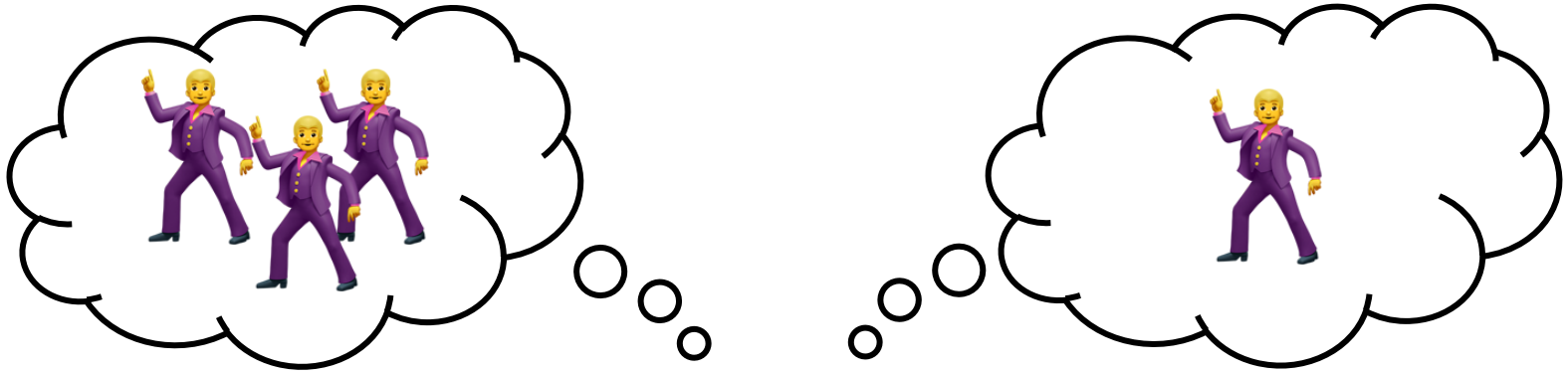


Singular *They* and variation in sentence processing behavior

https://tinyurl.com/FoleyUGA

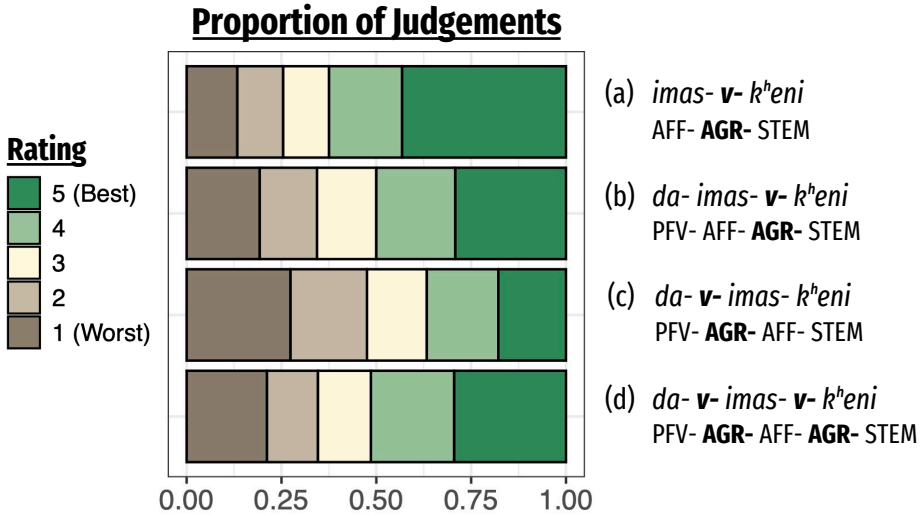
Steven Foley • srfoley@uga.edu • https://stevenrfoley.github.io/

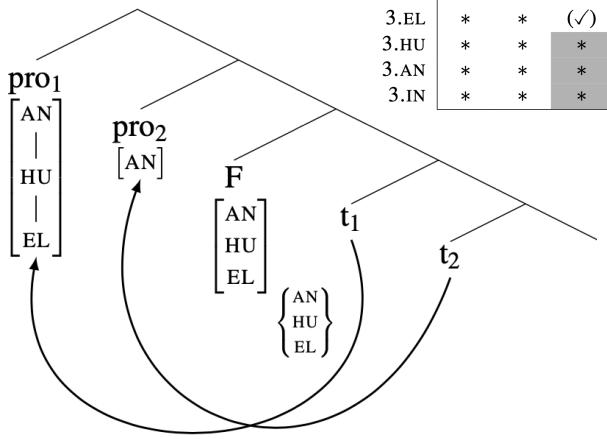
UGA linguistics department colloquium • January 31st, 2025

About my research

Grammatical diversity, especially in morphosyntax

- What constrains and explain variation, across and within languages?
- Multiple grammars of agreement in Georgian 🇬🇪 (Foley & Amiridze, submitted)
- Patterns of pronoun movement across Zapotec 🇲🇽 (Foley & Toosarvandani 2022)





Yalálag

	1SG	2SG	3.EL	3.HU	3.AN	3.IN
1SG	–	*	✓	✓	✓	✓
2SG	*	–	✓	✓	✓	✓
3.EL	*	*	(✓)	✓	✓	✓
3.HU	*	*	*	(✓)	✓	✓
3.AN	*	*	*	*	(✓)	✓
3.IN	*	*	*	*	*	(✓)

Laxopa

	1SG	2SG	3.EL	3.HU	3.AN	3.IN
1SG	–	*	✓	✓	✓	✓
2SG	*	–	✓	✓	✓	✓
3.EL	*	*	(✓)	✓	✓	✓
3.HU	*	*	✓	(✓)	✓	✓
3.AN	*	*	*	*	(✓)	✓
3.IN	*	*	*	*	*	(✓)

Zoogocho

	1SG	2SG	3.EL	3.HU	3.AN	3.IN
1SG	–	*	✓	✓	✓	✓
2SG	*	–	✓	✓	✓	✓
3.EL	*	*	(✓)	✓	✓	✓
3.HU	*	*	✓	(✓)	✓	✓
3.AN	*	*	✓	✓	(✓)	✓
3.IN	*	*	*	*	*	(✓)

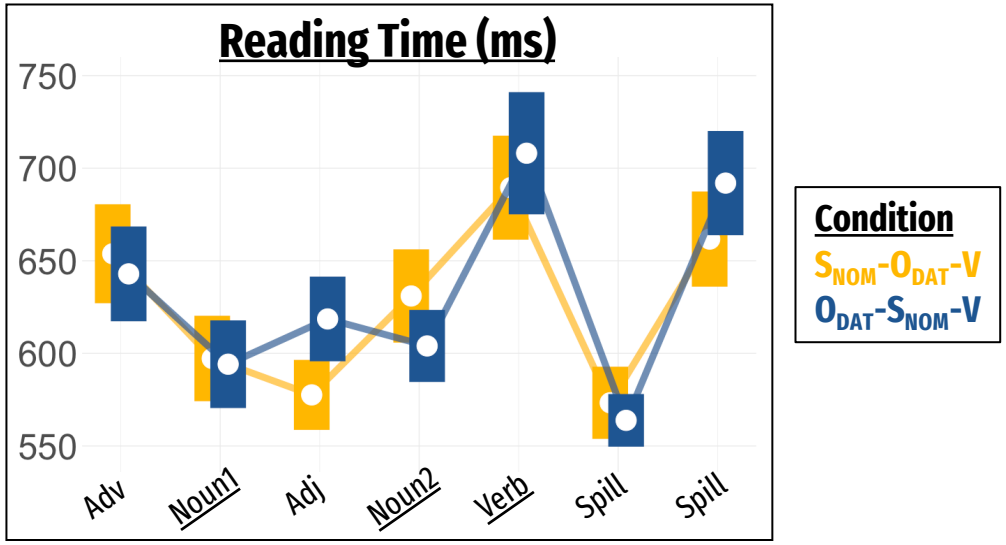
About my research

Parsing incremental ambiguities

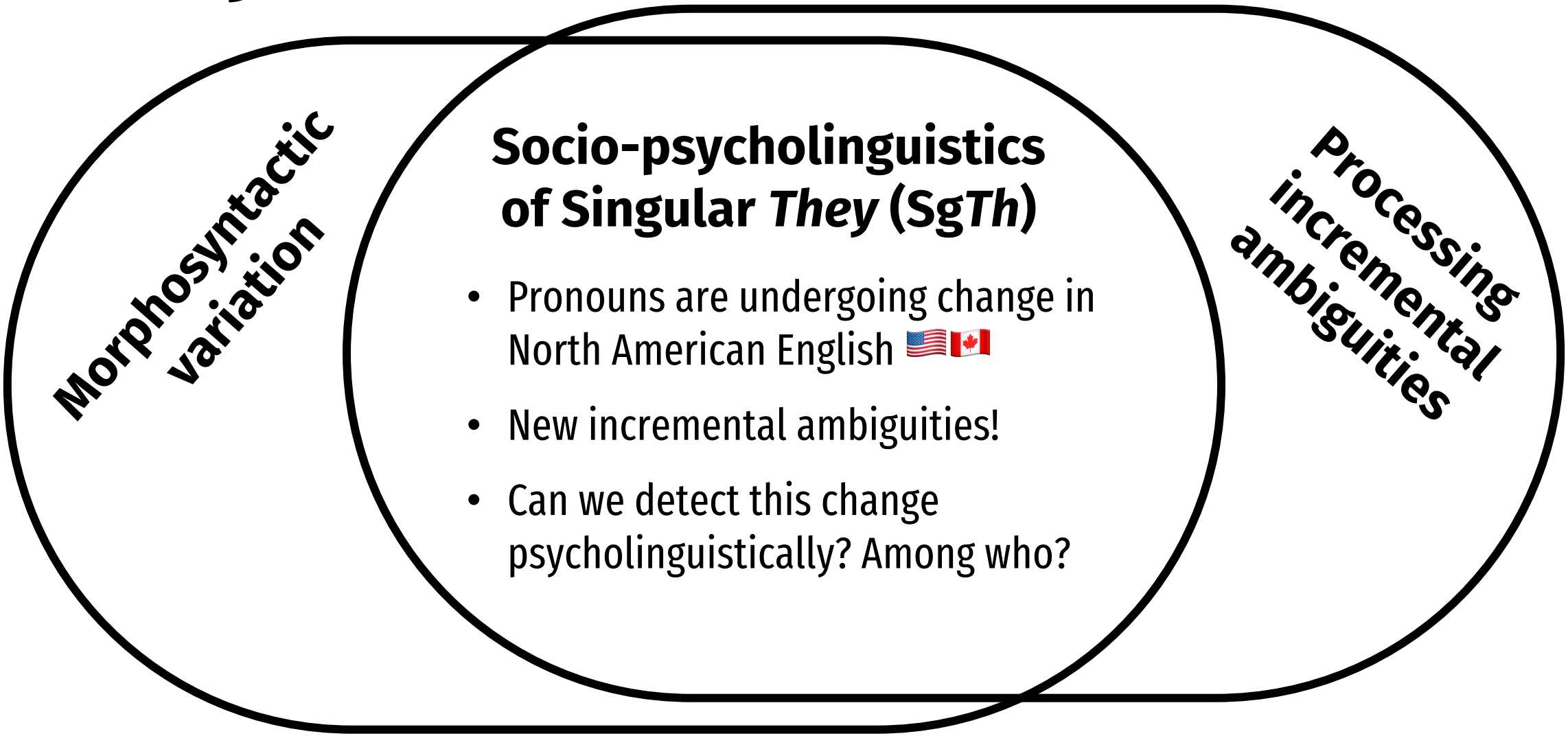
- Morphosyntactic variation poses many challenges to real-time comprehension
- How are sentences processed efficiently across diverse languages?
- Identifying subjects & objects given Georgian's complex morphosyntax (Foley 2020; Foley, in prep)
- Processing verb-initial relative clauses in Zapotec (Foley et al. 2019)

