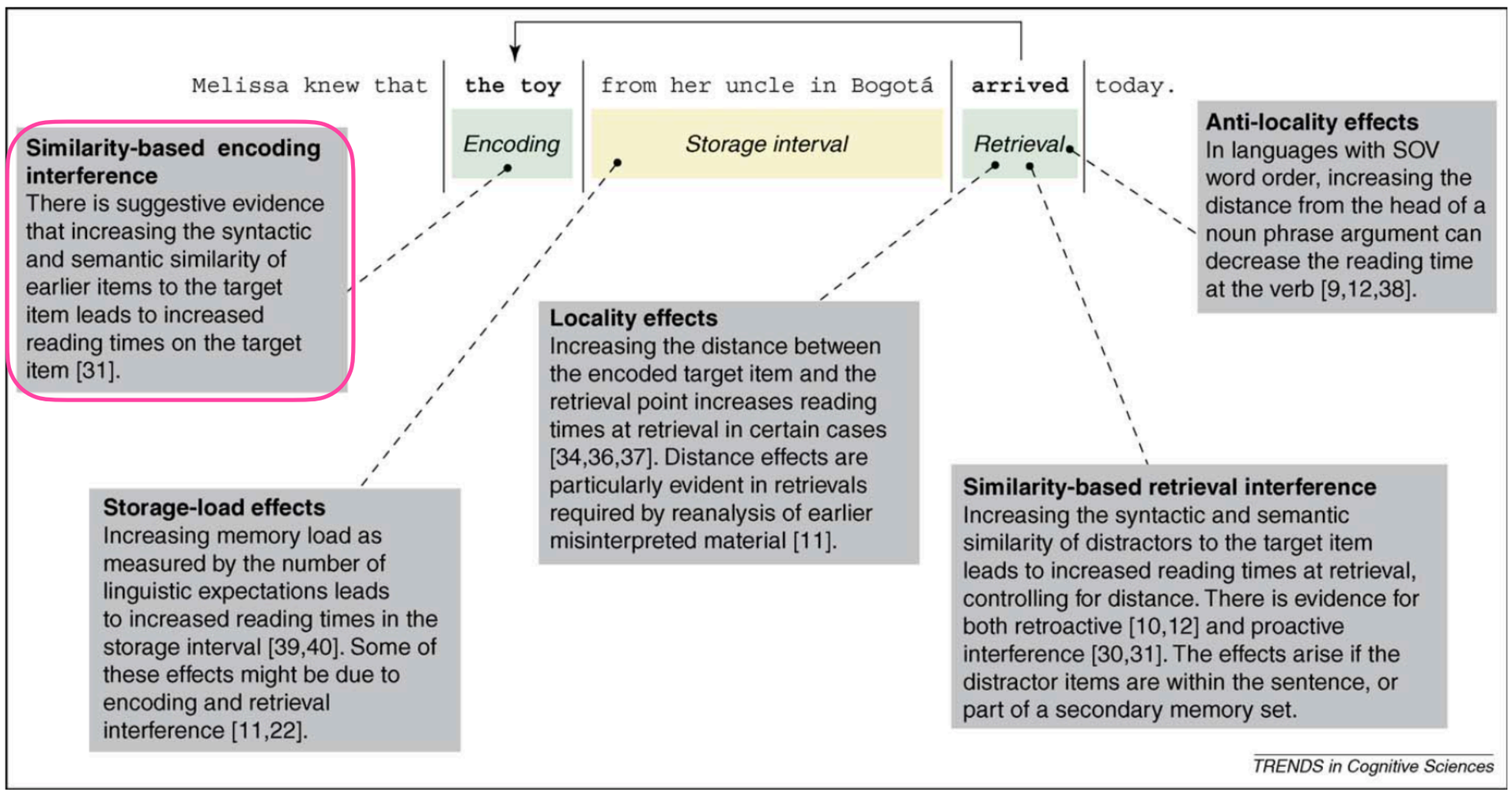

Figure 1. Recent empirical work investigating incremental structure building in sentence processing can be usefully summarized in terms of distinct effects on the working memory processes of encoding, storage and retrieval. The figure illustrates the three processes with a simple example, showing the encoding of a subject noun-phrase, '*the toy*', and its later retrieval at the associated verb, '*arrived*'. See the text and Box 1 for more detail about the nature of the encoded and retrieved structures. Abbreviation: SOV, subject-object-verb word order.

Lewis, Van Dyke, & Vasishth (2006)

The parsing and semantic interpretation of a sentence **require** that **intermediate representations be held in memory and addressed during comprehension**.

Object-extracted constructions impose greater demands of this sort than do subject-extracted constructions because **they require that two NPs be stored and subsequently accessed while subject-extracted constructions do not**.

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Why?

Gordon, Hendrick, & Johnson (2001), p. 1420

Similarity can help and it can hurt
Ex.: Oberauer, Ferrell, Jarrold, Pasiecznik & Greaves (2012)

- Participants memorized lists of words, with the goal of recalling **targets** which were either phonologically similar or dissimilar to **distractors** that followed them.
  - **baff daff haff vame rame pame nidd jidd gidd** SIMILAR
  - **baff jaab maab vame zegg yegg nidd vipe yipe** DISSIMILAR
- Better recall of targets - <u>in the right order</u> - for similar lists! cf. Oberauer, 2009, for a related effect for semantic similarity
- … but similar lists also led to more ***intrusions*** for immediately adjacent ***distractors***

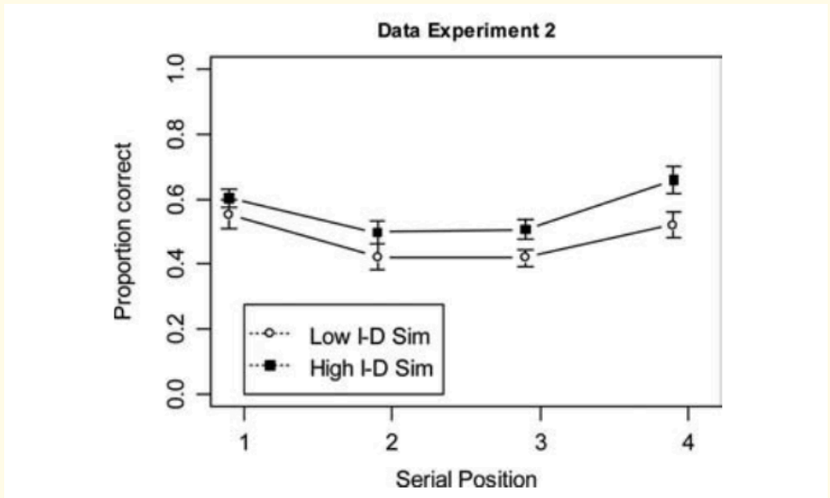
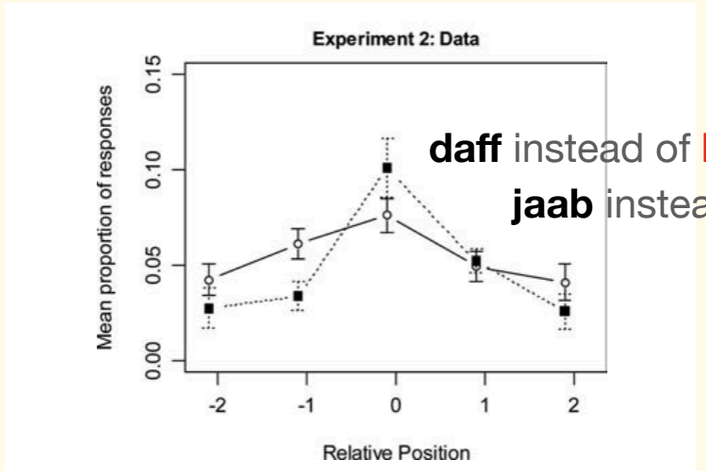


Figure 3. Serial position curves for high and low item–distractor similarity (I-D Sim), Experiment 2. Top: predictions from simulations with SOB-CS (serial order in a box–complex span); bottom: experimental data. Error bars are 95% confidence intervals for within-subject comparisons.

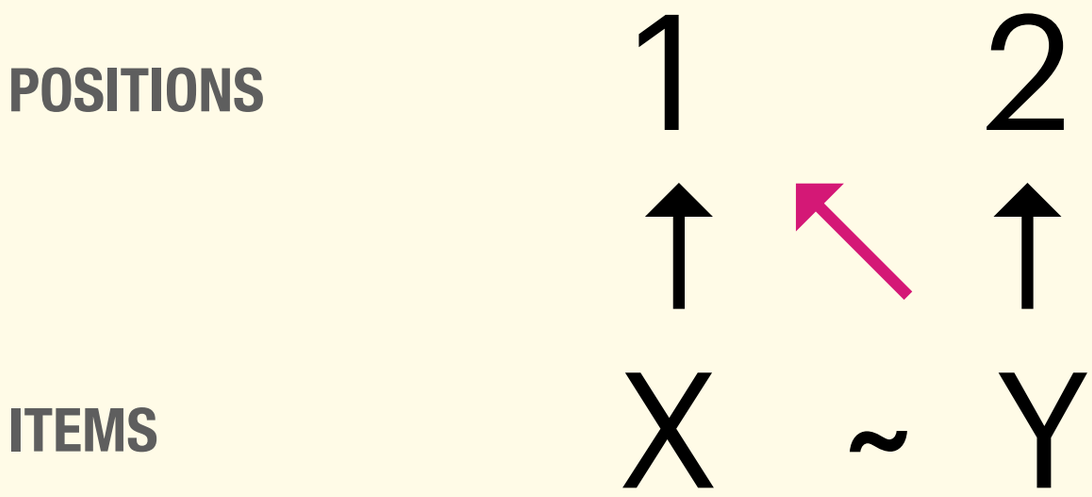


daff instead of **baff** >>
jaab instead of **baff**

Figure 4. Relative position plots for selection of distractors, Experiment 2. Each data point reflects the proportion of responses that were distractors from five input positions defined relative to the current position of recall. For each relative position, proportions of responses are averaged across all output positions for which that relative position exists. Error bars are 95% confidence intervals for within-subject comparisons. I-D Sim = item–distractor similarity.

Similarity can help and can hurt

Ex.: Oberauer, Ferrell, Jarrold, Pasiecznik & Greaves (2012)

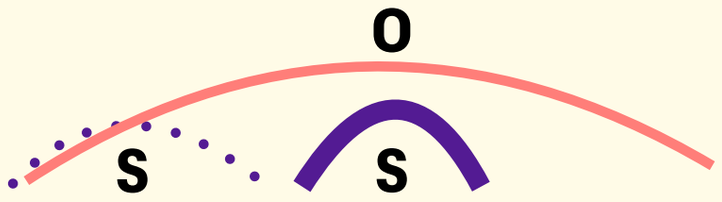


Important assumption:
Items get associated with preceding positions

SUPERPOSITION EFFECT (Ferrell & Lewandowsky, 2002)
Y effectively contributes some of its features to the preceding position.
If X and Y are similar, this will **strengthen** the **binding of content to context: <X,1>**

FEATURE OVERWRITING (Nairne, 1990; Oberauer & Kliegl, 2006)
Shared features get “overwritten”, **weakening** the **content of X or Y.**

Applying to ORCs …



ORC **The banker** that **the barber** praised climbed the mountain.

SRC **The banker** that praised **the barber** climbed the mountain.

			ORC	
POSITIONS	1	2	S	O
	↑ ↖	↑	↑ ↖	↑
ITEMS	X	~ Y	DP_2	~ DP_1
			ENHANCED (‘barber’)	**DEGRADED** (‘banker’)

Hypothesis: Reanalysis is the culprit, not linear order per se
DP_1 (‘banker’) is effectively associated with two syntactic positions (S, O). As a consequence, it “loses” its shared features to actual subject, DP_2 (‘barber’)

Encoding interference damages representations

Rich & Wagers (2020)

- Manipulate **Similarity** and **Contiguity** of matrix subject **DP1** and embedded **DP2** in a complex sentence.

- Measure reading times when **DP1** must be integrated with **TP1**

DP$_1$	[**DP$_2$**	**TP$_2$**]	**T$_1$ V$_1$ Adv$_1$**	**VP$_1$**
the knife that	the **sword** **HI**	was placed near	**had been recently**	sharpened
	the **stick** **MED**			
	the **shirt** **LO**			

Similarity of DP1 ~ DP2

More similar **DP2** degrades **DP1**

DP1 integration

(no arg structure cues)

RTs ~ quality of DP1

Encoding interference damages representations

Rich & Wagers (2020)

DP2 contiguous with DP1

DP$_1$	**[DP$_2$**		**TP$_2$]**	**T$_1$ V$_1$ Adv$_1$**	**VP$_1$**
the knife that	the **sword**	**HI**	was placed near	**had been recently**	sharpened
	the **stick**	**MED**			
	the **shirt**	**LO**			

DP2 discontiguous with DP1

DP$_1$	**[T$_2$ V$_2$ P$_2$**	**DP$_2$]**		**T$_1$ V$_1$ Adv$_1$**	**VP$_1$**
the knife that	– was placed near	the **sword**	**HI**	**had been recently**	sharpened
		the **stick**	**MED**		
		the **shirt**	**LO**		

Encoding interference damages representations

Rich & Wagers (2020)

Similarity

(by LSA cos θ)

Contiguous encoding | **Discontiguous**

HI Similarity: knife ~ sword

LO Similarity: knife ~ shirt

RT (ms)

480
440
400
360
320
480
440
400
360
320

been recently sharpened spill | been recently sharpened spill

LSA
(-0.07, 0.08]
(0.08, 0.22]
(0.22,0.77]

UCSC
N_{SUBJ} = 64

Prolific
N_{SUBJ} = 48

N_{ITEM} = 42

Data collected during COVID-19 pandemic

Summary (Part 1)

- How two DPs interact during sentence processing is determined by their similarity
  - When DPs are similar *and* dynamically associated to the same position, this can lead to **enhancement** of the "winning" binding but **degradation** of one of the DPs.
  - Rich & Wagers (2020) document the downstream effects of the degradation
- No general theory (yet) of which features matter for similarity
  - Some formal features do, like **gender** & **number**; others don't (**person**).
  - **DP "size"** also seems to matter. More on that later …
- **BUT,** so far, encoding interference has been shown in **N - N - V** configurations, when multiple nouns proceed the verb.
  - **Is there encoding interference in N - V - N configurations?**
  - In principle, possible if there is reanalysis (or the attachments are competitive)