(i) *lom-**i*** *vep^{h}χv-**s*** *naχavs*
lion-**NOM** tiger-**DAT** see:**FUT**
"The lion will see the tiger" [**S$_{NOM}$-O$_{DAT}$-V**]

(ii) *lom-**i*** *vep^{h}χv-**s*** *unaχavs*
lion-**NOM** tiger-**DAT** see:**PERF**
"The tiger has seen the lion" [**O$_{NOM}$-S$_{DAT}$-V**]

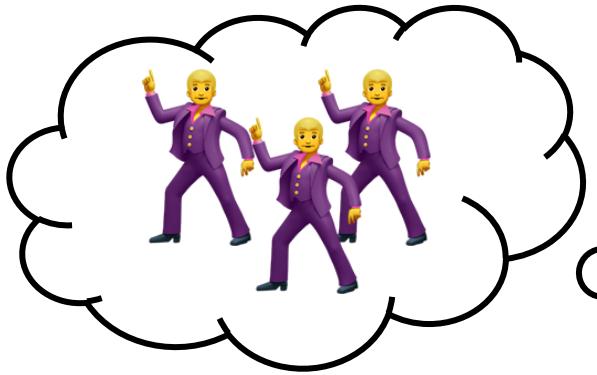


Today's talk


Morphosyntactic variation
Socio-psycholinguistics of Singular *They* (Sg*Th*)
• Pronouns are undergoing change in North American English 🇺🇸🇨🇦
• New incremental ambiguities!
• Can we detect this change psycholinguistically? Among who?
Processing incremental ambiguities

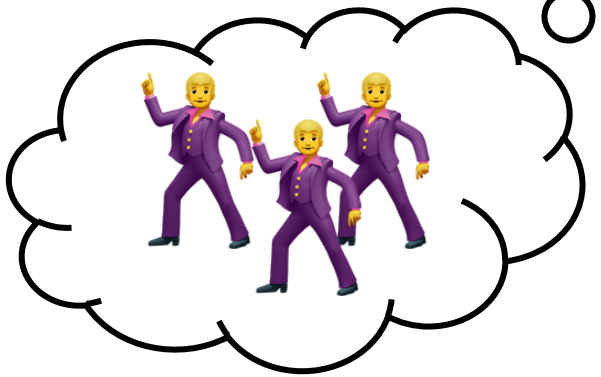
Today's talk

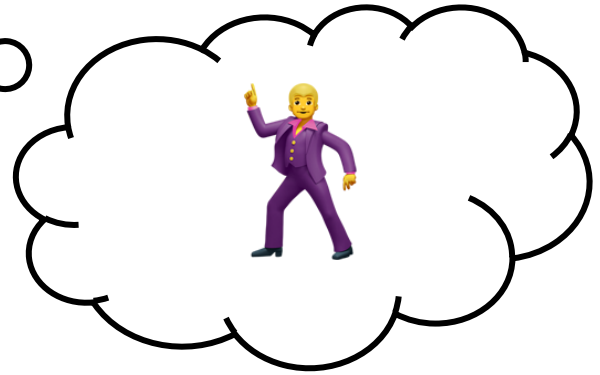
Comprehenders **less familiar** w/ SgTh



After <u>they</u> started dancing...

Comprehenders **more familiar** w/ SgTh





Today's talk

Preview of the present study

- Two reading-time experiments on cataphoric (pronoun-first) reference
- Many diverse participants, representing a wide range of ages and gender identities

Psycholinguistic findings

- Everyone processes *they* differently than *s/he*

Sociolinguistic findings

- Different comprehenders process *they* differently
- Just who? It's demographically nuanced

~~1. Introduction~~

2. Singular *They*

3. Cataphora

4. Experiments

5. Conclusion

Pronouns

Nouns and coreferent pronouns must match in features

- In English, 3SG pronouns contrast gender/animacy: feminine, masculine, or inanimate

(1) a. **The nun** said **she** meditates. **[3SG, FEM]**

b. #**The nun** said **he** meditates. **[3SG, MASC]**

c. #**The nun** said **it** meditates. **[3SG, INAN]**

- These singular pronouns cannot corefer with plural noun phrases (NPs)

(2) a. **The nuns** said **they** meditate. **[3PL]**

b. #**The nuns** said **she** meditates. **[3SG, FEM]**

Pronouns

For *they*, the matching constraint is more complicated

- Primary usage: coreference with plural NPs

(4) **The poets** said **they** meditate. **Plural *They***

- Other usages: coreference with various types of singular NPs

(5) %**Each poet** said **they** meditate. **Quantified Sg*Th***

(6) %**The poet** said **they** meditate. **Definite Sg*Th***

They is changing

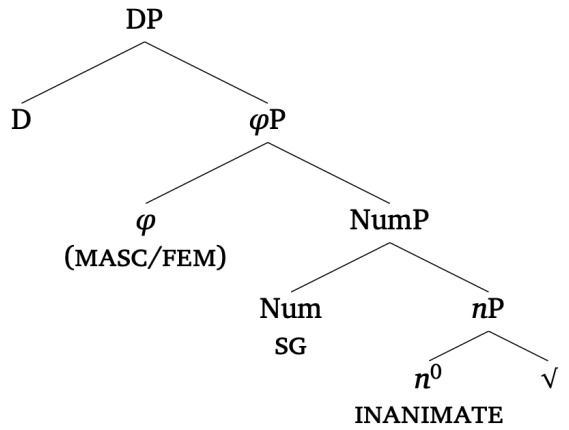
Multiple stages of Sg*Th* innovation (Bjorkman 2017, Konnelly & Cowper 2020)

	Non-Innovators	Innovators	Super-Innovators
Plural *They* (the poets...they)	✓	✓	✓
Quantified Sg*Th* (each poet...they)	#	✓	✓
Definite Sg*Th* (the poet...they)	#	#	✓

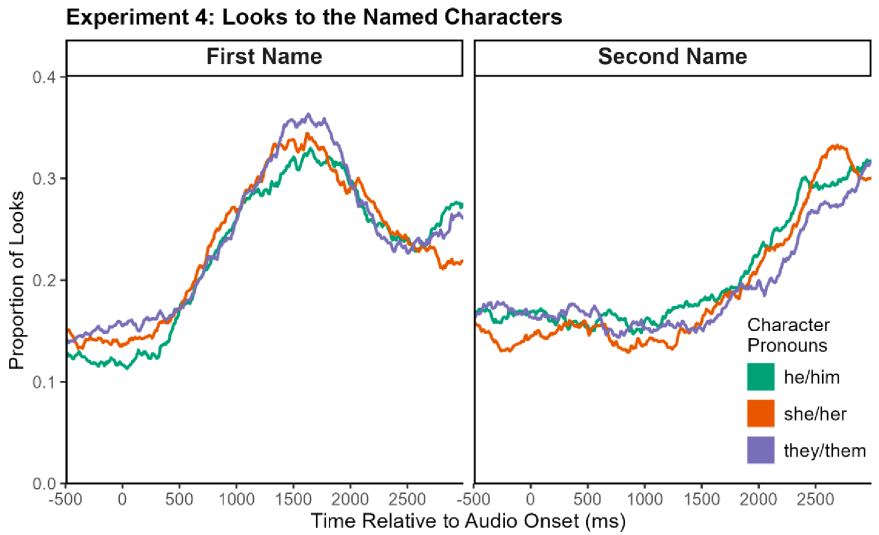
Previous research on SgTh

Lots of recent work in intersecting subfields

- **Theoretical morphosyntax** (Bjorkman 2017; Ackerman 2019; Conrod 2019; Konnelly & Cowper 2020; Conrod et al. 2020)
- **Sociolinguistics** (Bradley 2020; Hekanaho 2020; Hernandez 2020; Conrod 2022)
- **Experimental syntax, pragmatics, and psycholinguistics** (Sanford et al. 2006; Sanford & Filik 2007; Moulton et al. 2020, 2022; Camilliere et al. 2021; Van Handel et al. 2021; Han & Moulton 2022; Gardner 2023; Arnold et al. 2024; Kaiser & Post, to appear)



Bjorkman 2017

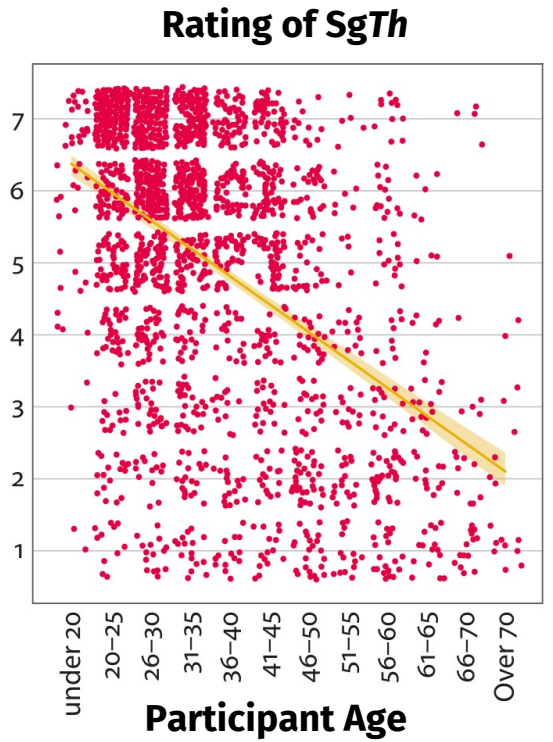


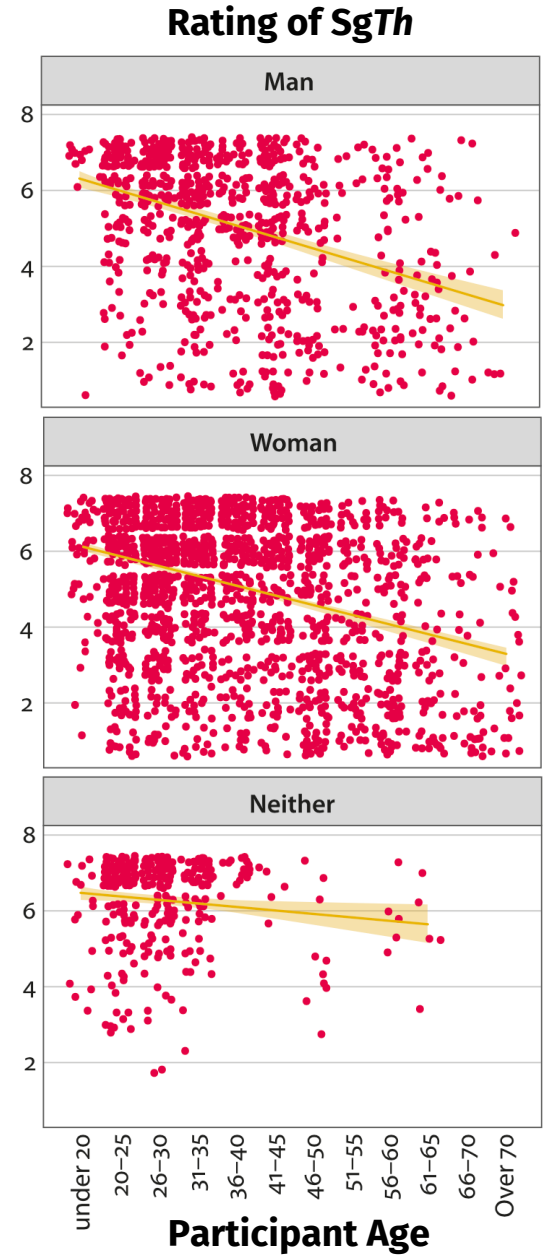
Gardner 2023

Previous research on Sg*Th*

Who are the innovators?

- LGBTQ, especially trans & nonbinary, speakers (Conrod 2019, Hernandez 2020)
- Younger speakers (Conrod 2019, Hekanaho 2020) — evidence of a change in progress (Conrod 2022, following Weinreich et al. 1968)
- A question of experience and acquisition!





Conrod 2022

Innovations of the current study

Most variationist research has used off-line data (judgements)

- How are "slow"/off-line & "fast"/real-time processes related? (Lewis & Philipps 2015)
- Sg*Th* is socially salient: a change from above (Conrod 2022, following Labov 1966)

		Comprehenders for whom…	
		Sg*Th* is **easy** to process	SgTh is **hard** to process
Raters for whom…	Sg*Th* is **acceptable**	??	??
	Sg*Th* is **unacceptable**	??	??

~~1. Introduction~~

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Anaphora vs. cataphora

Anaphoric pronouns follow their NP antecedents

- Most common configuration of nouns & pronouns (Reinhart 1983)

(7) **The nun** makes lunch after **she** jogs. **Anaphora**

Cataphoric pronouns precede their NP postcedents

- Rarer and more pragmatically marked (Carden 1982)

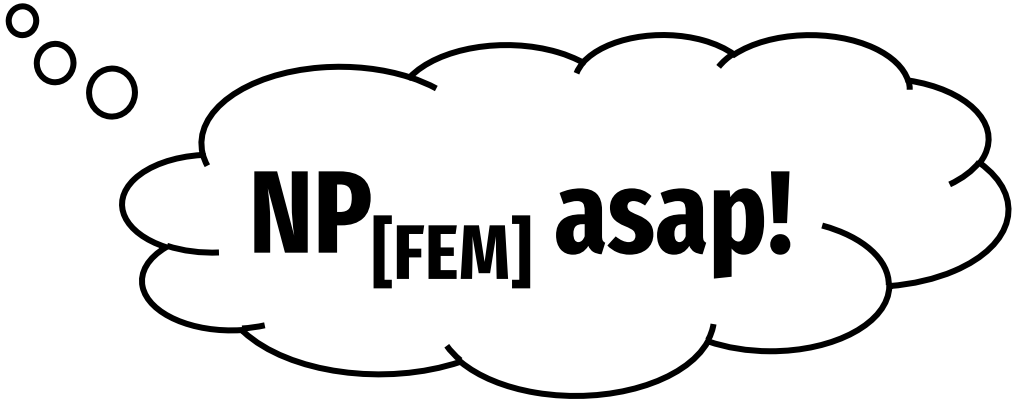
(8) After **she** jogs, **the nun** makes lunch. **Cataphora**

Psycholinguistics of cataphora

Cataphors are processed predictively

- Comprehenders expect a suitable coreferent noun in the nearest possible position
- **The predictive search is active** (Pablos et al. 2015, Giskes & Kush 2021)**, abstract** (Giskes & Kush 2022)**, and sensitive to binding principles** (Kazanina et al. 2007, Kush & Dillon 2021)

(9) After **she** jogs...



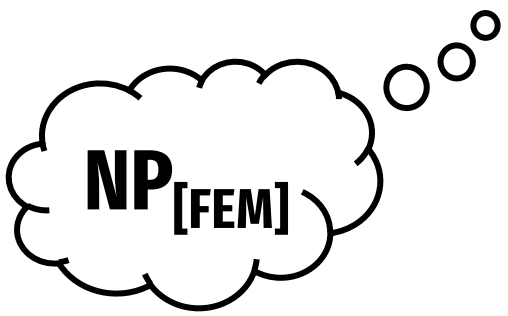
Psycholinguistics of cataphora

Evidence: Gender Mismatch Effects (Van Gompel & Liversedge 2003, et seq.)

- Processing difficulty (slow RTs) at gender-discordant nouns following cataphors

(10) After **she** jogs,  **the nun** makes the monk lunch.

(11) After **she** jogs,  the monk makes **the nun** lunch.



Gender Mismatch Effect!

Psycholinguistics of cataphora

How general is the predictive search?

- Almost all studies on cataphora have manipulated gender
- But pronouns also contrast number features

Are there Number Mismatch Effects?

- Maybe so, in ’00s British English (Van Gompel & Liversedge 2003, exp. 3)
- And in Dutch (Giskes & Kush 2022)

he
[3RD, **SG**, MASC]

she
[3RD, **SG**, FEM]

it
[3RD, **SG**, INAN]

they
[3RD, **PL**]

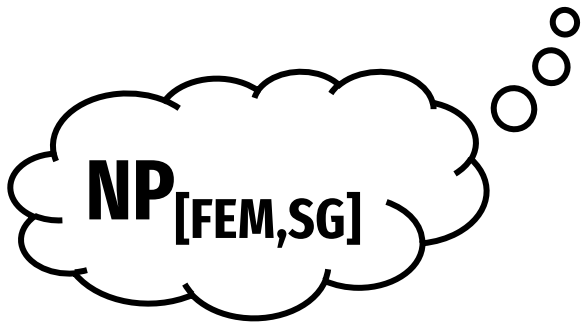
Psycholinguistics of cataphora

Number Mismatch Effects

- Does *she* evoke [SG] in addition to [FEM]?

(12) After **she** jogs,  **the nun** makes the nurses lunch.

(13) After **she** jogs,  the nuns make **the nurse** lunch.



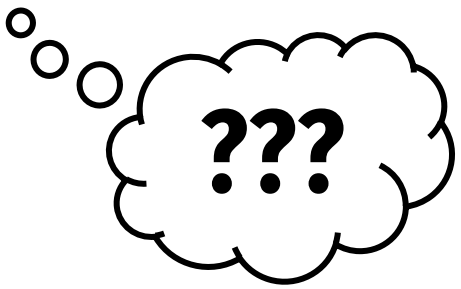
Number Mismatch Effect!

Psycholinguistics of cataphora

Number Mismatch Effects

- Given ongoing change in English, what about cataphoric *they*?
- What kinds of predictions are made by which comprehenders?

(14) After they jog...



~~1. Introduction~~

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Synthesizing predictions

Starting points

- During real-time processing, cataphoric pronouns evoke predictions for number
- Variation in Sg*Th* acceptability correlates with real-time processing behavior
- Trans/nonbinary speakers & younger speakers are more likely to be *they*-innovators

Synthesizing predictions

	Sg*Th* Non-innovators (Older and cisgender)	**Sg*Th* Innovators** (Younger and non-cis)
***s/he*...SG** (After she jogs, the poet...)	easy 🐇	easy 🐇
***s/he*...PL** (After she jogs, the poets...)	hard 🐌	hard 🐌
***they*...PL** (After they jog, the poets...)	easy 🐇	easy 🐇
***they*...SG** (After they jog, the poet...)	hard 🐌	easy 🐇

Everyone will have a NME after SG cataphors

Only non-innovators will have a NME after *they*

Overview of experiments

Two remote reading-time studies with diverse participants

- Hosted on PCIbex (Zehr & Schwarz 2018), participants recruited via Prolific
- **Exp1:** Recruitment targeted **gender identity**, wide age range to boot

Exp1 Participant Breakdown

	N_{Subj}	Age Range
Cis men	38	18–65
Cis women	22	21–79
Trans men	13	19–49
Trans women	6	20–42
Other identity	41	19–75

Design

2×2: {Cataphoric ***s/he*** *vs.* ***they***} × {Number **match** vs. **mismatch**}

- 32 itemsets with 64 fillers

(a) When **she** exercises at home, **the reporter** misses the librarians' enthusiastic encouragement. — ***s/he…SG***

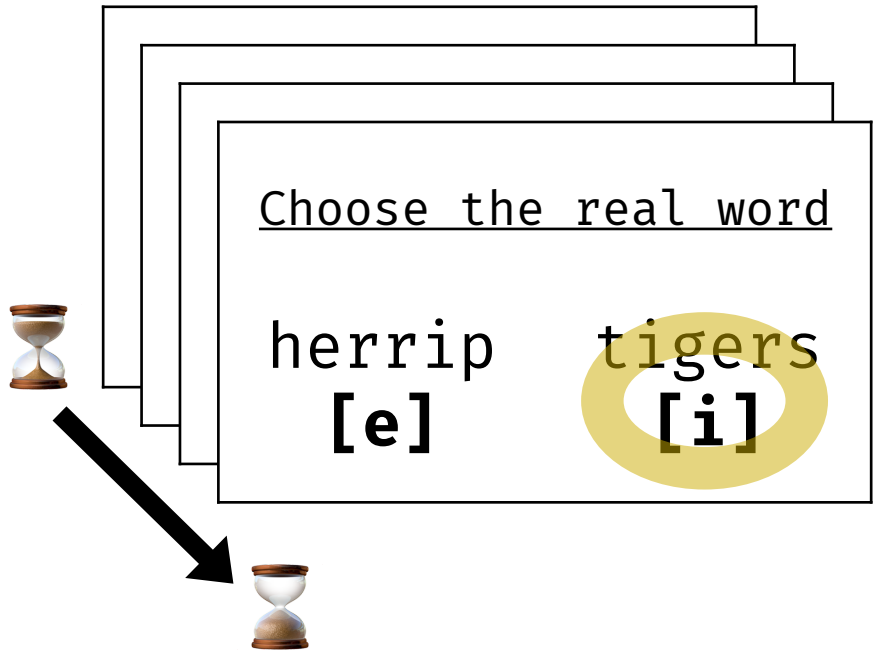
(b) When **she** exercises at home, **the reporters** miss the librarian's enthusiastic encouragement. — ***s/he…PL***