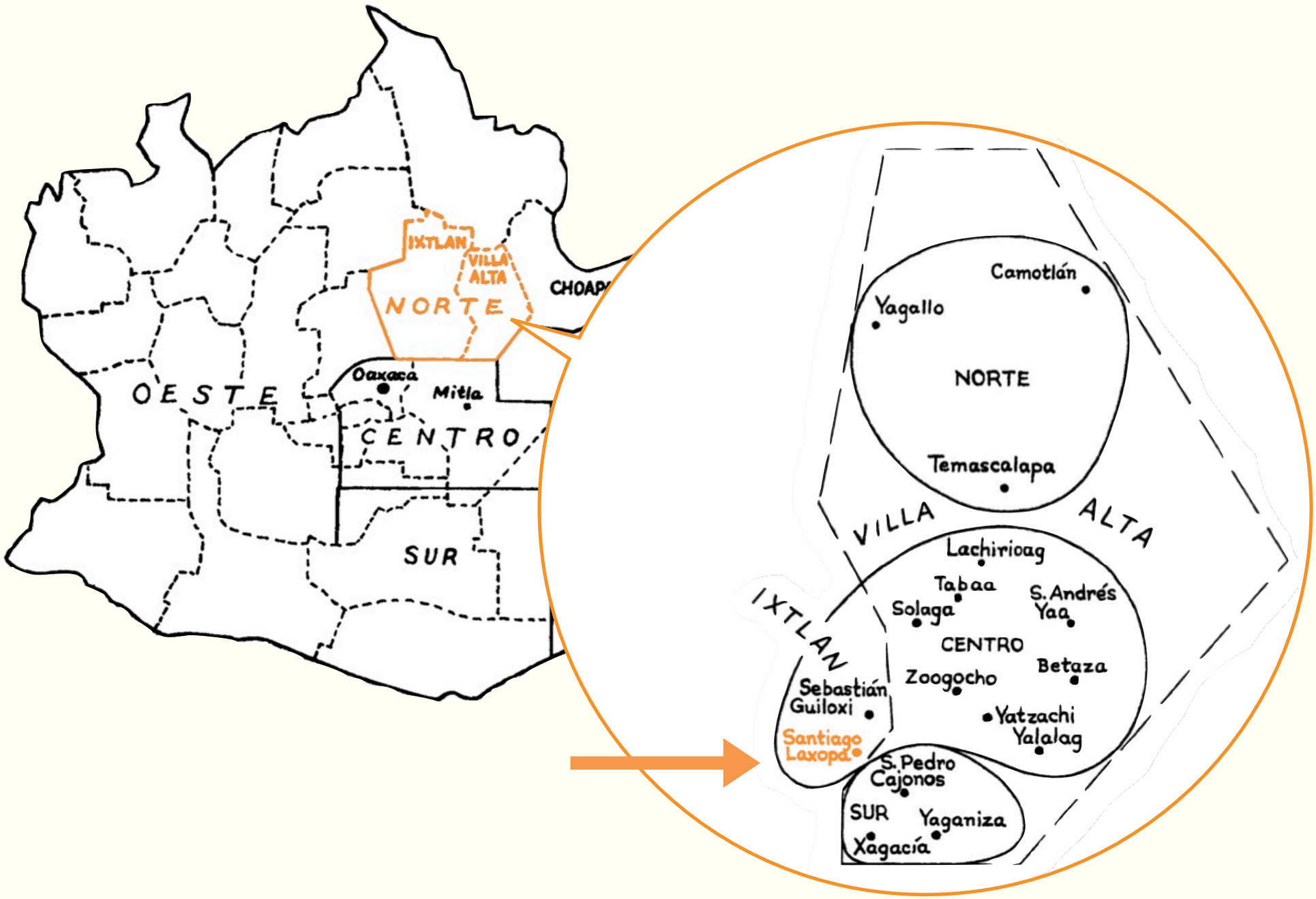
Part 2

Encoding interference
N - V - N

RC processing

In verb-initial languages

Santiago Laxopa Zapotec (SLZ)



SLZ in a nutshell

1. **Rigidly VSO**:
   V-N-N is <u>un</u>ambiguous

2. **Movement creates ambiguity**:
   N-V-N: gap in SUBJ or OBJ position

3. There are **resumptive pronouns** (RPs)

- which look like regular pronouns:
- … SUBJ pronouns obligatorily cliticize on verb
- … OBJ pronouns cannot cliticize across NP subject
- therefore, **can potentially disambiguate**

1: Rigid VSO word order

	Verb	Subject	Object
(1)	Tsyill	bene’ nu’ulhe=nh	bene’ xyage’=nh.
	pinch.CONT	*CL woman=DEF*	*CL man=DEF*

‘The woman is pinching the man.’

NOT ‘The man is pinching the woman.’

Adler, Foley, Pizarro-Guevara, Sasaki, & Toosarvandani (2018)

2: Movement creates ambiguity

Head noun | Relative clause

(2) Shlhe'eyd=a' bene' nu'ulhe=nh tsyill bene' xyage'=nh.

see.CONT=1SG CL woman=DEF pinch.CONT CL man=DEF

'I see the woman that __ is pinching the man.'

OR 'I see the woman that the man is pinching __.'

N	V	__	NP	**SRC**
N	V	NP	__	**ORC**

2: Movement creates ambiguity

	Subject or Object	Verb	Subject or Object
(3)	Bene’ nu’ulhe=nh	tsyill	bene’ xyage’=nh.
	CL *woman=DEF*	*pinch.CONT*	*CL* *man=DEF*

‘*THE WOMAN* is pinching the man.’

OR ‘The man is pinching *THE WOMAN*.’

3: Pronouns

Resumptive pronouns (RPs) can eliminate ambiguity.

Subject RPs must be clitics, and object RPs cannot cliticize across a subject DP.

Head noun | Relative clause

(4) Shlhe'eyd=a' bene' nu'ulhe=nh | tsyill=**e'** bene' xyage'=nh.

see.CONT=1SG CL woman=DEF | *pinch.CONT=**3EL*** *CL man=DEF*

'I see the woman that she is pinching the man.'

~~'I see the woman that the man is pinching her.'~~

N [V=*pro* NP]

✓**SRC**

✗**ORC**

How do SLZ comprehenders parse RCs?

- Picture-matching experiments to probe the comprehension of RCs
- N = 105 speakers, living in Santiago Laxopa; auditory presentation
- Sentence types: **ambiguous** (gap), **subject RPs** and **object RPs**

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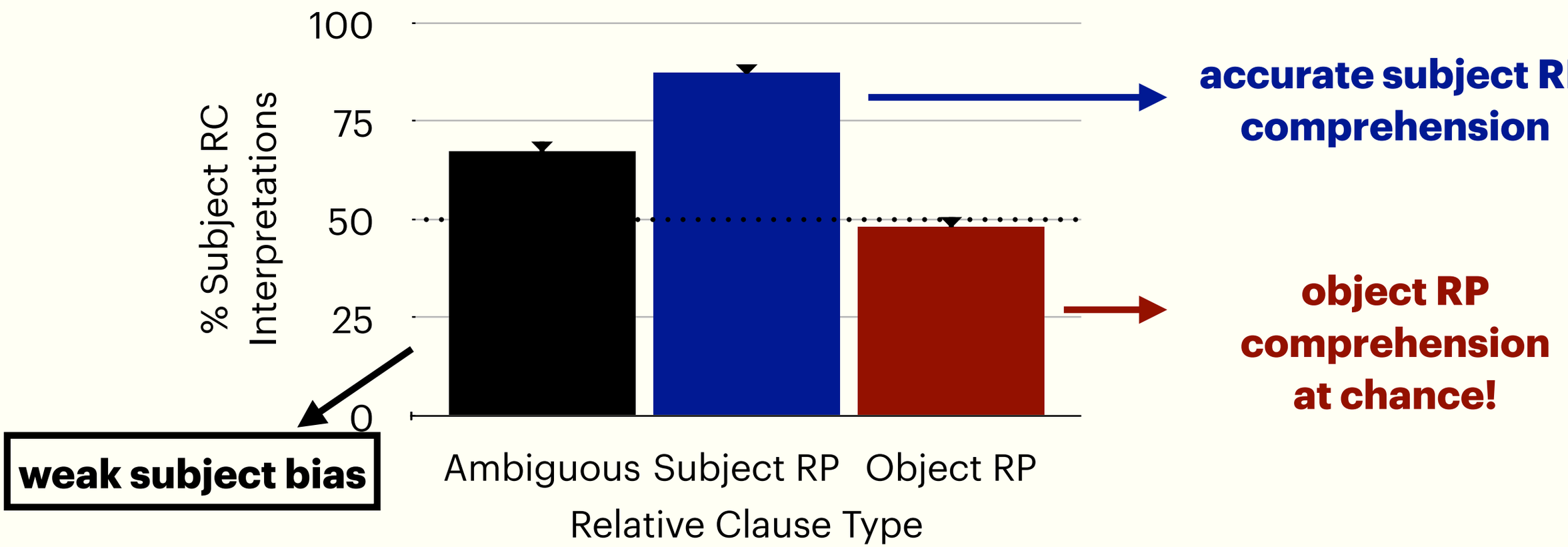
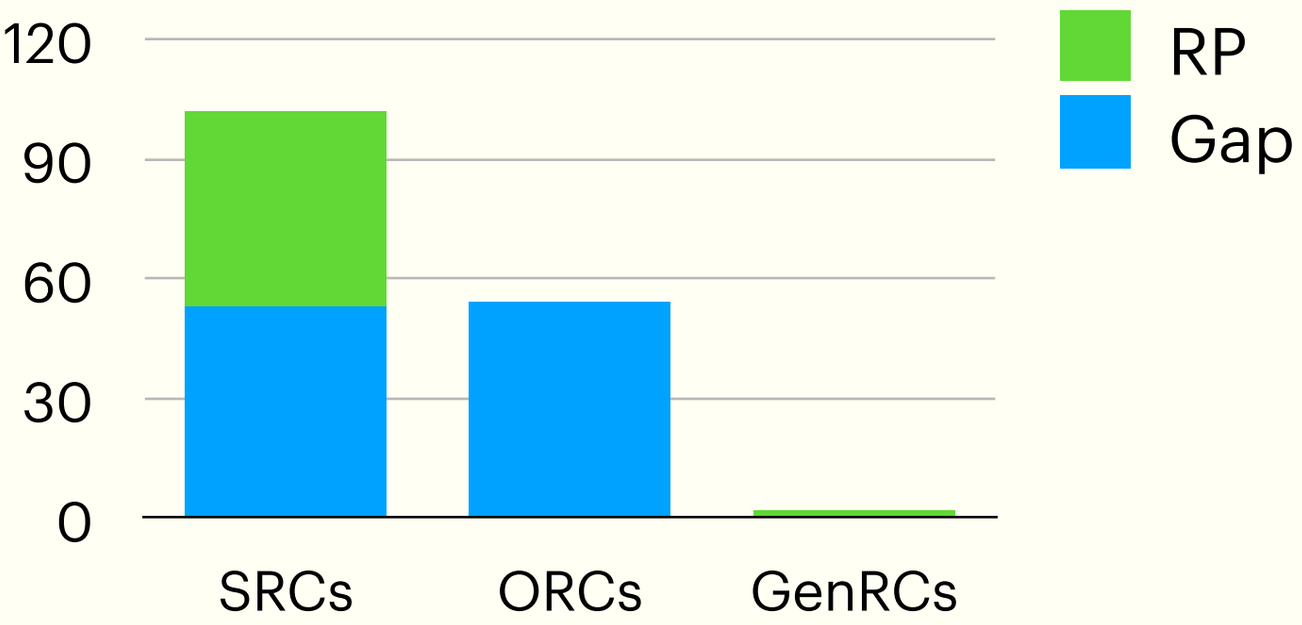


Why are object RPs so hard?

Suggestive observation from Foreman & Munro (2007):
In Macuiltianguis Zapotec (MacZ), **object RPs** – and only object RPs – are **unacceptable** in MacZ — a typologically remarkable claim; cf. Keenan & Comrie, 1977

Plumb (2017) adds to this by showing that, in a historical variety, there are 0 attested object RPs (Colonial Valley Zapotec, CVZ; historical, 16th-19th C. corpus)



Plumb (2017), adapted from Table 1,
“Resumptive pronoun attestation in CVZ”

Why are object RPs so hard?

Foreman & Munro (2007):
Object RPs – and only object RPs – are **unacceptable** in Macuiltianguis Zapotec (**MacZ**)
(this is a typologically remarkable claim; cf. Keenan & Comrie, 1977)

A parsing constraint is proposed to account for this:
immediately post-verbal NPs are parsed as subjects if they satisfy the verb's selectional requirements.

We will call it **V<SUBJ**

Thus, in MacZ, there is a kind of constructional competition:

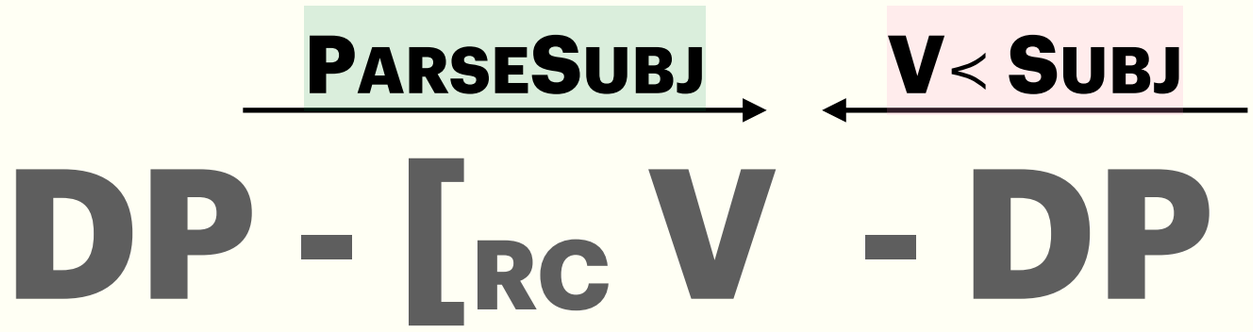
… NP-only RCs receive a default ORC interpretation

… and subject RPs are frequently used to achieve SRCs

What is happening moment-by-moment??

Foreman & Munro's **V<SUBJ** parsing principle for MacZ is not strictly *incompatible* with there being an alternative principle — **PARSESUBJ** — to interpret RC fillers as subjects.

It will cause conflict whenever the the post-verbal subject is a full DP.
And our weak subject bias initially suggests **PARSESUBJ** IS SLIGHTLY FAVORED in that competition.



Any evidence for an early **PARSESUBJ** principle?