(c) When **they** exercise at home, **the reporters** miss the librarian's enthusiastic encouragement. — ***they…PL***

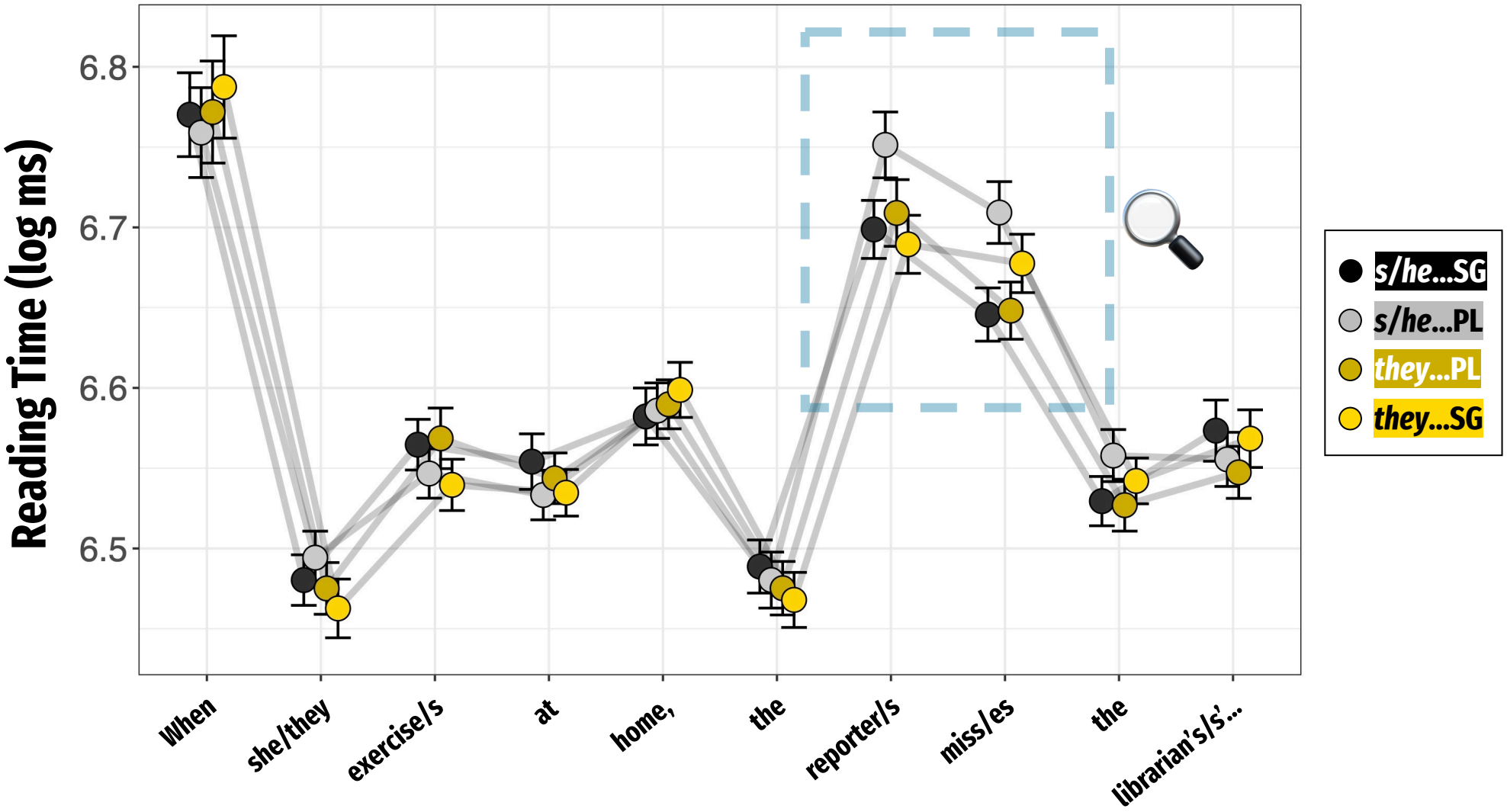
(d) When **they** exercise at home, **the reporter** misses the librarians' enthusiastic encouragement. — ***they…SG***

Lexicality Maze task

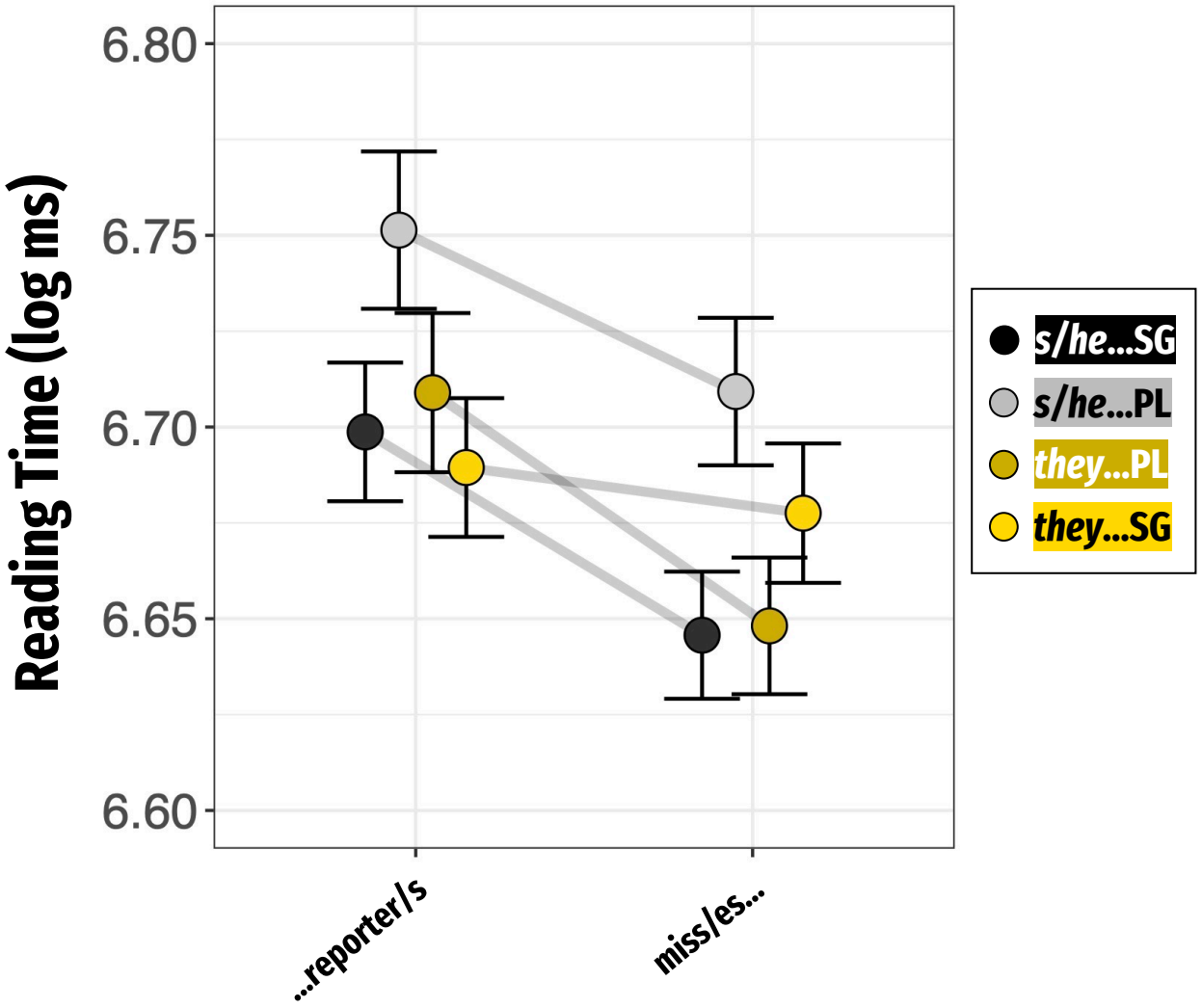
Self-paced reading × lexical decision (Freedman & Forster 1985, Boyce et al. 2020)



Exp1 results



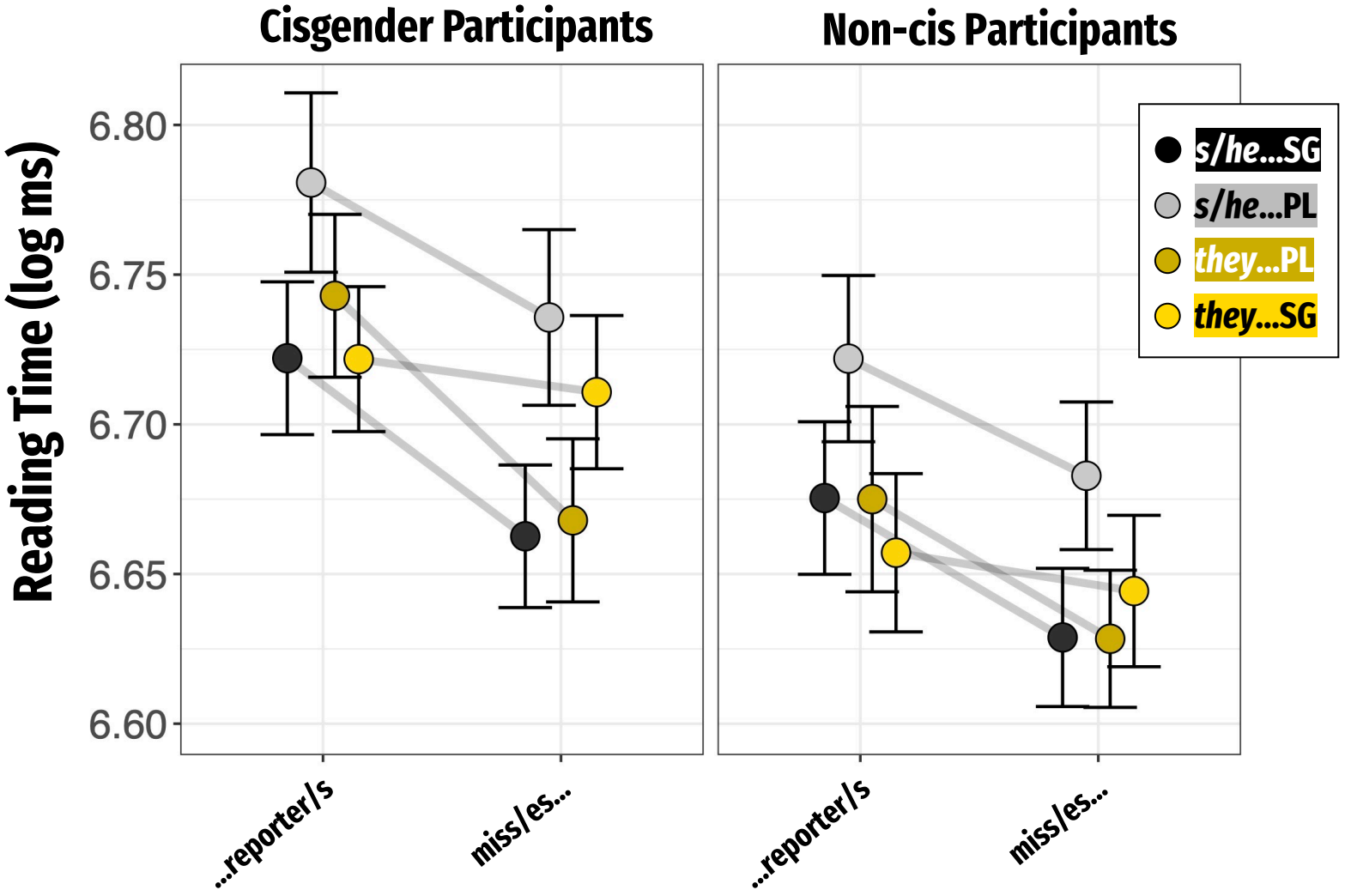
Exp1 results



Across all participants: NMEs are asymmetrical!

- Big, immediate effect for *s/he*
  RT(***s/he...PL***) ≫ RT(***s/he...SG***)
- Smaller, later effect for *they*
  RT(***they...SG***) ≥ RT(***they...PL***)
- Noun region: main effect of Cat (p<0.5) and Cat–Match interaction (p<0.001)
- Spillover region: main effect of Match (p<0.001) and Cat–Match interaction (p<0.05)

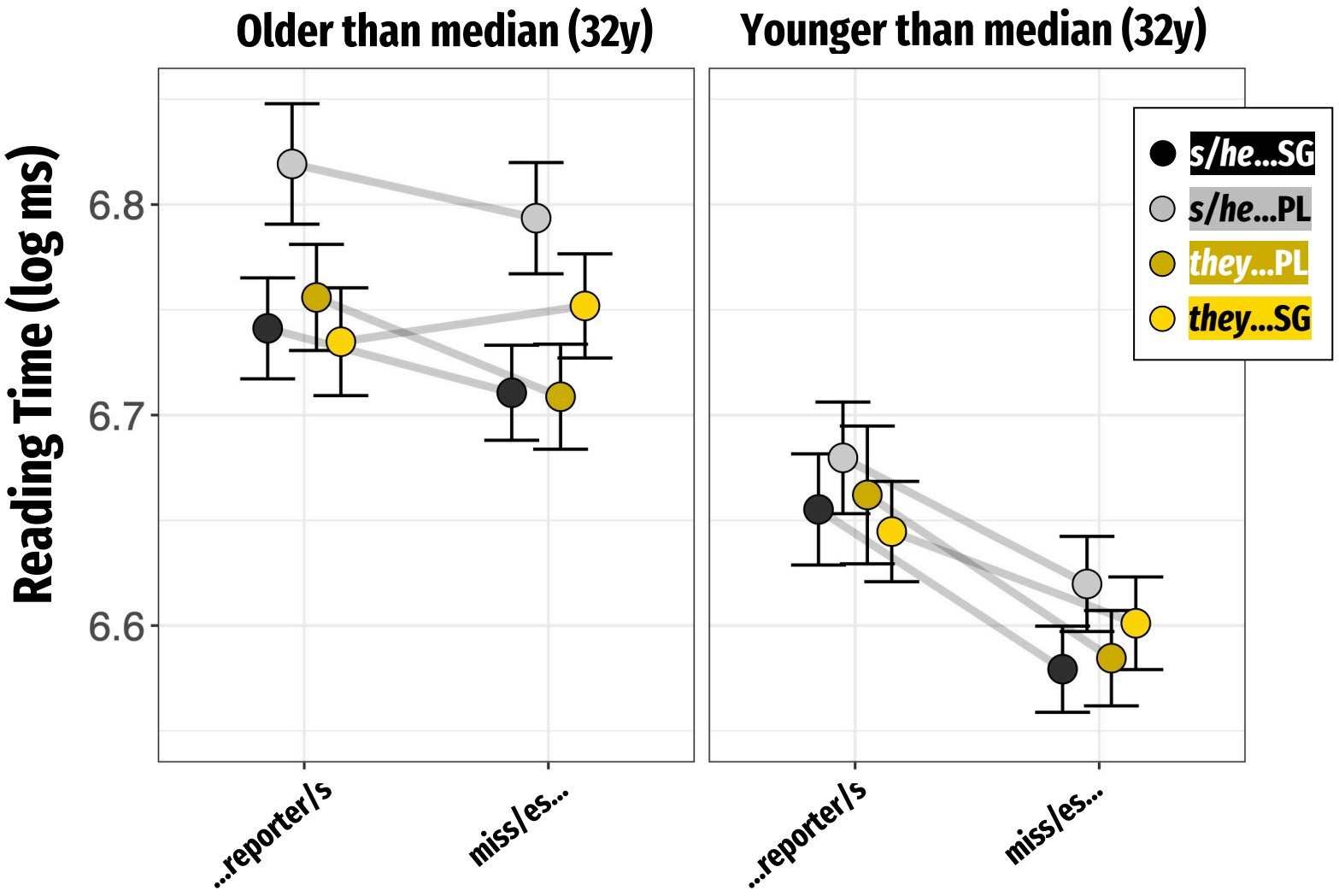
Exp1 results: By gender



They-mismatch merely trends greater among cis participants

- Hypothesis (cis predicts non-innovative wrt Sg*Th*) not supported by stats
- No significant interactions between Gender and Cataphor or Match

Exp1 results: By age



They-mismatch increases with age

- Hypothesis borne out: older predicts less innovative wrt Sg*Th*
- Noun & Spillover regions: main effect of Age (p's < 0.001)
- Noun region: Match–Age (p<0.05) & Cat–Match–Age interactions (p<0.05)

Exp1 discussion

Psycholinguistic finding: Asymmetrical NMEs

- ***S/he*** evokes a **strong expectation for SG**, but ***they*** evokes a **weak expectation for PL**
- Similar to findings for Dutch (Giskes & Kush 2022)
- *They* is highly ambiguous, with impersonal usages? (Kitagawa & Lehrer 1990)
- Plural is featurally underspecified? (Sauerland 2008)

Exp1 discussion

Sociolinguistic finding: Age interacts with NMEs for *they*

- Even without collecting off-line data, age predicts **variation in real-time behavior**
- Why not gender identity? Cis vs. non-cis are very coarse-grained categories

Next steps

- Target age more systematically during recruitment
- Find a better proxy for Sg*Th* innovation

Overview of Exp2

Method, design, and materials

- L-Maze again; Same 2×2 design; 28 itemsets from Exp1 + 68 new fillers

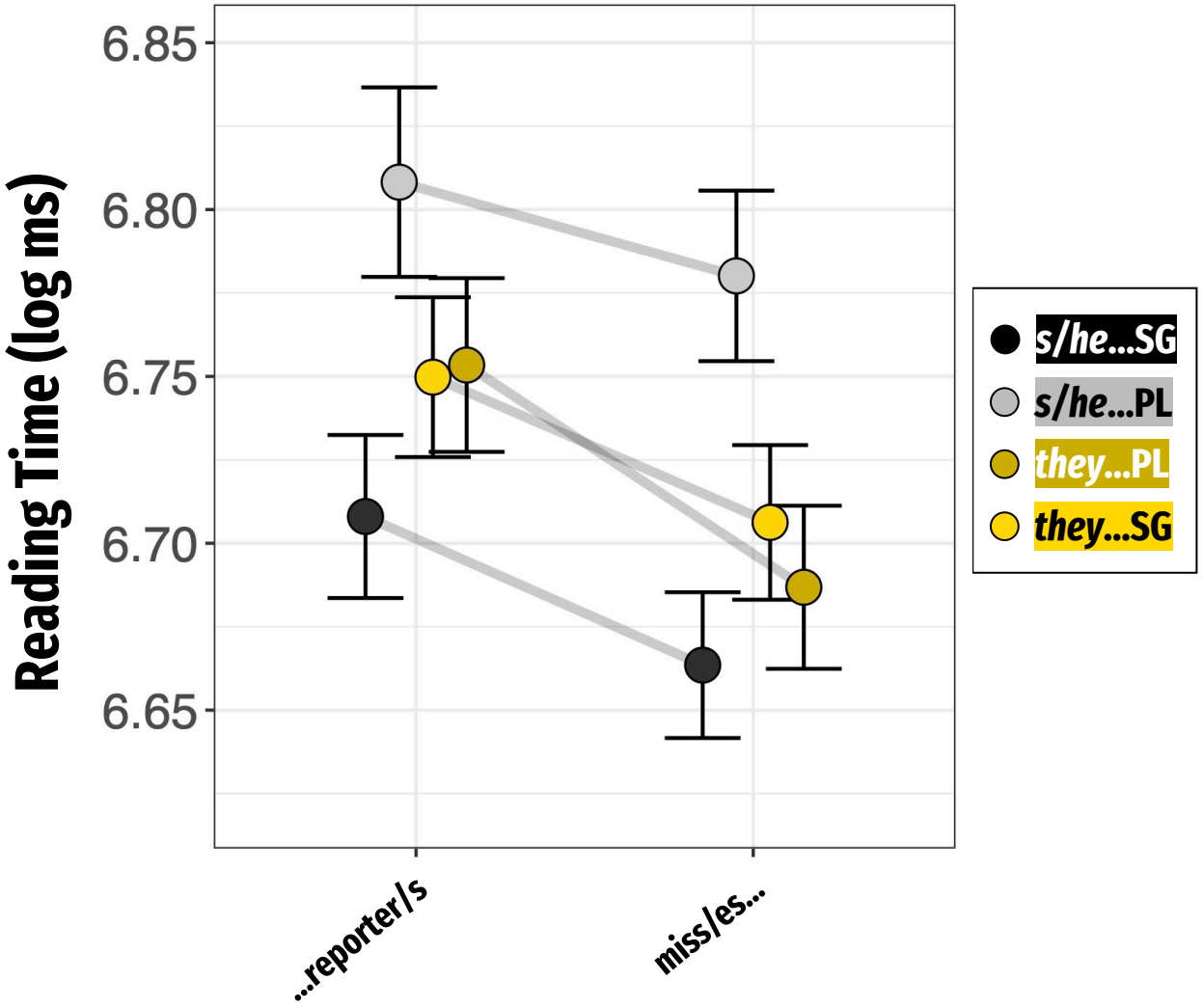
Recruitment

- More principled age hypothesis: speakers born before/after '84 "tipping point" (Tagliamonte 2023)
- More direct proxy for Sg*Th* familiarity: Composite score from large survey (Ahn & Conrod 2023)

Exp2 Participant Breakdown

	More Familiar w/ Sg*Th*	**Less Familiar w/ Sg*Th***
Born before 1980	N_{Subj} = 18	N_{Subj} = 22
Born after 1989	N_{Subj} = 24	N_{Subj} = 21