One important consequence of PARSESUBJ: object RPs will often trigger (or follow) reanalysis

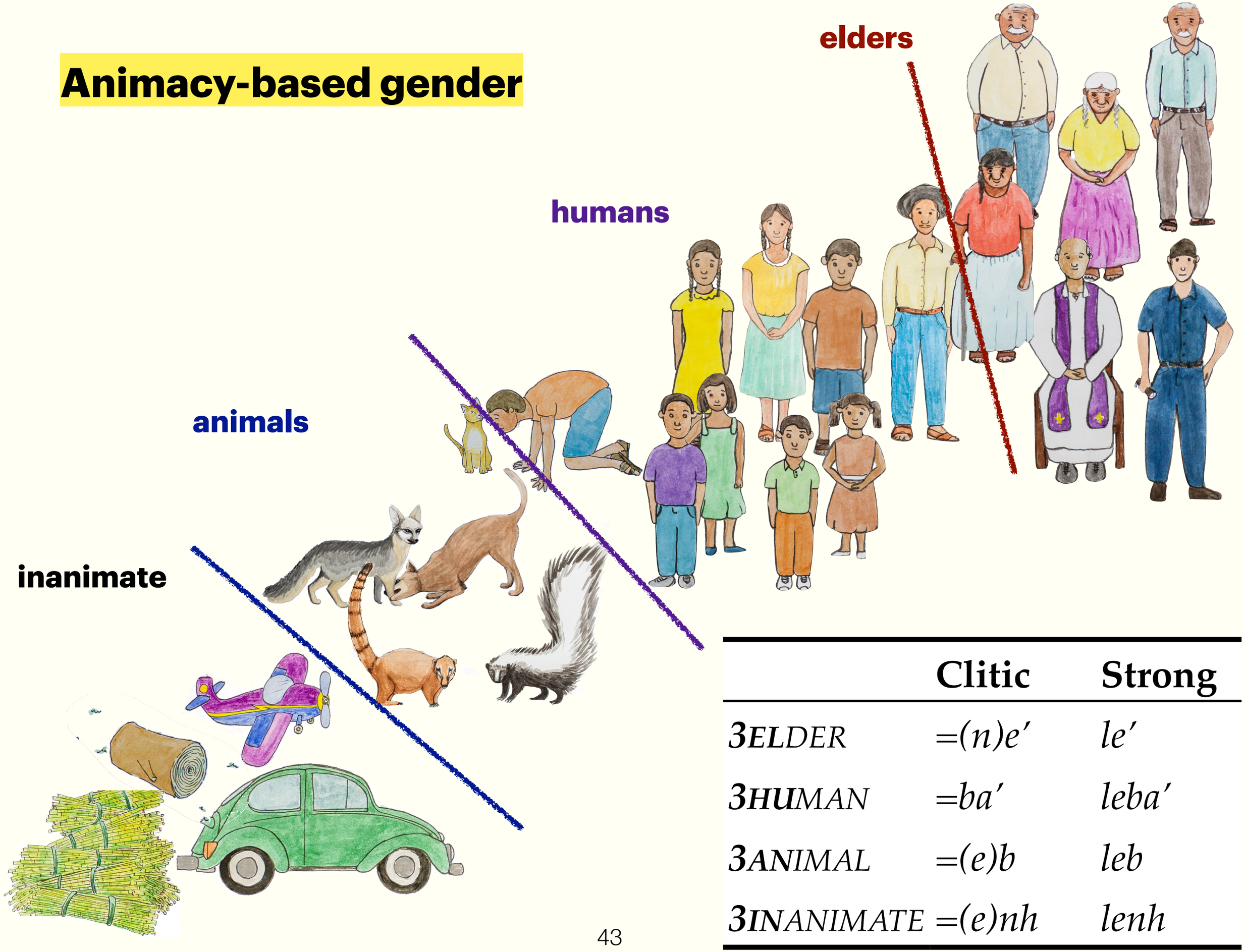
- **Recall: bad performance on object RPs in our first experiment**
  - **Conjecture:** we used DPs that were **insufficiently distinct**, which has been shown to affect ORC parsing (cf. Gordon et al. 2001, Villata & Franck, 2019)
  - **X_1** [V **X_2** RP]
    by hypothesis **X_1** & **X_2** compete for the same SUBJ position, and this simultaneous co-activation creates an opportunity for superposition (enhancing; Ferrell & Lewandowsky, 2002) & feature overwriting (destructive) (Oberaeur & Kliegl 2006)
  - **X_1** [V **Y_2** RP]
    A grammatically active index that can discriminate **X_1** & **Y_2** will facilitate reanalysis

More generally

It is sometimes claimed that **V-initial lgs** are more directly constrained by **animacy hierarchies** (Minkoff, 2000; cf. Clemens & Coon 2018)

It's possible **equal-animacy** effects are more deleterious in non-canonical sentences (cf. Kubo et al. 2015).

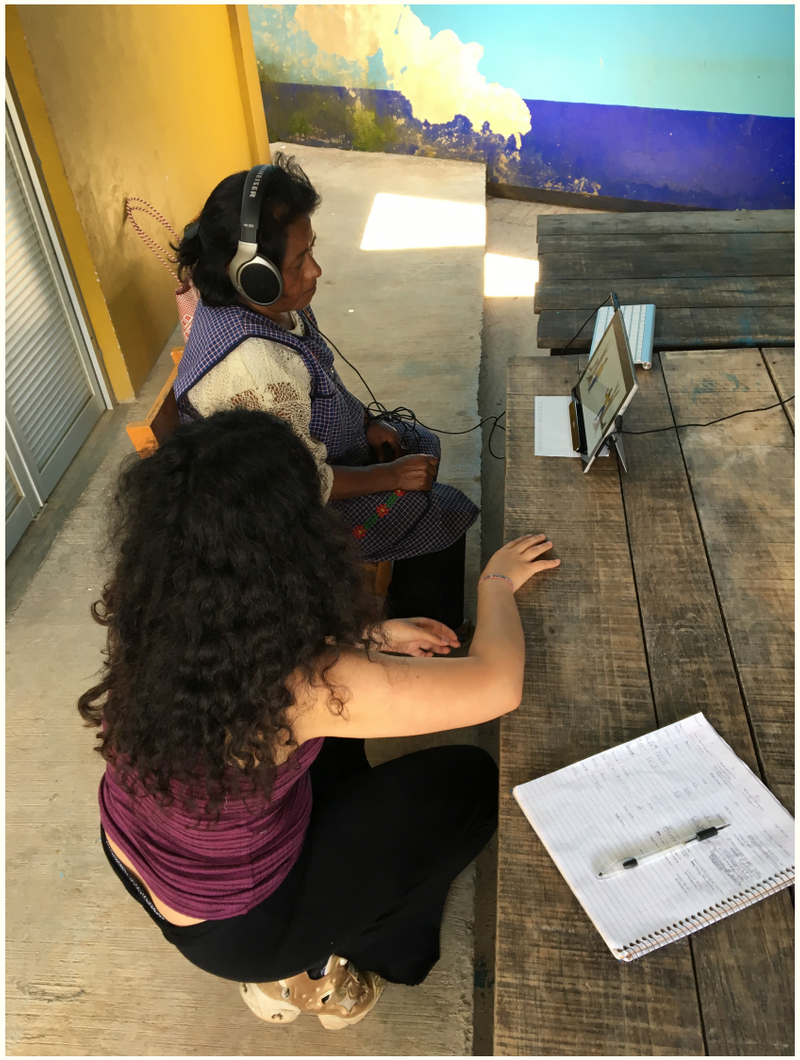
Animacy-based gender



	Clitic	Strong
3ELDER	=(n)e′	le′
3HUMAN	=ba′	leba′
3ANIMAL	=(e)b	leb
3INANIMATE	=(e)nh	lenh

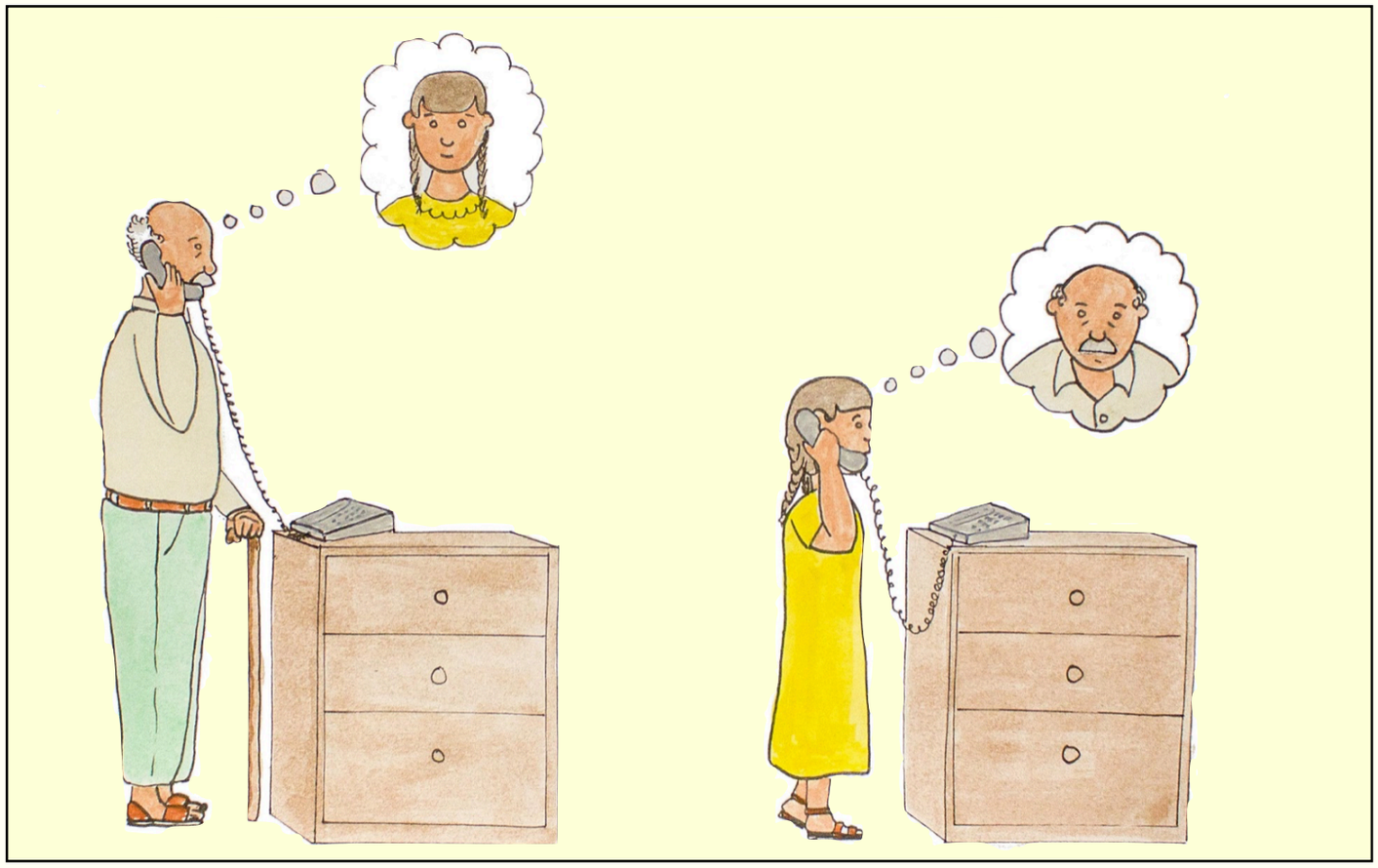
Eye-tracking while listening

Santiago Laxopa, Oaxaca, Summer 2019



N_{SUBJ} = 31; N_{ITEM} = 15
Tobii Nano Pro (60 Hz)
OpenSesame (Python)

SUBJ = EL **SUBJ = HU**

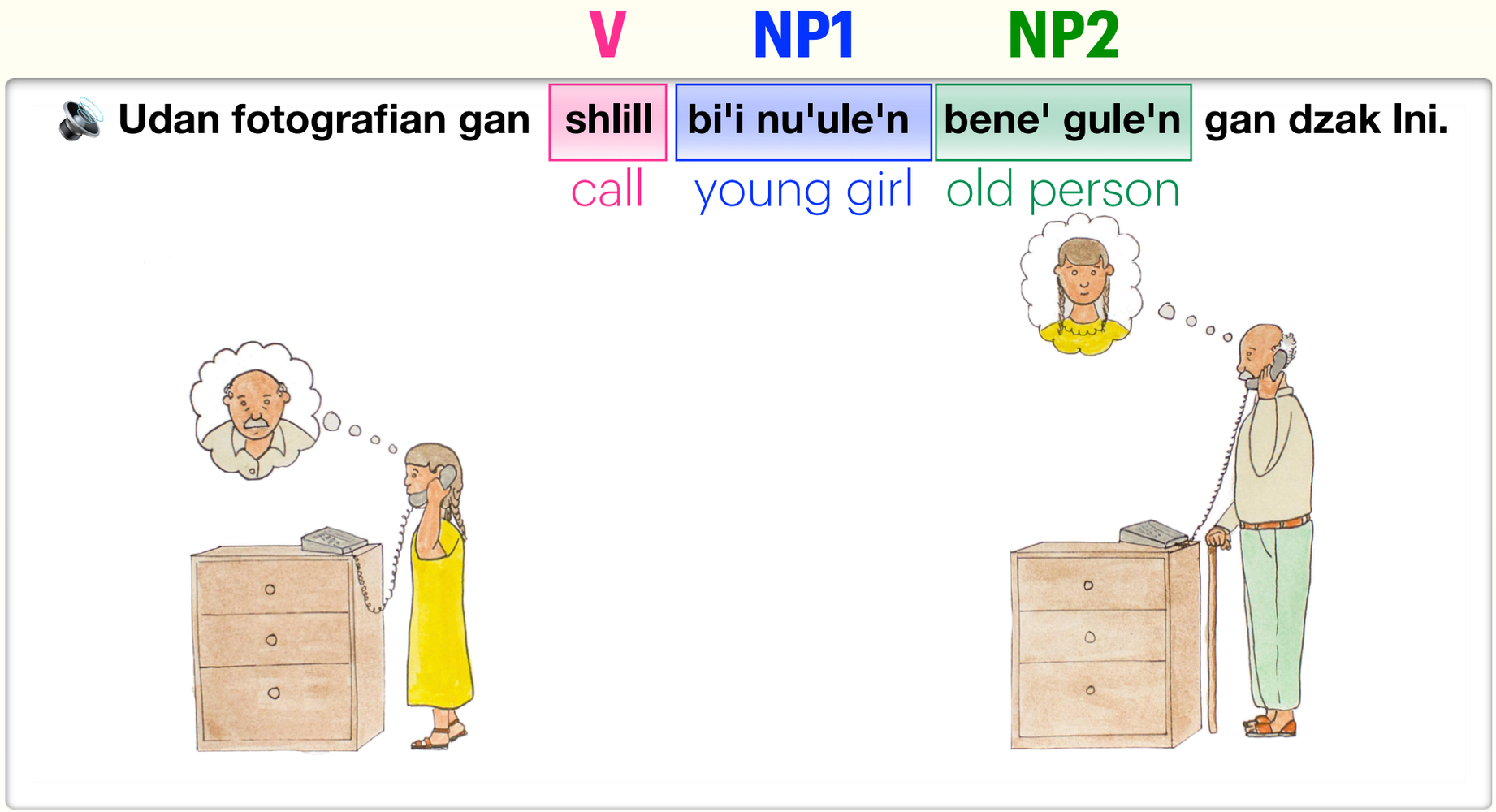


-lill/shlill ‘call’

These DPs are different genders, reflected by different classifiers & different pronouns

Baseline: incrementality in V-S-O clauses

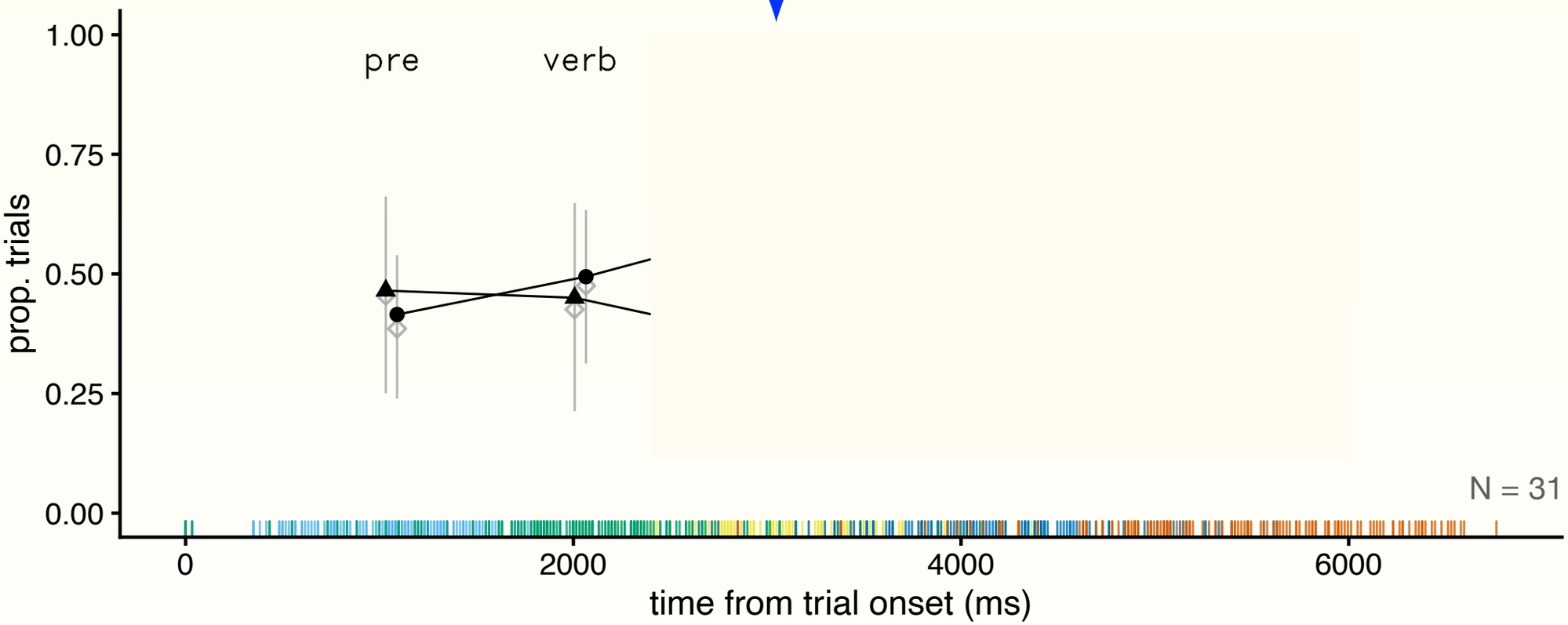
How much information is necessary to discriminate between interpretations?



86% (±4%)

Baseline: incrementality in V-S-O clauses

Zapotec speakers can direct their attention to the correct picture with just the information provided by a **verb** + **NP1**.

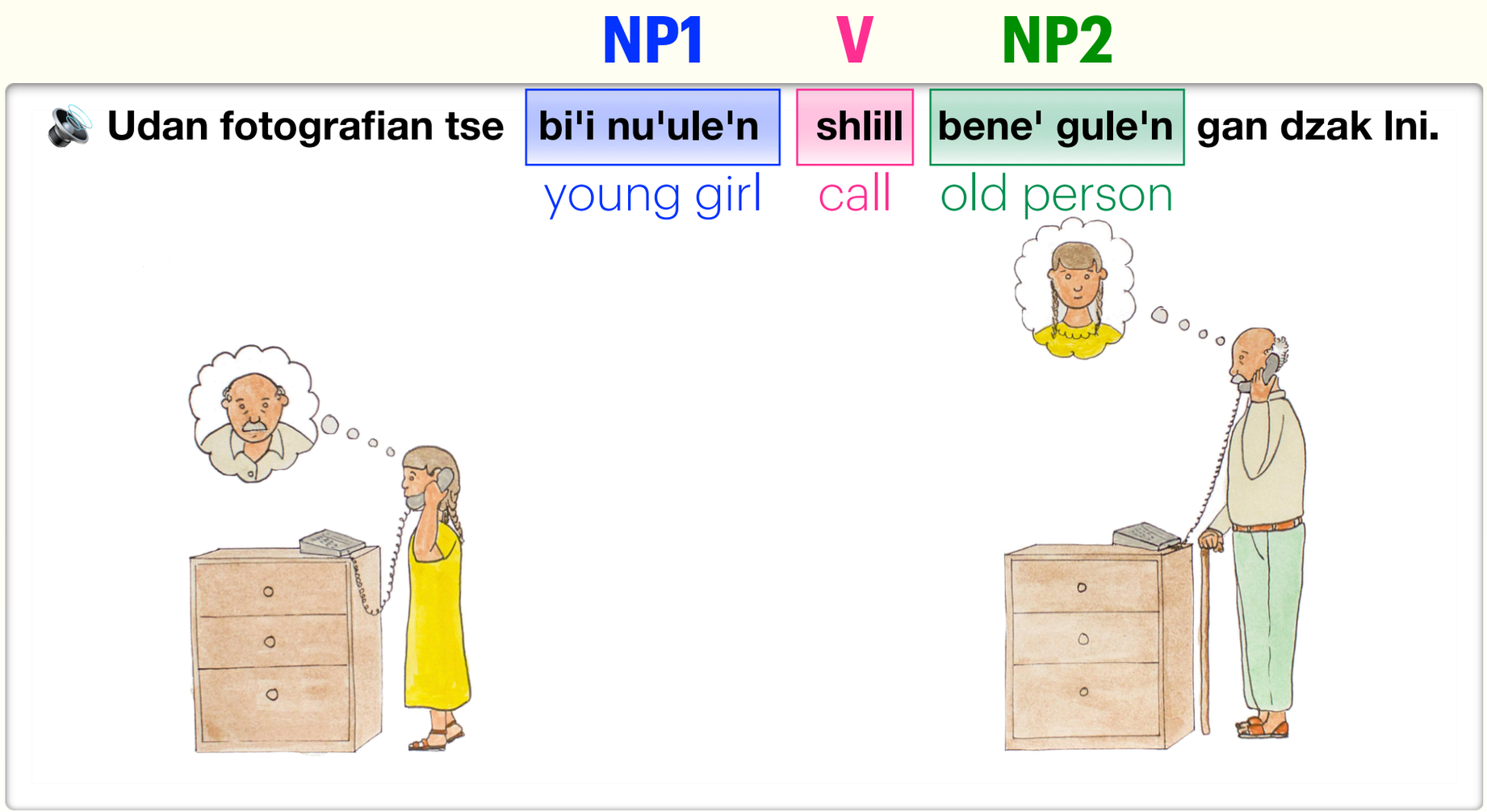


	V	NP1	NP2
●	shlill	bi'i nu'ule'n	bene' gule'n
	call	young girl	old person

	V	NP1	NP2
▲	shlill	bene' gule'n	bi'i nu'ule'n
	call	old person	young girl

Incrementality in relative clauses (with gaps)

How much information is necessary to discriminate between interpretations?

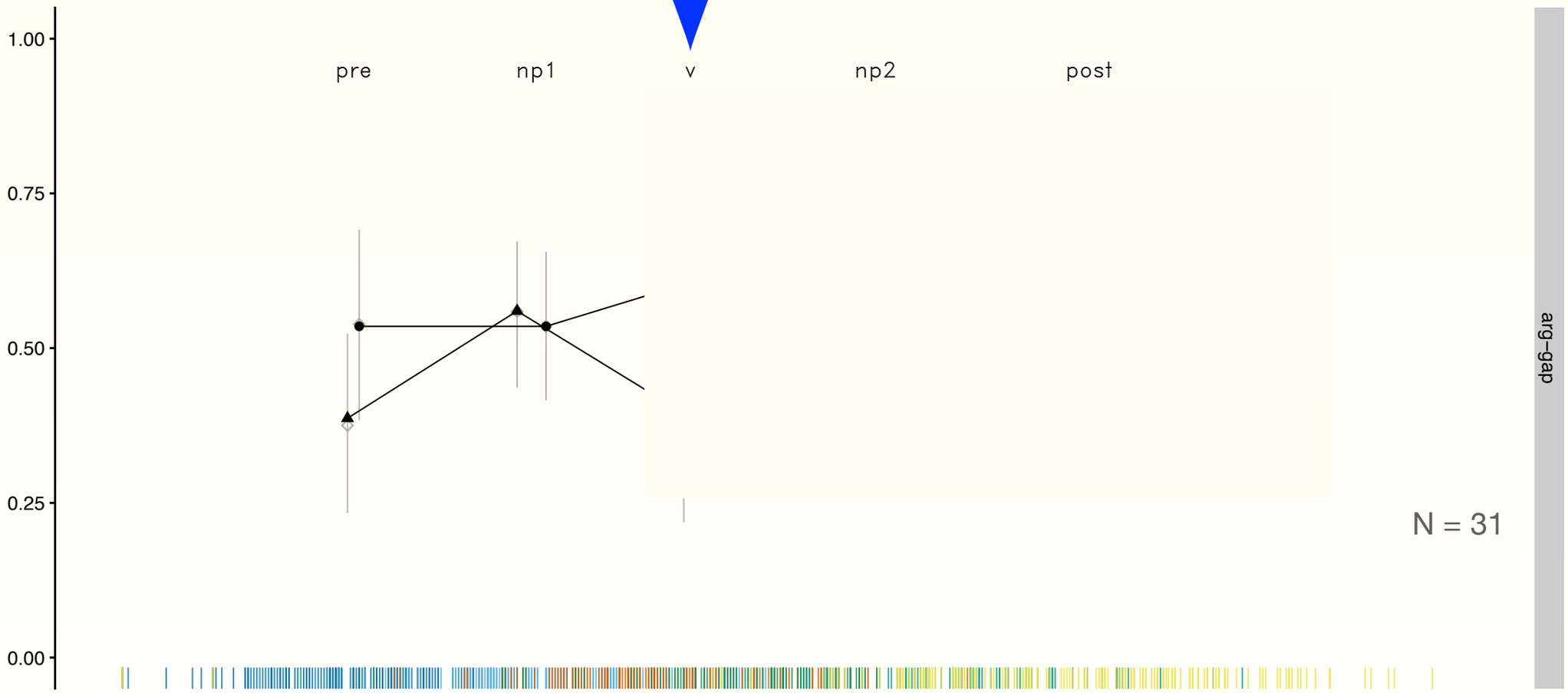


52% (±5%)

Different from Exp 1.
No bias either way!

Incrementality in relative clauses (with gaps)

How much information is necessary to discriminate between interpretations?



NP1 **V** **NP2**

● **bi'i nu'ule'n** **shlill** **bene' gule'n**

young girl call old person

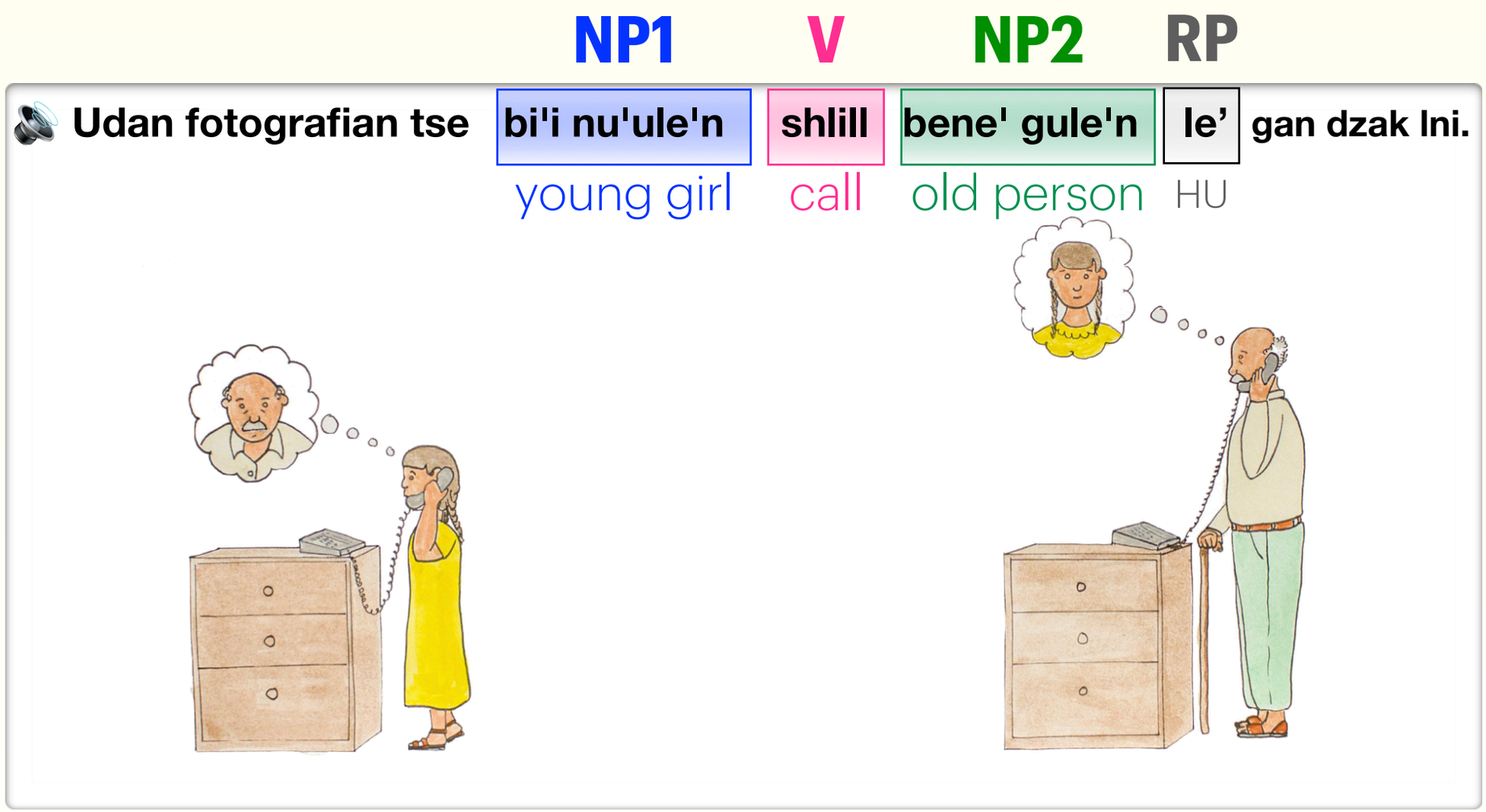
NP2 **V** **NP1**

▲ **bene' gule'n** **shlill** **bi'i nu'ule'n**

old person call young girl

Incrementality in relative clauses (with object RP)

How much information is necessary to discriminate between interpretations?

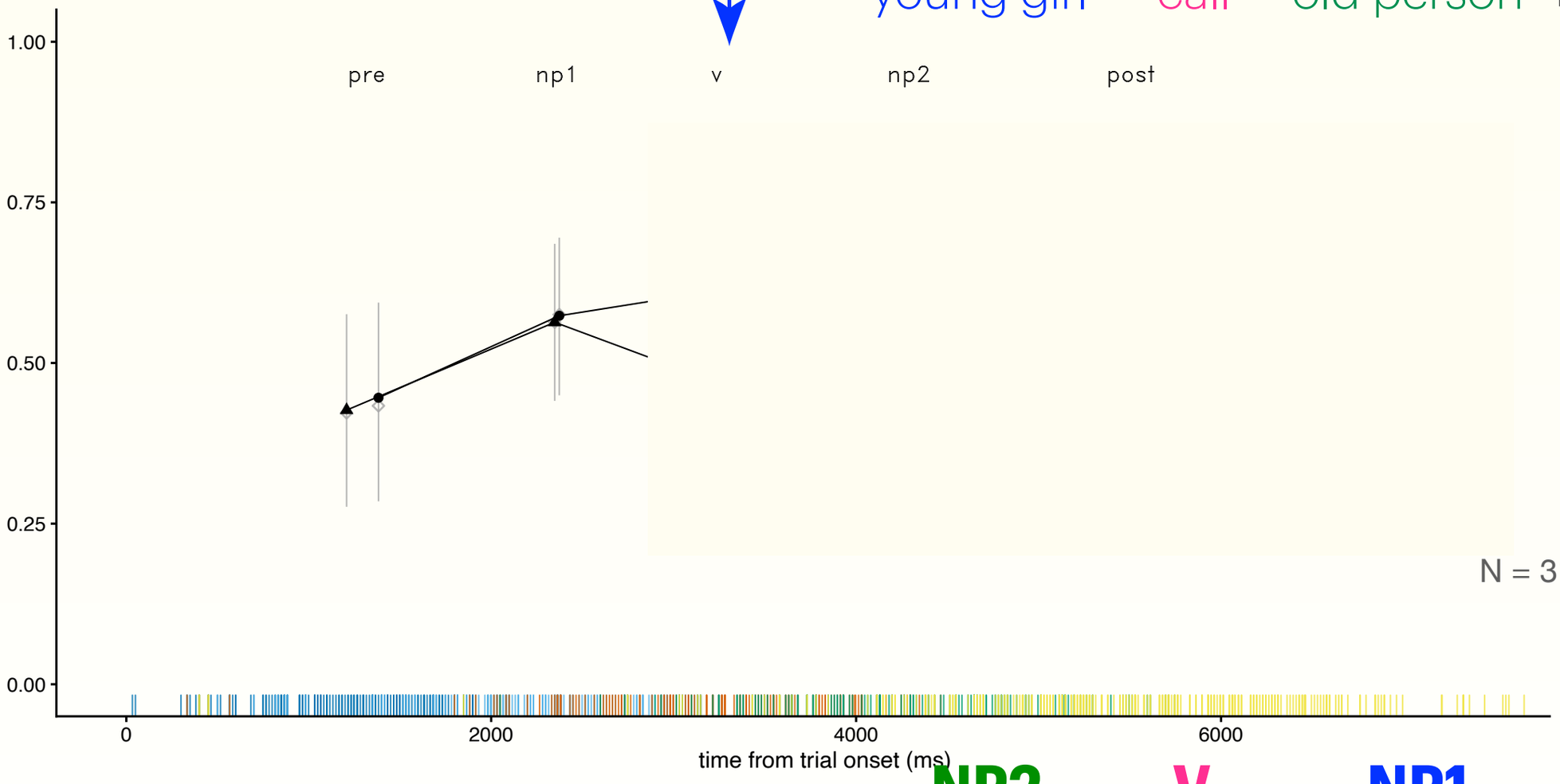


69% (± 5%)

Much more accurate than E1!