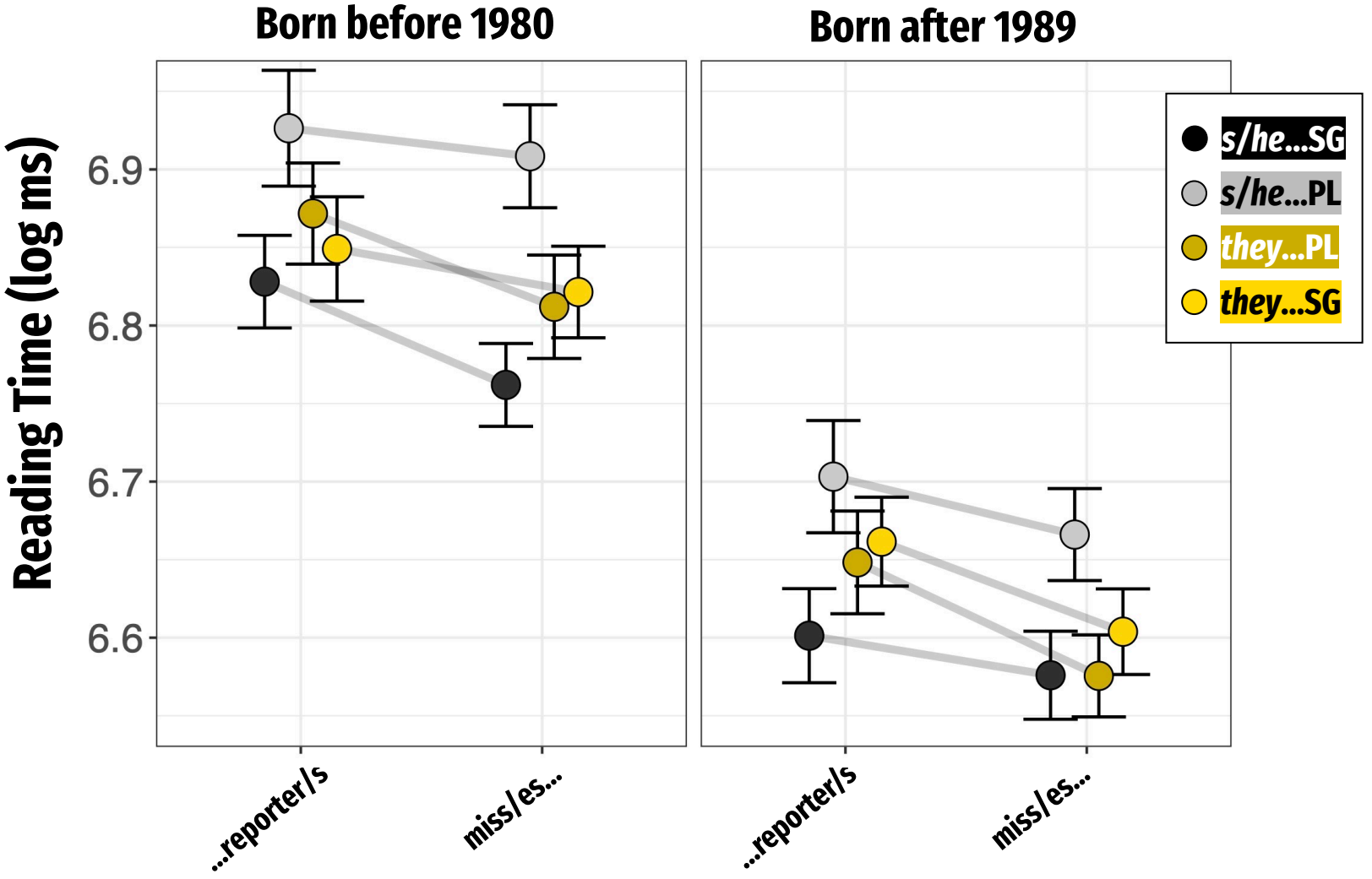
Exp2 results: Aggregated



Asymmetrical NME replicated

- Big, immediate effect for *s/he*
  RT(**s/he...PL**) ≫ RT(**s/he...SG**)
- Smaller, later effect for *they*
  RT(**they...SG**) ≥ RT(**they...PL**)
- Noun region: main effect of Match (p<0.001) and Cat–Match interaction (p<0.001)
- Spillover region: main effect of Cat (p<0.05), Match (p<0.001), and Cat–Match interaction (p<0.001)

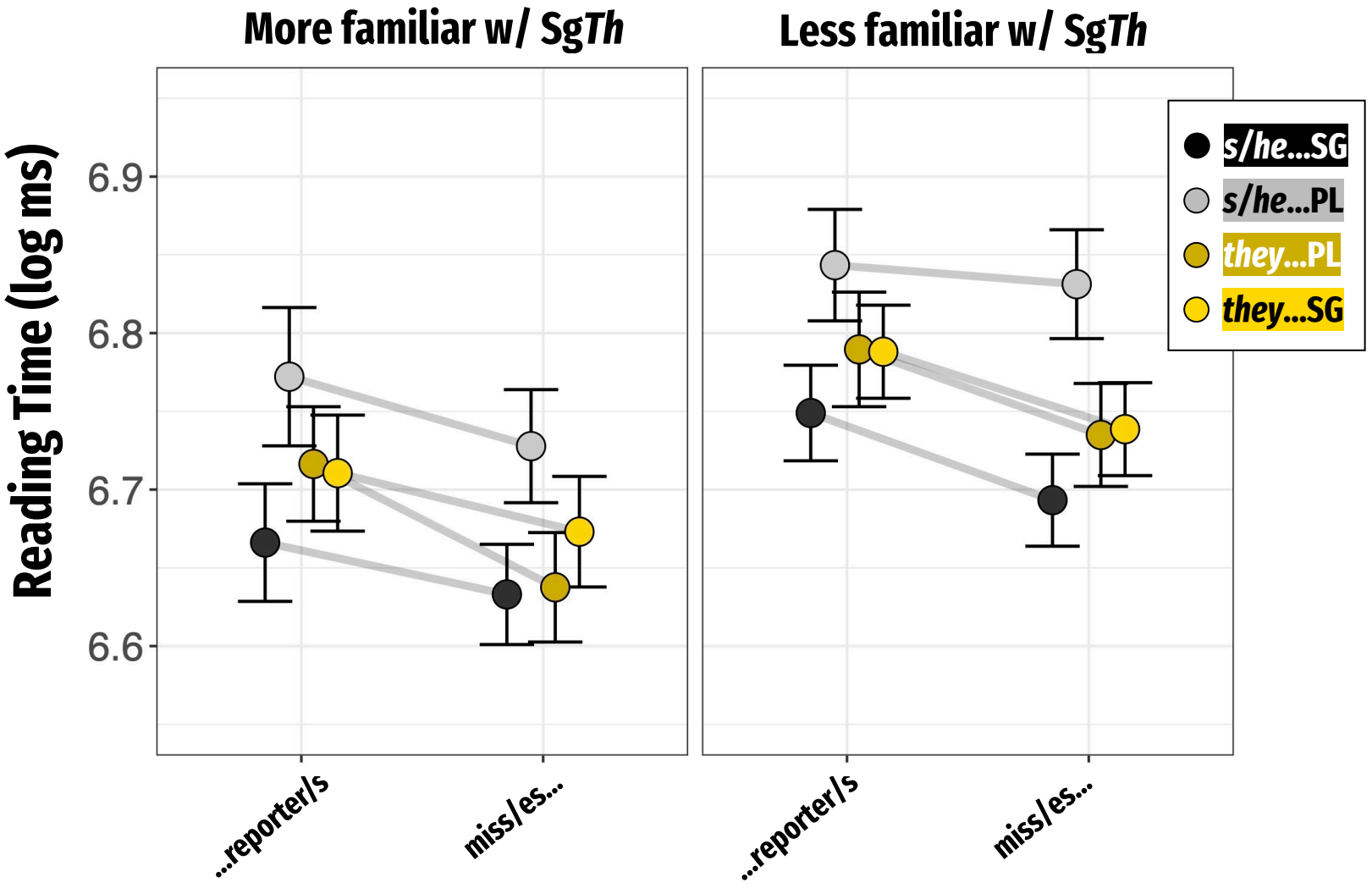
Exp2 results: By generation



No clear difference in *They*-NME across generations

- Noun and spillover regions: main effect of Generation (p's < 0.001), but no sig. interactions with Cat or Match