Incrementality in relative clauses (with object RP)

Speakers switch their attention from the **subject** picture to the **object** picture when they hear an RP.



NP1 **V** **NP2** **RP**

● **bi'i nu'ule'n** **shlill** **bene' gule'n** **le'**

young girl call old person HU

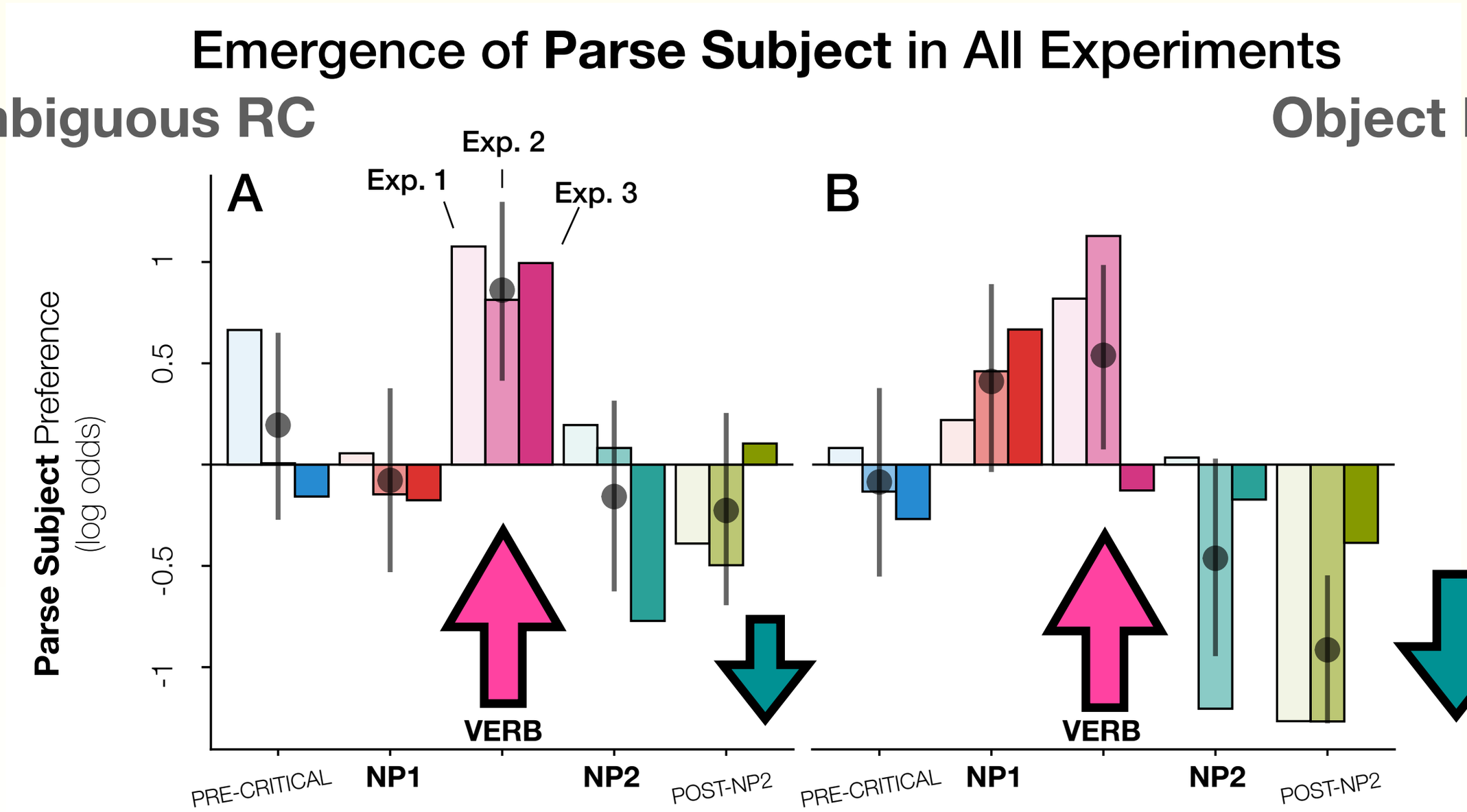
NP2 **V** **NP1** **RP**

▲ **bene' gule'n** **shlill** **bi'i nu'ule'n** **leba**

old person call young girl EL

Incrementality in relative clauses in 3 experiments

Exp. 1 (n = 31): Elder and Human arguments
Exp. 2 (n = 34): Human and Animal arguments
Exp. 3 (n = 30): Human and Inanimate arguments



Sasaki et al., 2021

Incrementality in Zapotec relative clauses (summary)

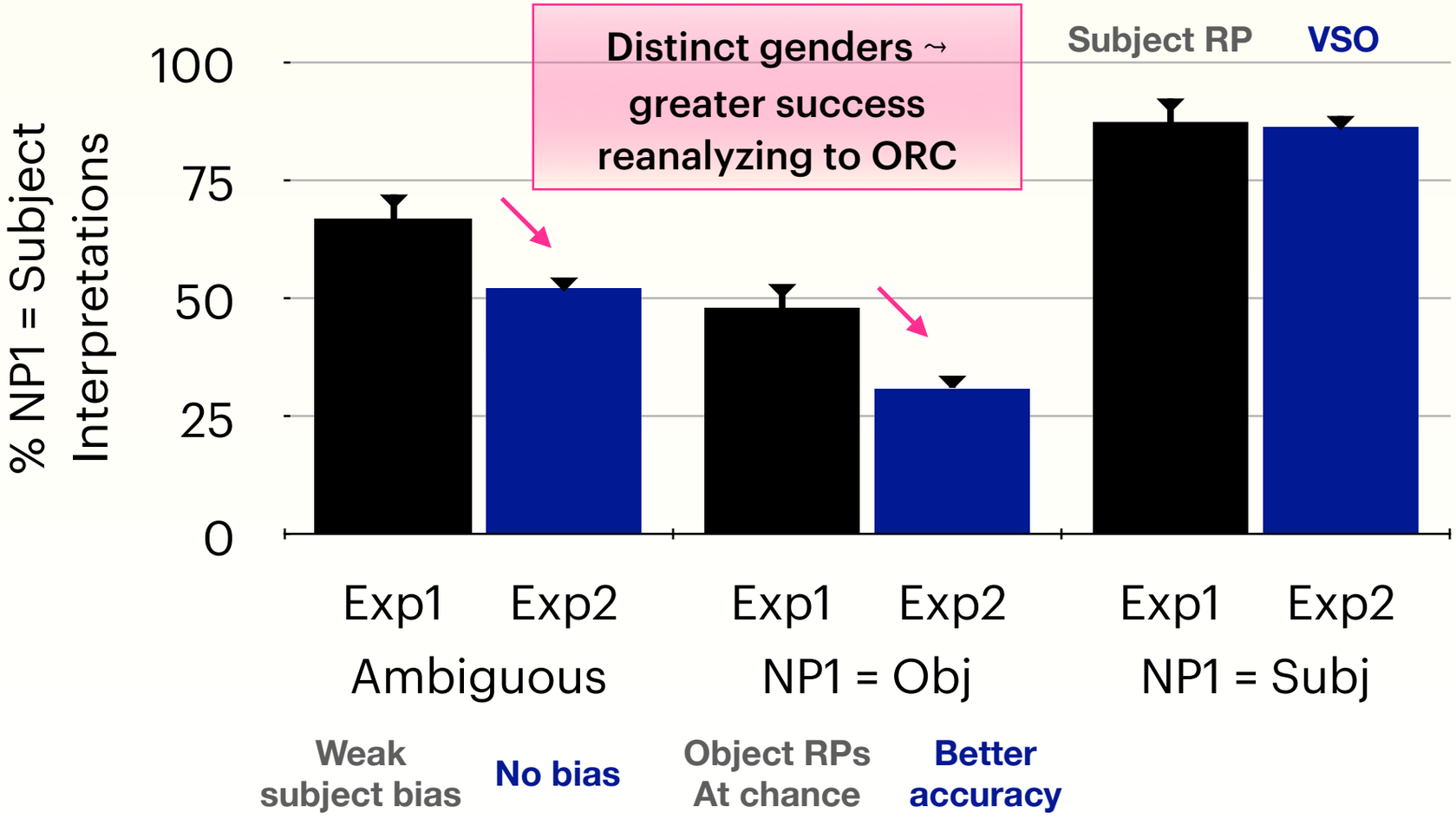
We find direct evidence for **PARSESUBJ** in *momentary* record, i.e., looks to pictures.

- Early looks to **subject gap** picture *before* **NP2**.

- Cross-over pattern in **object RP** sentences consistent with reanalysis
  (cf. Pickering, Traxler & Crocker, 2000)

Evidence for **V<SUBJ** is at best indirect

No *cumulative* preference for subject gaps (52%)



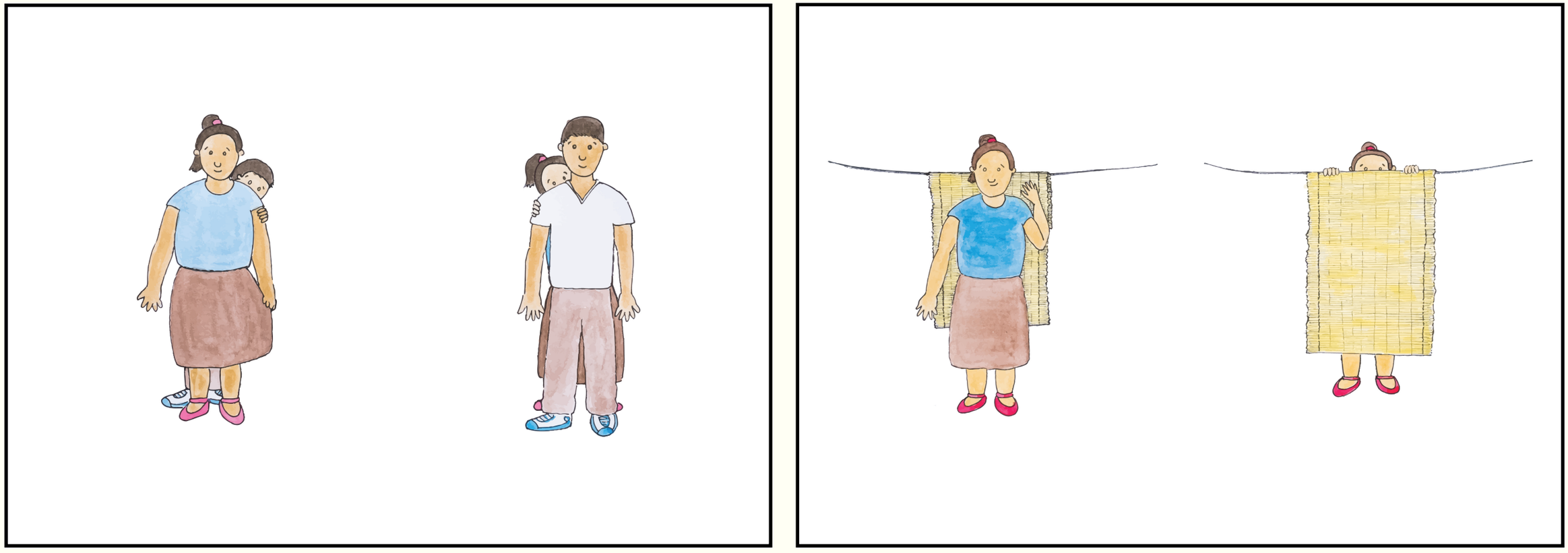
Eye-tracking while listening, Part 2

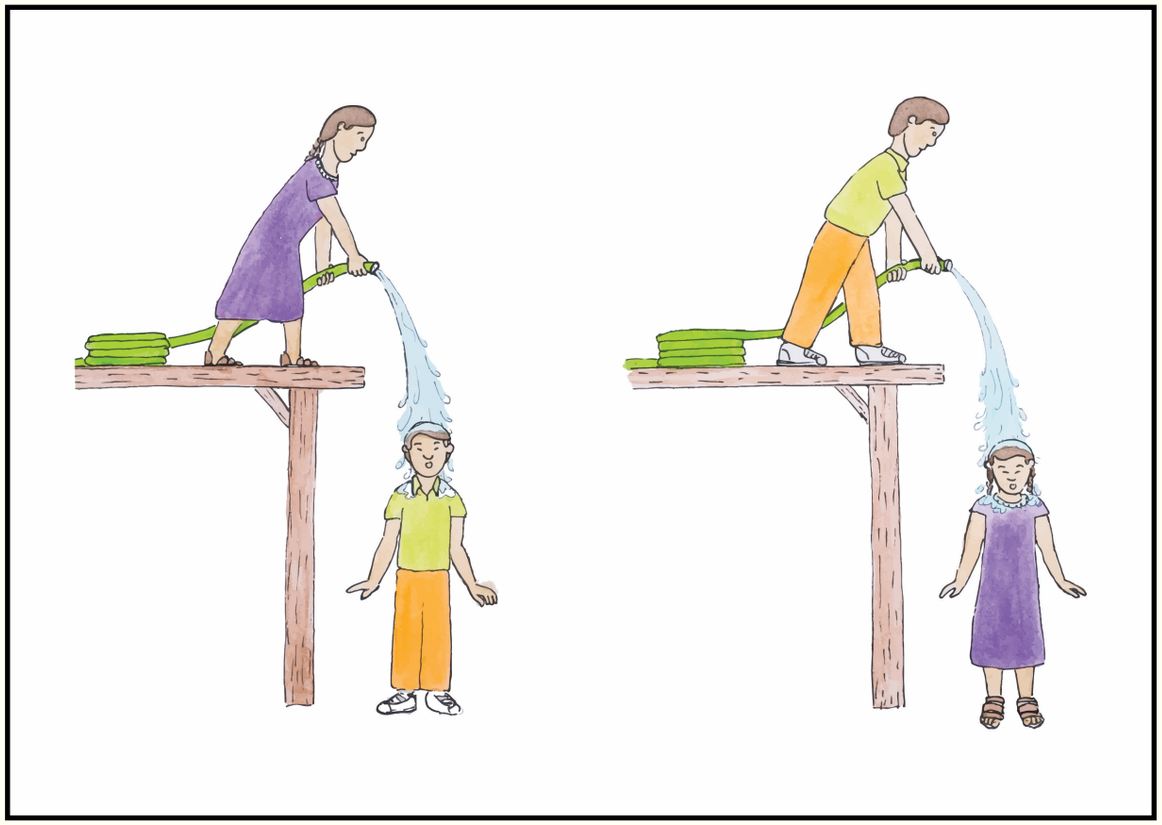
Santiago Laxopa, Oaxaca, Summer 2022, n_part = 96

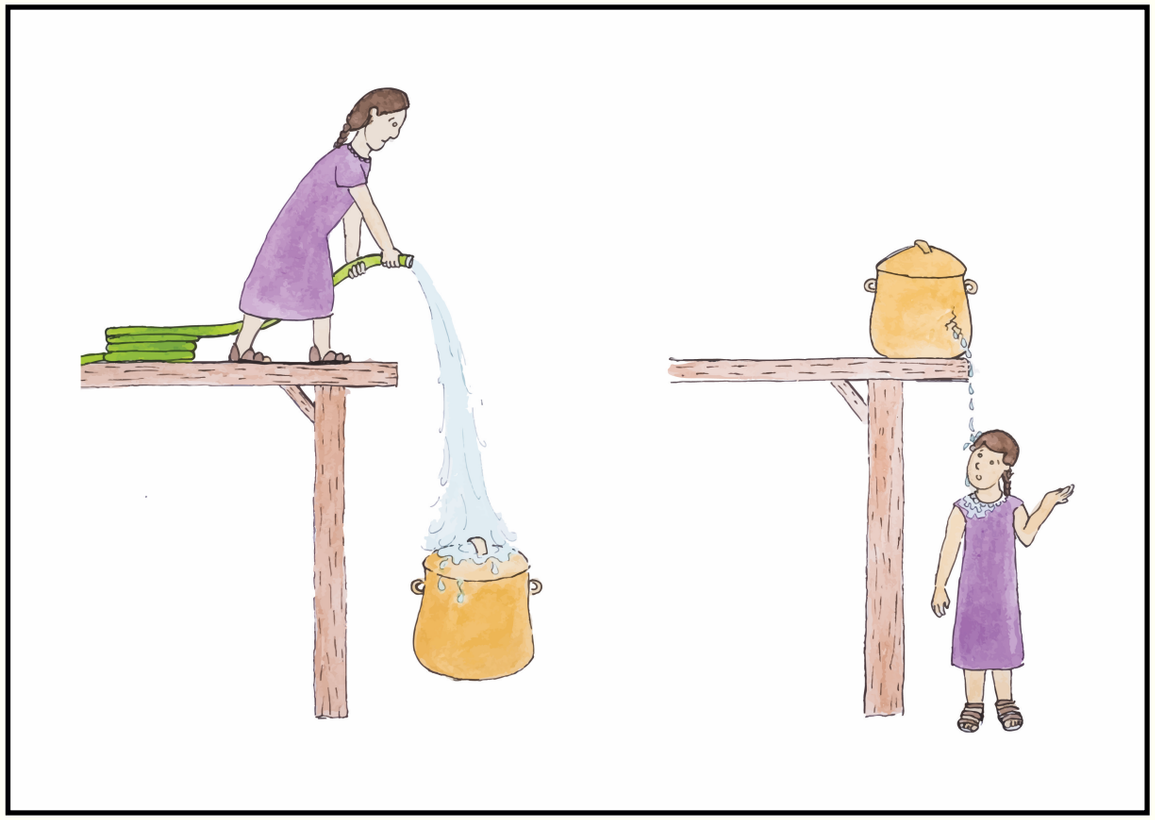
We directly test the idea that **DP match** affects the ease of reanalysis.

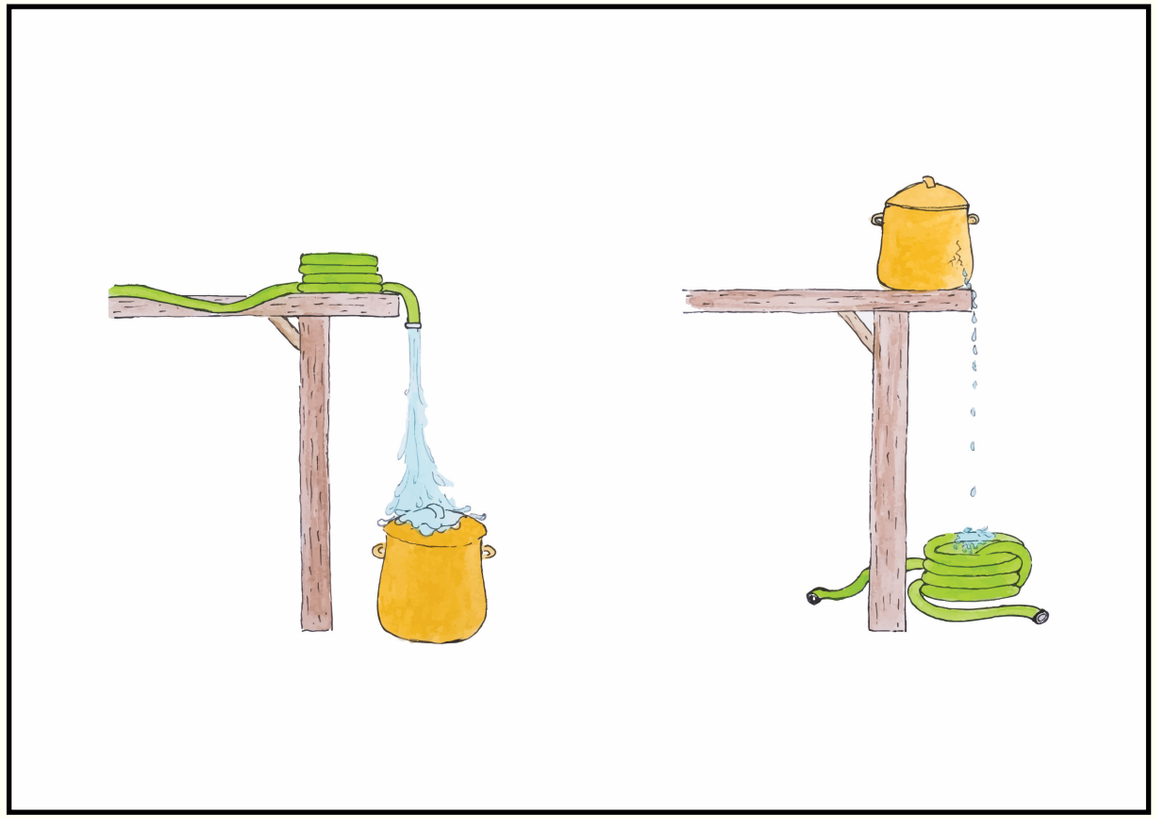
2 x 2 design: {Match, Mismatch} x {Gap, RP}

Between-items: 15 items NP1 = HU; 15 items NP1 = IN

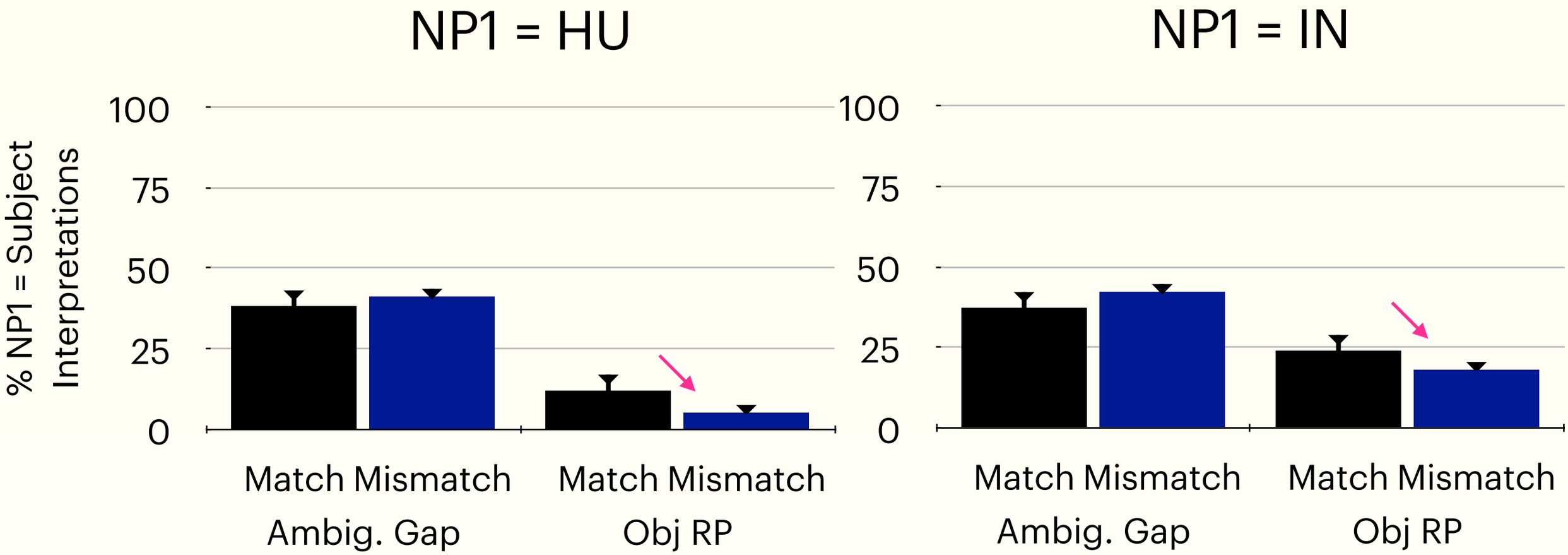


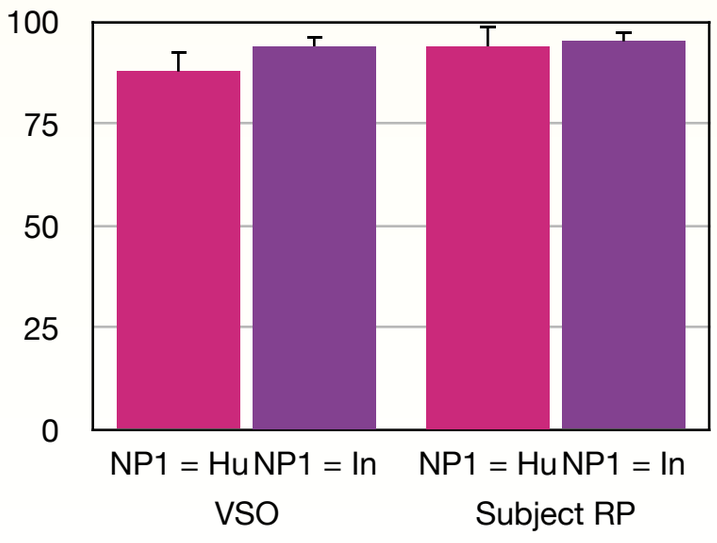






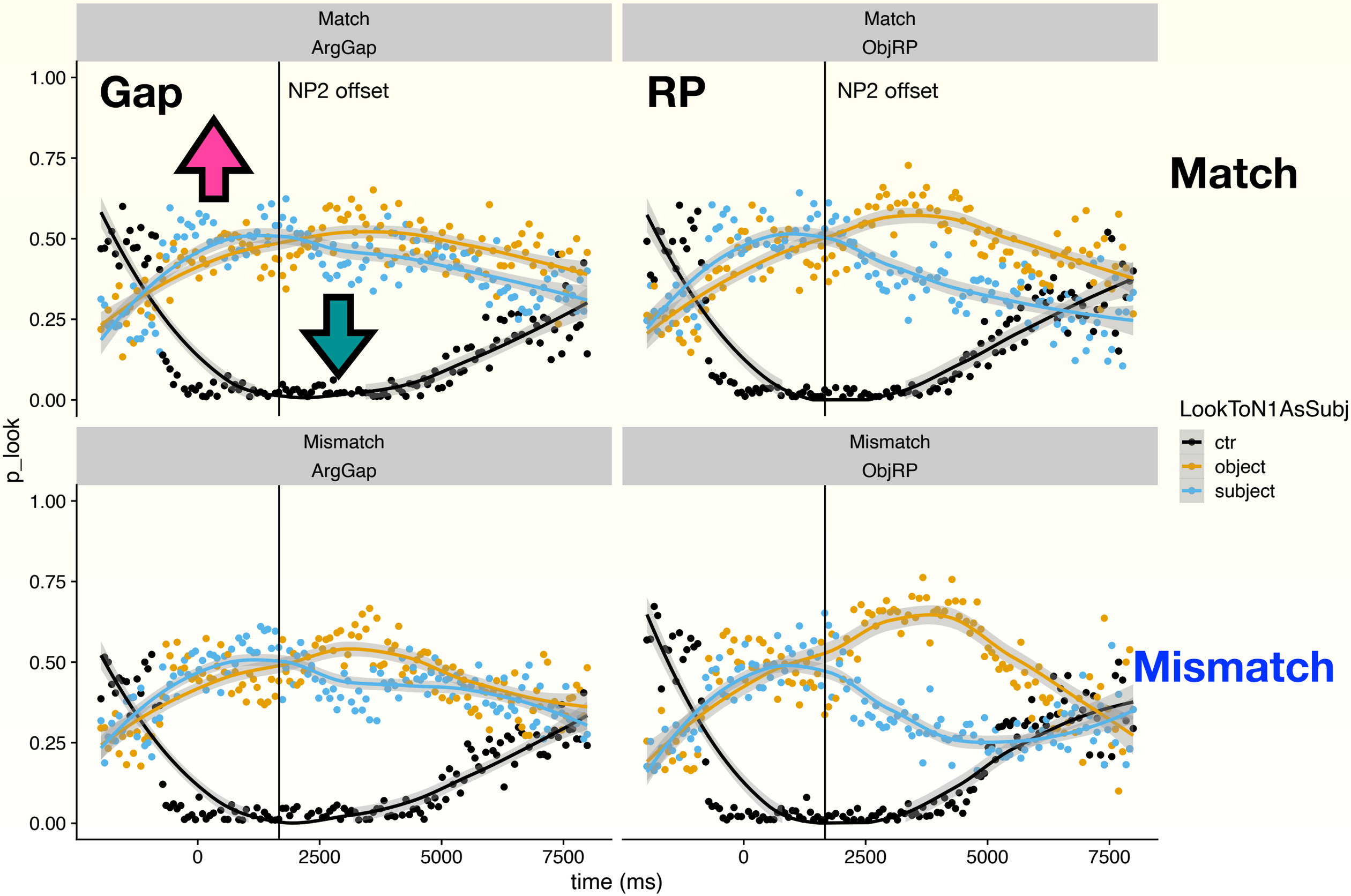
Effect of DP Match on ORC+RP comprehension