Exp2 results: By Sg*Th*-familiarity



No clear difference here either

- No significant main effects or interactions with Familiarity

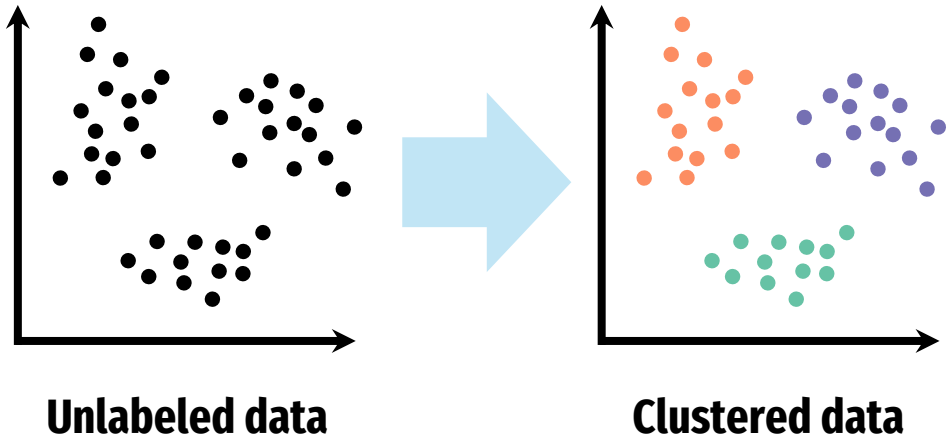
Exp2 clustering analysis

Predictions about demographic variables weren't borne out

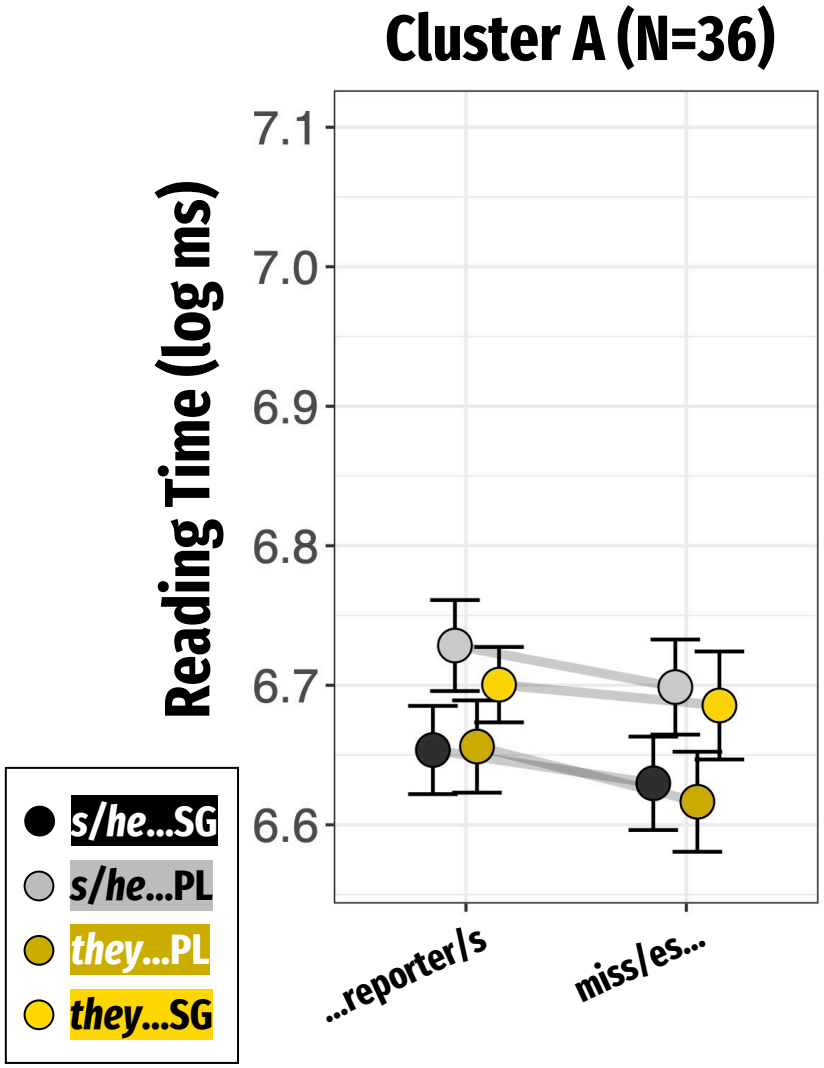
- Why? Different experiment, different participants, different recruitment

Exploratory *k*-means clustering analysis

- Algorithm for finding latent patterns in data (Burnett et al. 2024)
- Run on *z*-scored RTs at Noun & Spillover
- Here, a three-way clustering



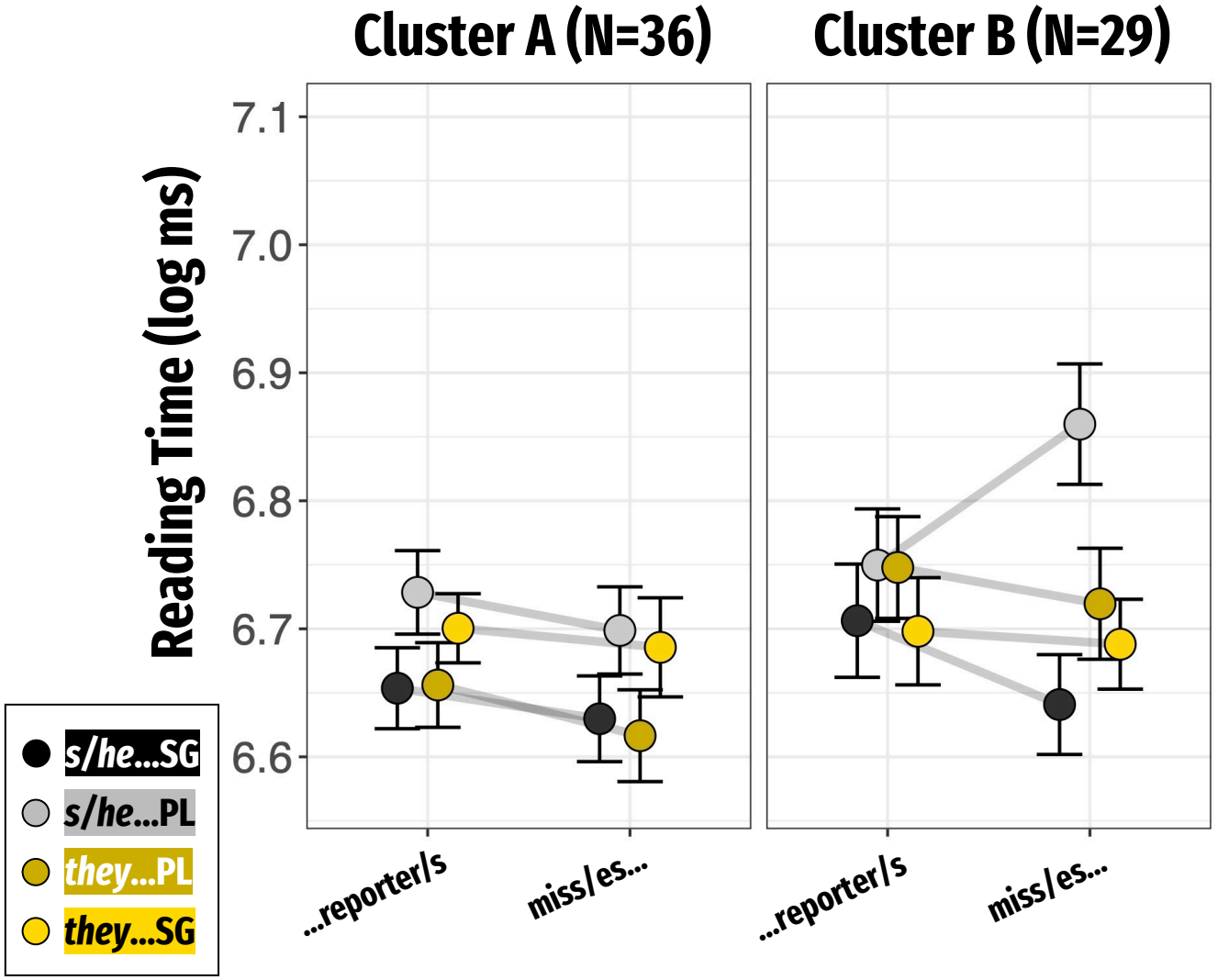
Exp2 clustering analysis



Cluster A

- Both mismatched conditions are hard to process
- Non-innovators wrt Sg*Th*?

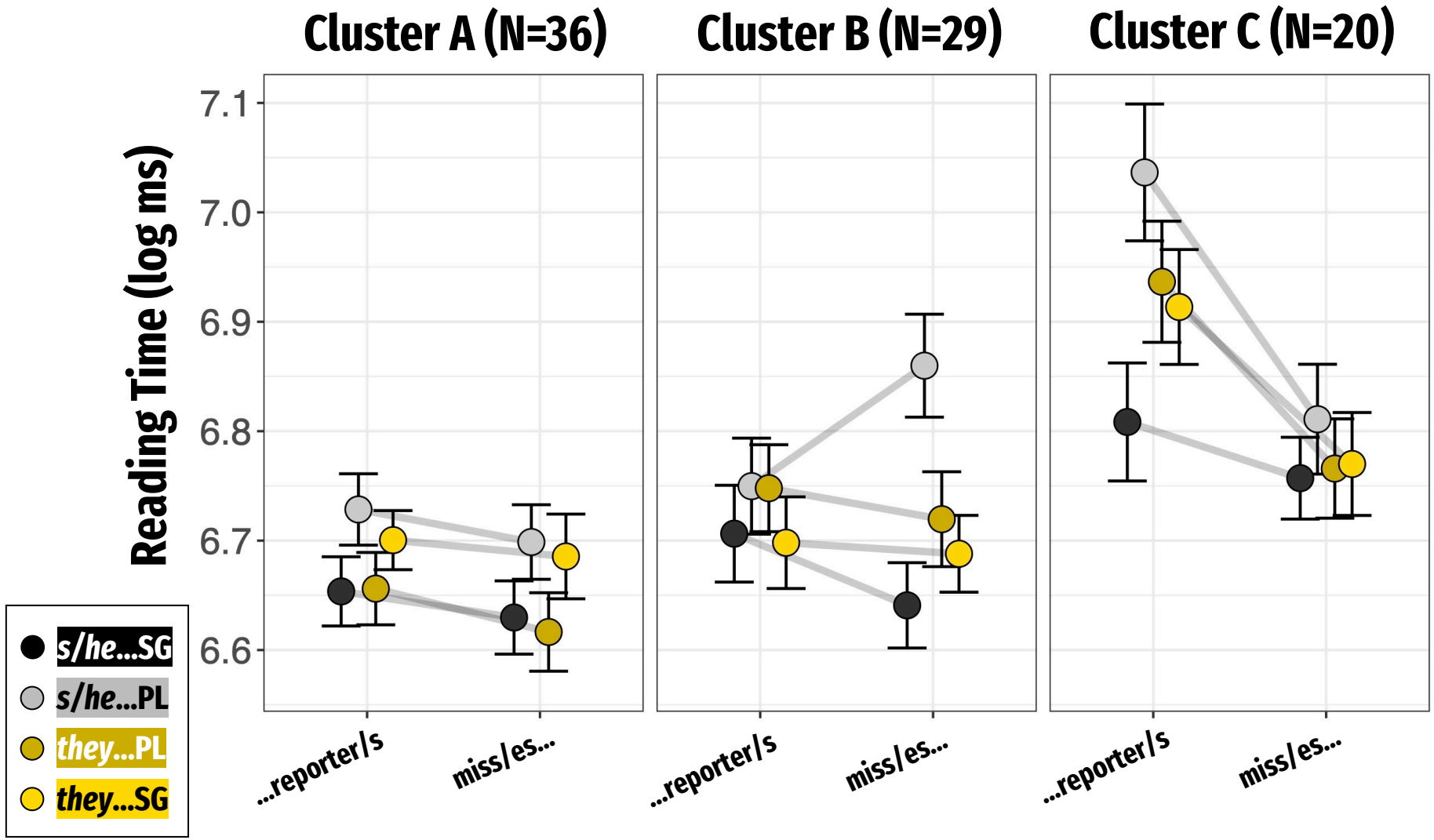
Exp2 clustering analysis



Cluster B

- Only *s/he*...PL is hard to process
- Super-innovators wrt Sg*Th*?

Exp2 clustering analysis



Cluster C

- Slower overall, *They* conditions are middling
- Less predictive readers? (Yadav et al. 2022)

Exp2 clustering analysis

What social variables predict the RT Clusters?

- Basically none! (Not age, Sg*Th*-familiarity, gender, prescriptivism, transphobia, etc.)

This is itself a notable finding

- Individuals are nuanced!
- Experience with Sg*Th* is difficult to predict

~~1. Introduction~~

~~2. Singular *They*~~

~~3. Cataphora~~

~~4. Experiments~~

5. Conclusion

Summary

Innovative singular usages of *they* are becoming widespread

- An issue of acquisition: Younger and Trans/Nonbinary speakers rate Sg*Th* best

Underexplored is variation in real-time processing behavior

- Especially relevant for a change from above

Experiments on cataphora bear psycholx & sociolx fruit

- Both studies: Number Mismatch Effects are different for cataphoric *s/he* vs. *they*
- Exp1 finds evidence that age predicts processing strategies for cataphoric *they*
- Exp2 suggests there are clusters of behavior that don't correlate with social variables

What's next

The many Singular *Theys*

- Many subtle factors influence acceptability of Sg*Th* (Camilliere et al. 2021)
- Specificity, type of quantifier, noun vs. name, gender bias, remoteness of referent

Acceptability + reading time

- Direct correlation of off-line and real-time measures

(15) After **they** jogged…

a. …**the poets** made lunch.

b. …**each poet** made lunch.

c. …**some poet** made lunch.

d. …**the poet** made lunch.

e. …**the nun** made lunch.

f. …**Alex** made lunch.