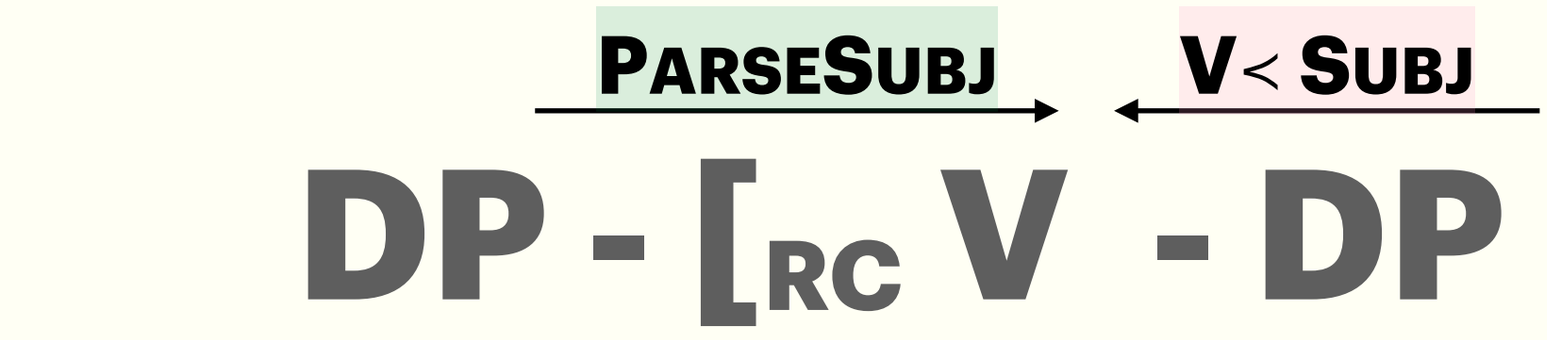


Distinct DPs ⇝ greater success reanalyzing to ORC

Mismatched arguments facilitate reanalysis

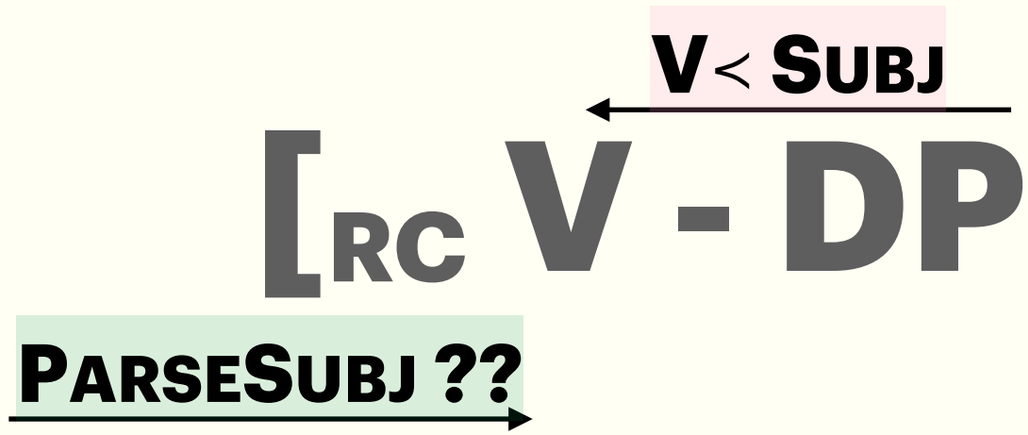


What is happening moment-by-moment??



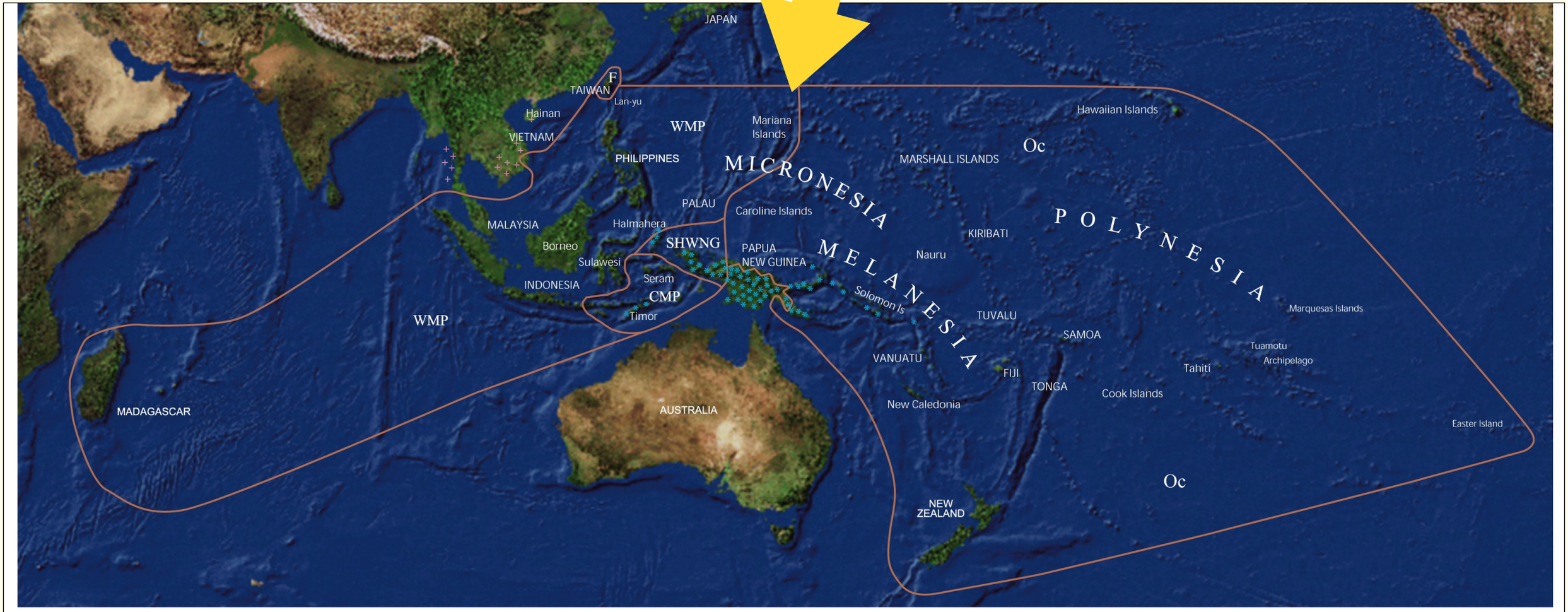
Zapotec

V-S-O
Head-initial RC



Chamorro

V-initial
Head-final RC

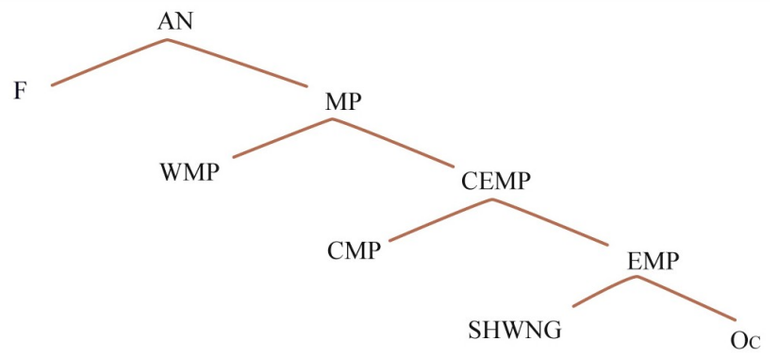


Key to the Austronesian Language Map

F	Formosan Languages
WMP	Western Malayo-Polynesian Languages
CMP	Central Malayo-Polynesian Languages
SHWNG	South Halmahera West New Guinea
Oc	Oceanic Languages
	Papuan Languages

Structure of the Austronesian Language Family

AN	Austronesian Language Family
F	Formosan Languages
MP	Malayo-Polynesian Languages
WMP	Western Malayo-Polynesian Languages
CMP	Central Malayo-Polynesian Languages
EMP	Eastern Malayo-Polynesian Languages
SHWNG	South Halmahera West New Guinea
Oc	Oceanic Languages



Chamorro has two head-RC orders

Head-final

(5) **Ågang atyu i [ha papaini i palåo'an] na biha**
call DEM D combing D woman L old.lady
"Call that woman who is combing the old lady" SRC
"Call that woman who the old lady is combing" ORC

Head-initial

(6) **Ågang atyu na biha i [ha papaini i palåo'an]**
call DEM L old.lady D combing D woman
"Call the old lady who is combing the woman" SRC
"Call the old lady who is the woman is combing" ORC

Chamorro RC parsing as a function of head-RC order

n = 135

- Picture matching to audio + touch-tracking
  (cf., mouse-tracking, Freeman & Ambady, 2010)

- Developed in OpenSesame http://osdoc.cogsci.nl/
  (Mathôt et al., 2012)

- and deployed on
  Google Nexus 10 tablets

Wagers, Chung & Borja (2018) *Cognition*

Subject Gap Interpretation

Head-initial relative clause

… **na biha i [ha papaini i palåo'an _]**

… old lady who _ is combing the woman

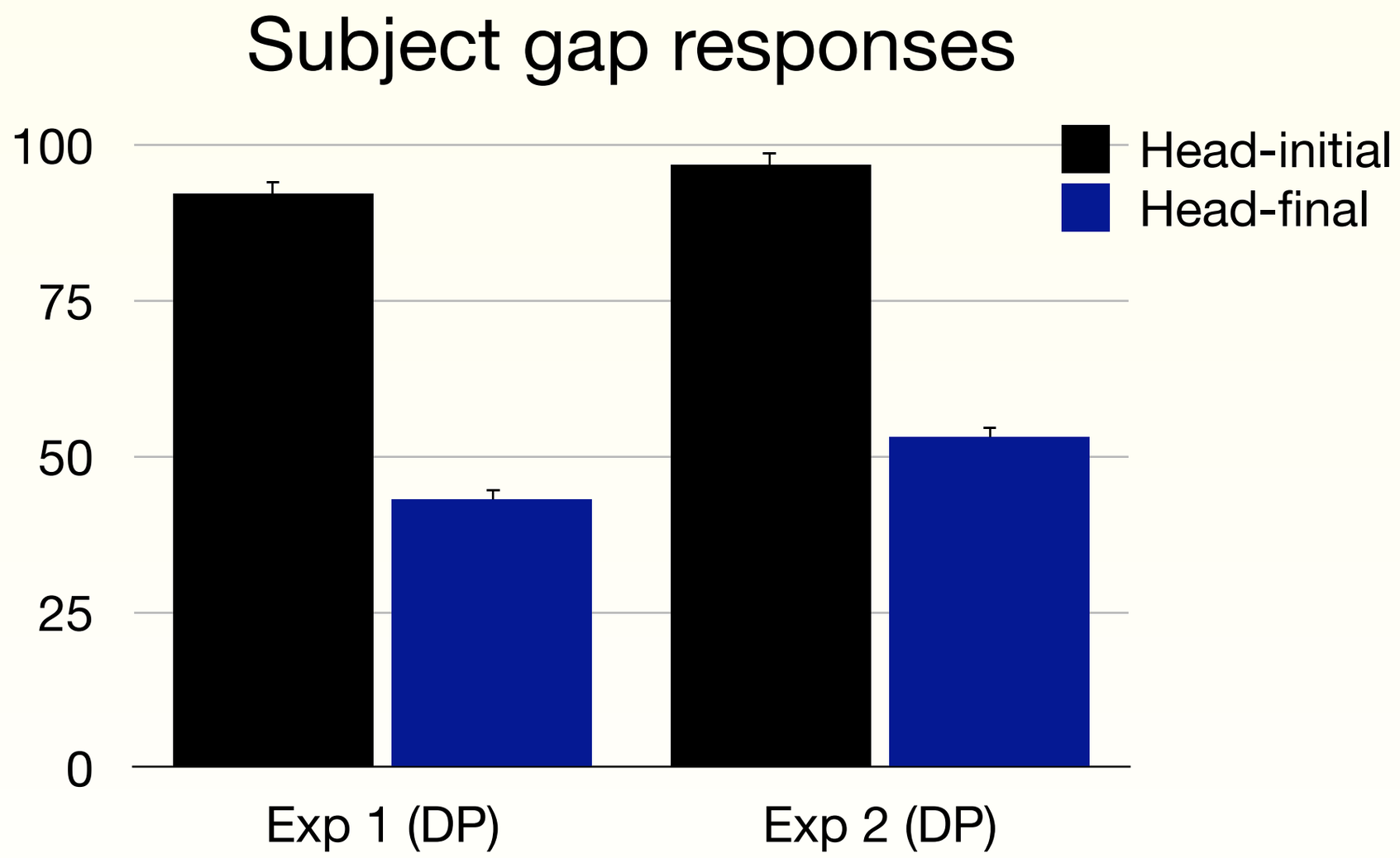
Object Gap Interpretation

Head-initial relative clause

… **na biha** **i** **[** **ha papaini** **i palåo'an** **_** **]**

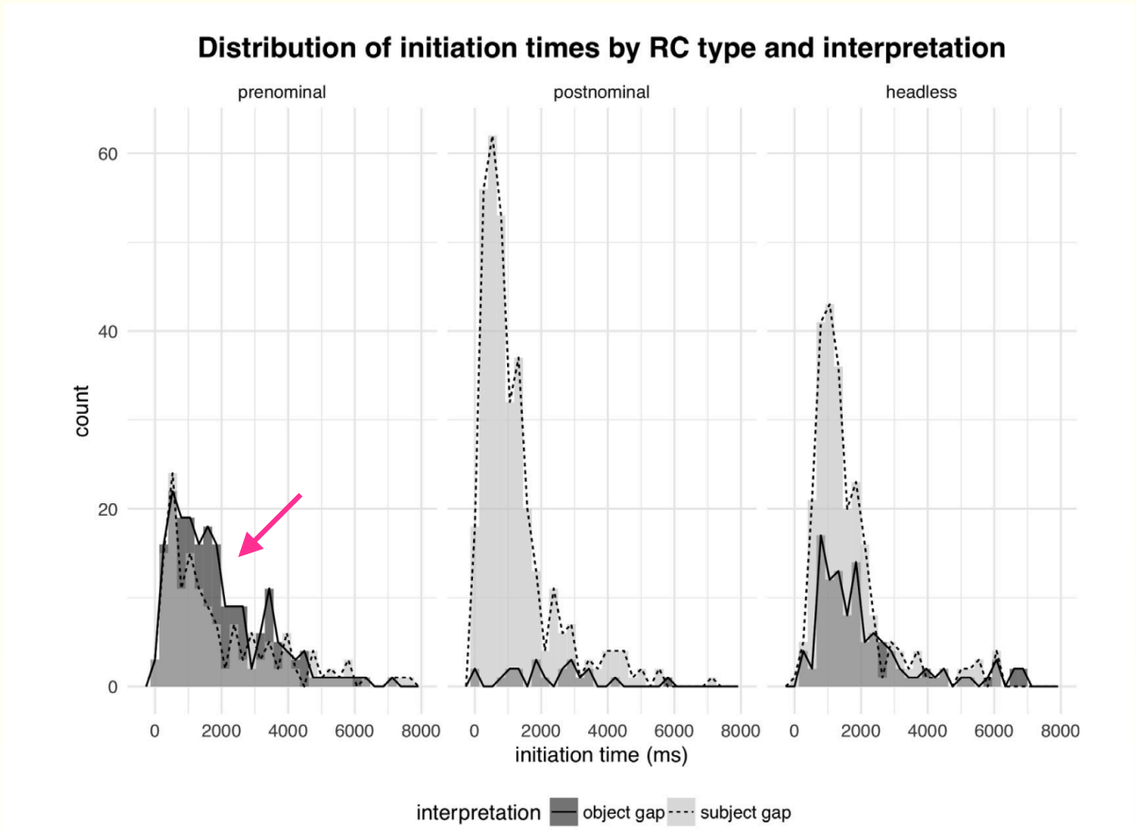
… old lady who the woman is combing _

Cumulatively, interpretations depend on head-RC order



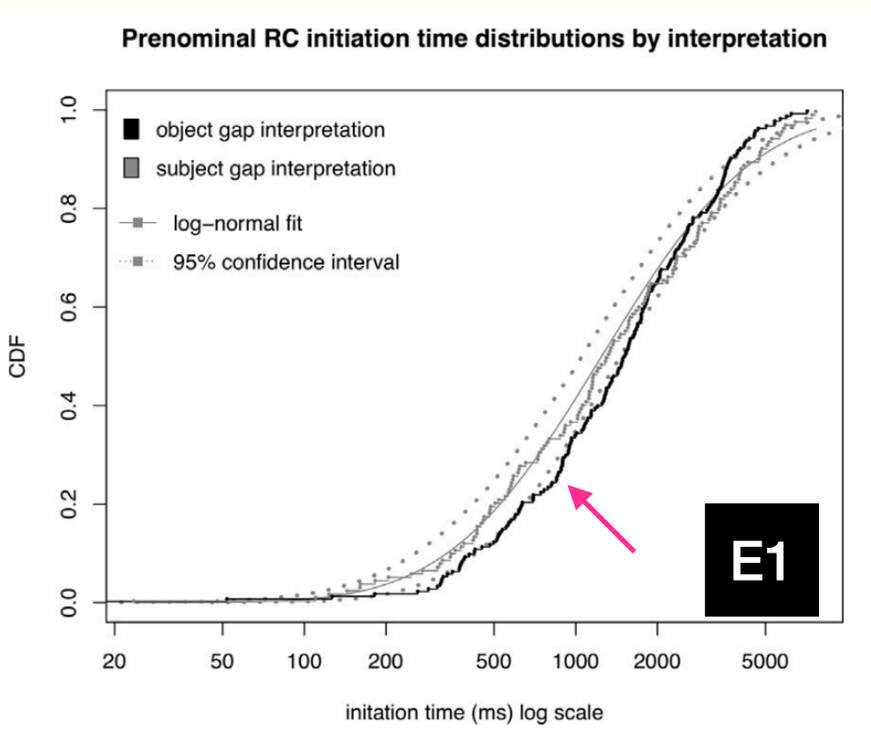
But, the earliest interpretations are subject gap interpretations!