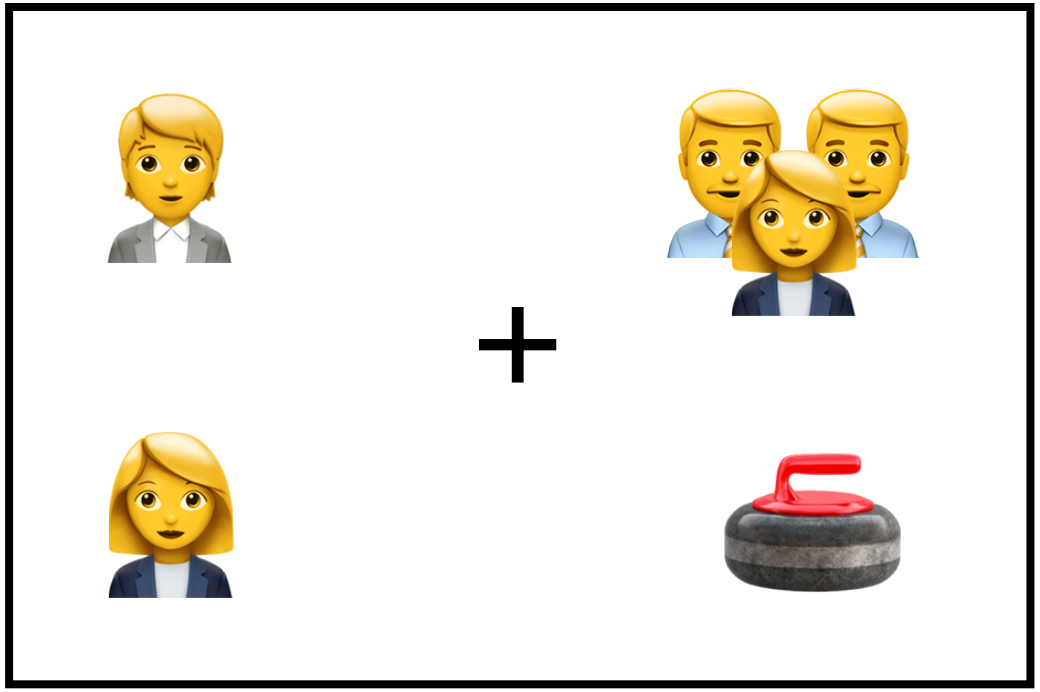
g. …**Alexander** make lunch.

- Read in the Maze
- Then rate: 1-2-3-4-5-6-7

What's next

Prediction vs. Memory Retrieval

- A fundamental issue in psycholinguistic theory (Pickering & Gambi 2018)
- New method: Visual-world eyetracking — building on my experience with Zapotec (Foley et al. 2019)



📣 After they jog...

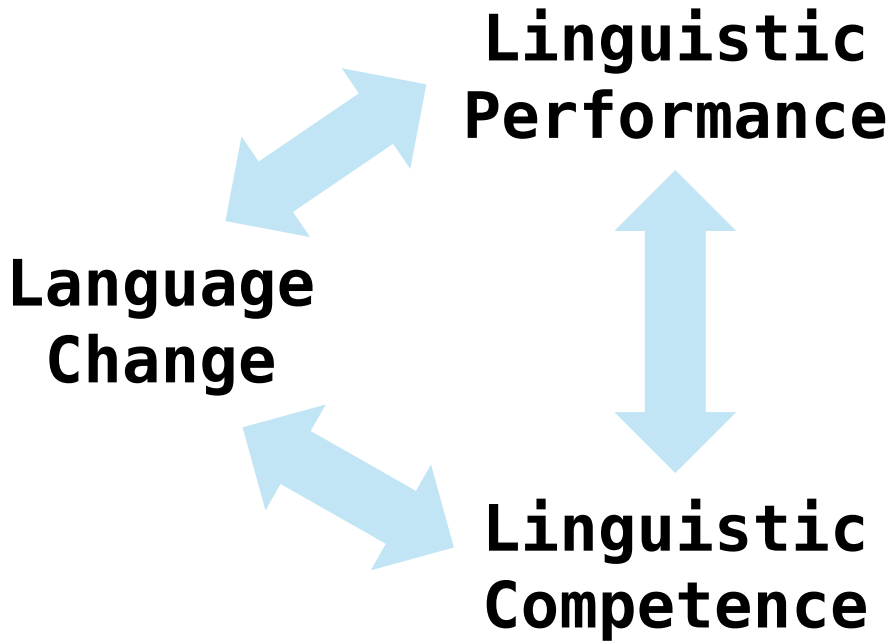
What's next

Beyond English

- Crosslinguistic processing of cataphora, or number
- Experimental approaches to other grammatical innovations (Foley & Amiridze, submitted)

Rich empirical & theoretical ground

- Much opportunity for psycholinguists to explore individual differences
- And for variationists to explore real-time data



Special thanks

Lauren Ackerman

Byron Ahn

Kirby Conrod

Ameena Faruki

Xander Guidry

Ruth Schultz

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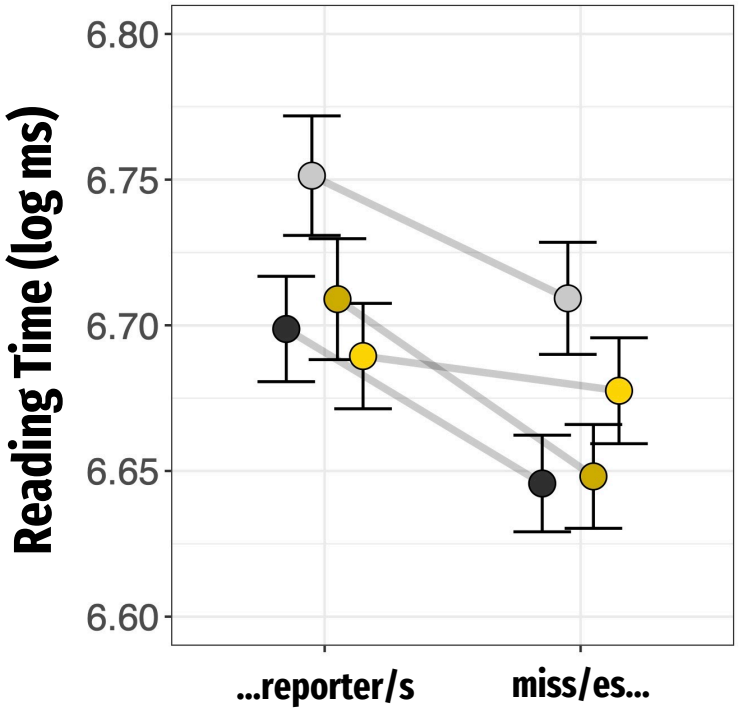
At a glance

(a) When **she** exercises at home, **the reporter** misses the librarians'…

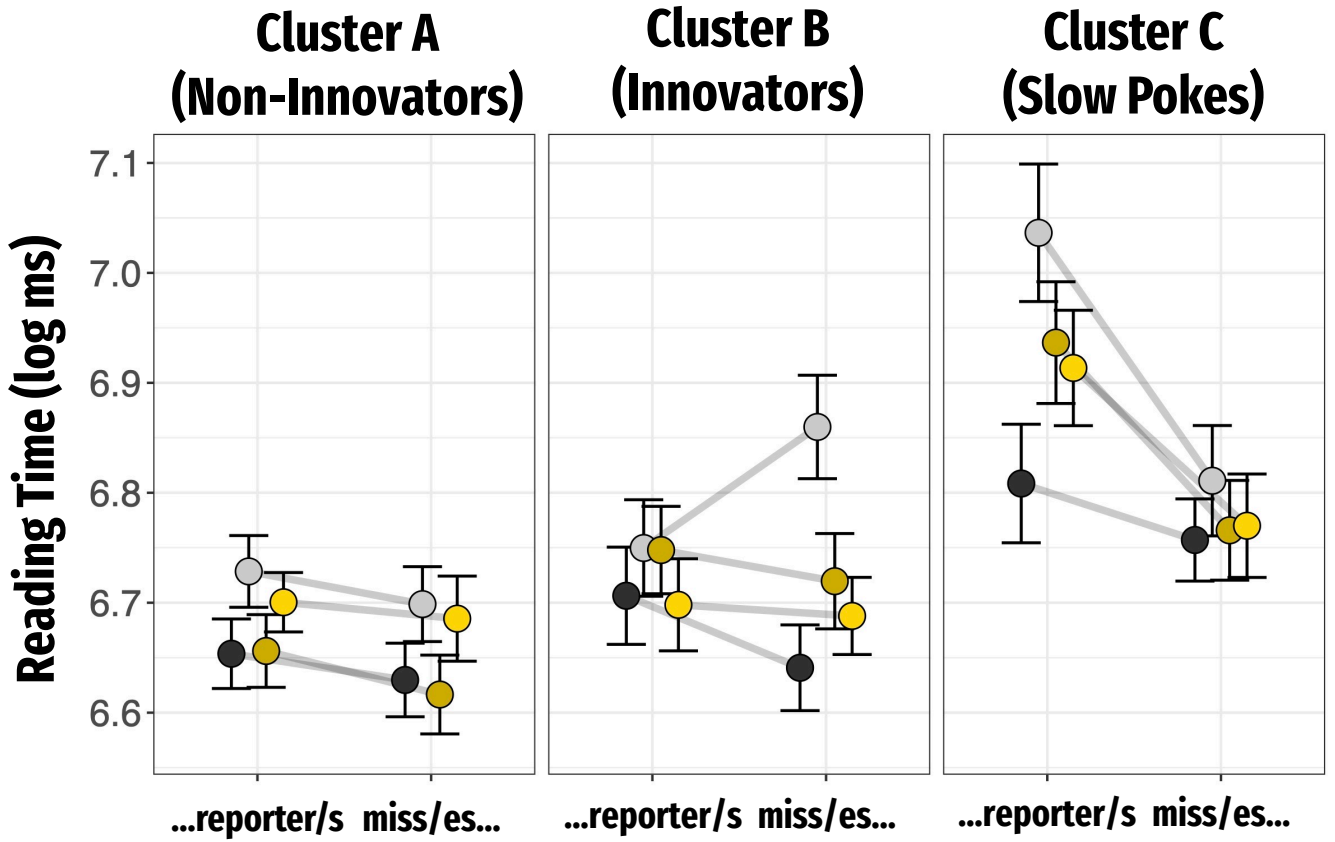
(b) When **she** exercises at home, **the reporters** miss the librarian's…

(c) When **they** exercise at home, **the reporter** misses the librarians'…

(d) When **they** exercise at home, **the reporters** miss the librarian's…



Exp1: Pooled results



Exp2: Clusters