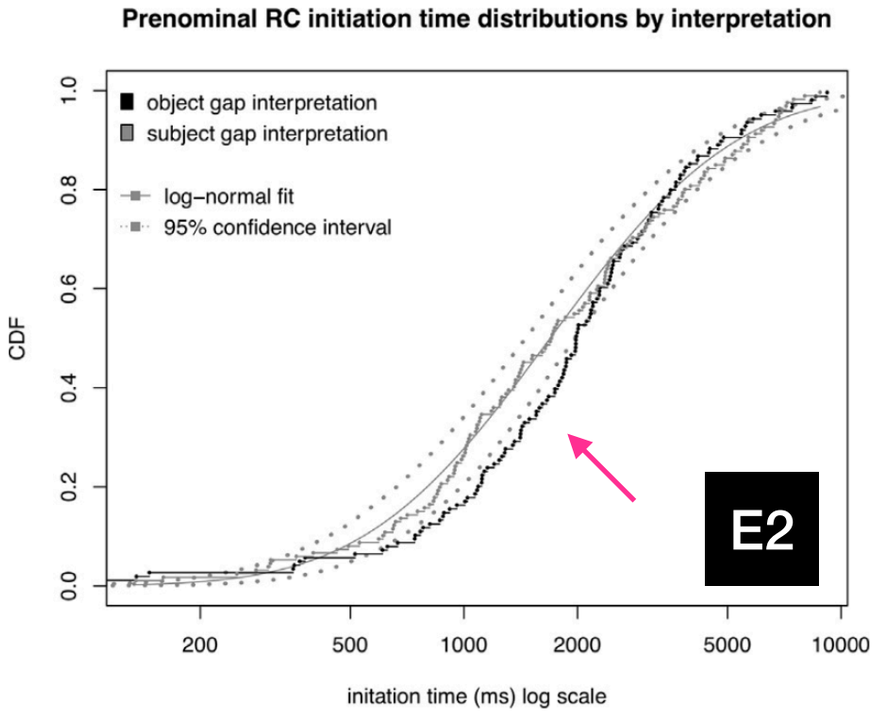
Evidence that **V< SUBJ** doesn't precede **PARSESUBJ** in head-final RCs.



Median initiation times (ms) and difference intervals

RC Type	Object	Subject	(O–S) 95% C.I.
prenominal	1510	1308	[486, –142]
postnominal	2038	816	[2181, 589]
headless	1635	1266	[650, 79]





What is happening moment-by-moment

Rarely triggers reanalysis

PARSESUBJ → ← V< SUBJ

DP - [RC V - DP

Head-initial RC

Is success of reanalysis is a function of **similarity?**

V< SUBJ ←

[RC V - DP] - DP

Head-final RC

PARSESUBJ →

Inserts an easily defeasible subject gap

Chamorro has two head-RC orders

Head-final

(5) **Ågang atyu i [ha papaini i palåo'an] na biha**
call DEM D combing D woman L old.lady
"Call that old lady who is combing the woman" SRC
"Call that old lady who the woman is combing" ORC

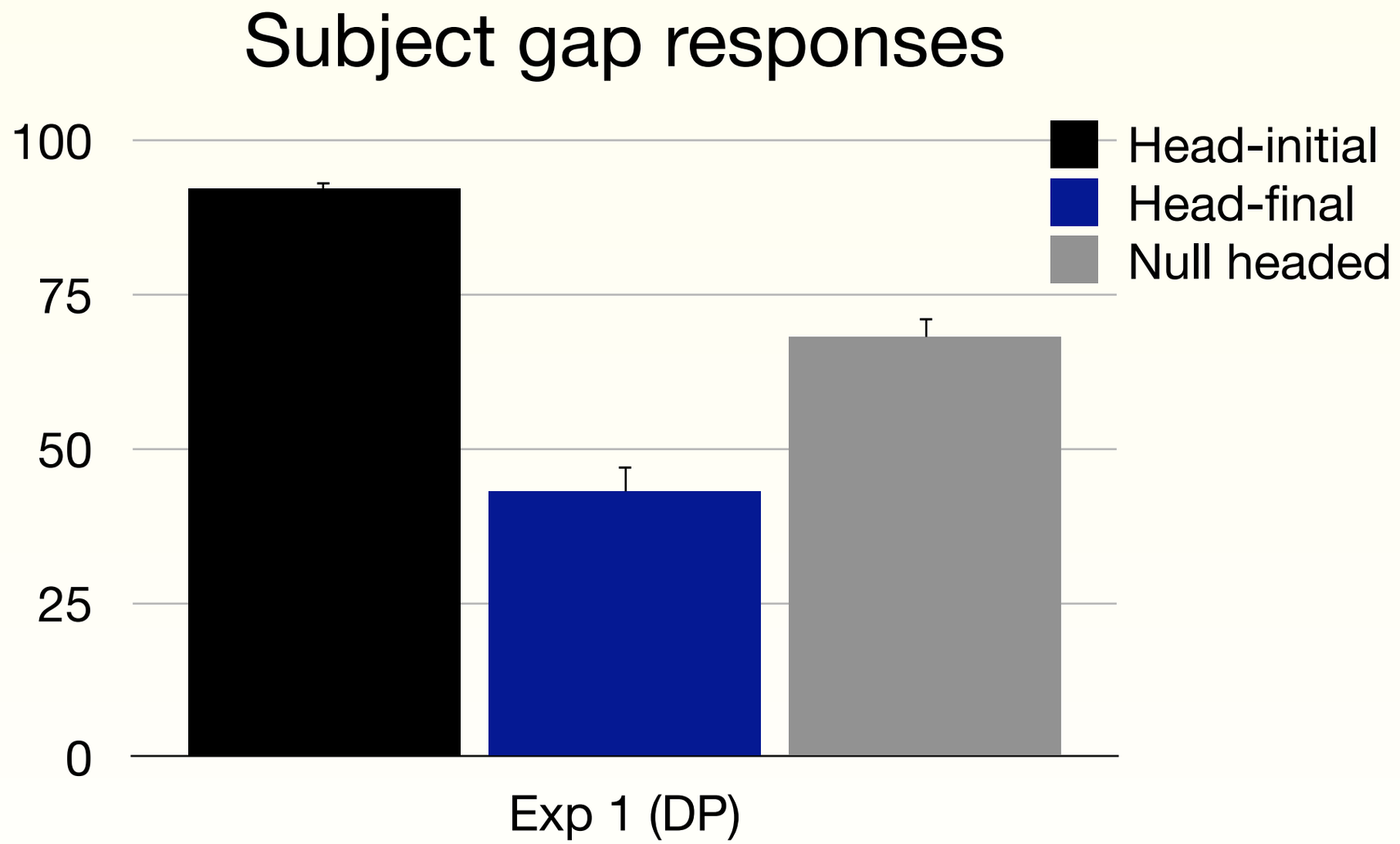
Head-initial

(6) **Ågang atyu na biha i [ha papaini i palåo'an]**
call DEM L old.lady D combing D woman
"Call that old lady who is combing the woman" SRC
"Call that old lady who is the woman is combing" ORC

Null-headed RCs

(7) **Ågang atyu i [ha papaini i palåo'an]**
call DEM D combing D woman
"Call that one who is combing the woman" SRC
"Call that one who the woman is combing" ORC

Subject gap interpretations depend on head-RC order



Wagers, Borja & Chung (2018) *Cognition 178*

Summary (Part 2)

Neither **Chamorro** nor **Zapotec** show an across-the-board cumulative preference for subject gaps.

Both **Chamorro** and **Zapotec** nonetheless show evidence of the momentary effects of **PARSESUBJ**, a rule that inserts subject gaps early.

Arguably, **Chamorro** and **Zapotec** have a competing constraint (**V**< **SUBJ**) that wants to identify the first post-verbal constituent as a subject. Cf. Bondoc et al. 2019 for Tagalog

In both languages, the **PARSESUBJ** interpretation gets entrenched in **N-V-N** constructions in circumstances of **encoding interference**

In **Zapotec**, the similarity relationship is defined by gender/animacy.
In **Chamorro** it is DP type or size. Cf. Pizarro-Guevara 2020 for Tagalog.

Conclusion

Encoding interference arises in both **N - N - V** and in **N - V - N** configurations.

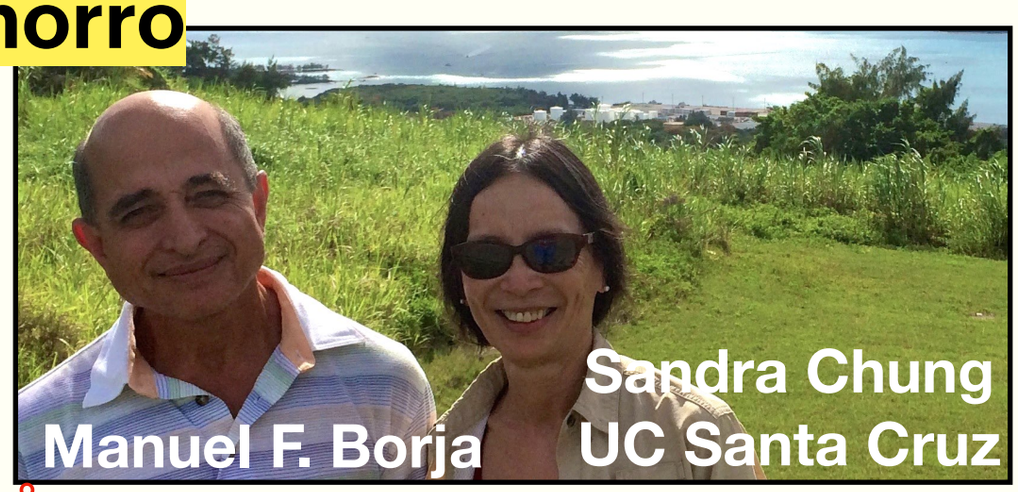
Factors like gender/animacy and DP type/size count toward encoding interference in **N - V - N** just like **N - N - V**.

This occurs despite the fact that the **N - V - N** configuration arguably provides clearer positional cues to the order of the two nouns.

It's not linear order, then, but **the process of reanalysis** which I've argued unifies the two configurations.

If this is correct, the reanalysis in **N - V - N** is "unforced": it doesn't have to happen to attain a grammatical parse. I've argued two competing principles, which are activated at different time points, prompt the reanalysis.

Chamorro

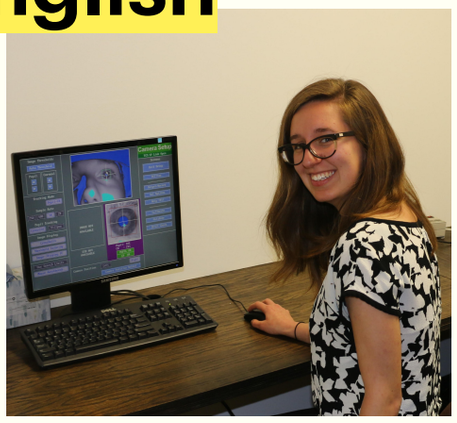


Inetnun Åmut yan Kutturan Natibu

Delaney Gomez-Jackson

Jack Duff

English

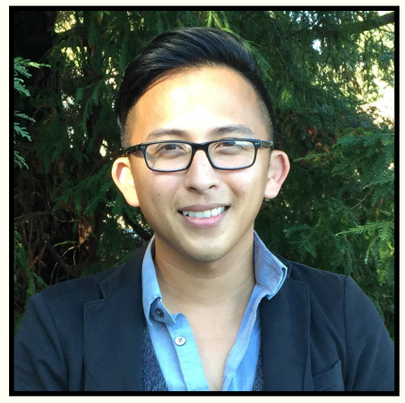


Stephanie Rich

Zapotec

Steven Foley
Princeton

Jed Pizarro-Guevara
UMass



Kelsey Sasaki
Oxford

Hebrew

Mandy Cartner
Tel Aviv U.

Ivy Sichel

Azusena Orozco

Maziar Toosarvandani

Brianda Caldera

Fe Silva Robles
Senderos

Duxklhenu'!

- **Zapotec**
  - Raul Díaz Robles, and 2 other speakers
  - Residents of Santiago Laxopa
    - Director Evaristo López Velazquez
    - Santiago Laxopa President Celestino Robles Ramirez
  - **z/lab**: Fe Silva Robles, Maziar Toosarvandani, Kelsey Sasaki, Jed Pizarro-Guevara, Steven Foley, Brianda Caldera, Azusena Orozco, Jack Duff, Delaney Gomez-Jackson
- **RPs:** Jim McCloskey, Sandy Chung, Ivy Sichel,
- **r/lab** at UC Santa Cruz, audiences at Michigan, MAPLL-TCP-TL 2019, CUNY 2020 and IJPCP 2021

- **NSF BCS #2019804** to UCSC (Toosarvandani, PI; Sichel & Wagers, Co-PI)

- UCSC Academic Senate **Committee on Research** and Vice Chancellor for Research
- **The Humanities Institute**, UC Santa Cruz
- **Roque Reyes Mendoza**, illustrator

Dångkulu na Si Yu'us Ma'åsi'!

Luta

* Tita A. Hocog
* Antonio C. Atalig Memorial Library
* Sentrun Manåmku'
* Denise Tanya King
* Rita H. Inos Rota High School
* Office of the Mayor & Mayor Efraim M. Atalig
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* Dr. Ignacia T. Demapan & Kagman Elementary
* Cindy P. Reyes & the CCLPC
* Marianas Public Land Trust

Manuel F. Borja

Chamorro Dictionary Working Groups

NMI Humanities Council

Nicole Goux, illustrator

http://chamorro.sites.ucsc.edu

National Science Foundation BCS #1251429 to MW & SC