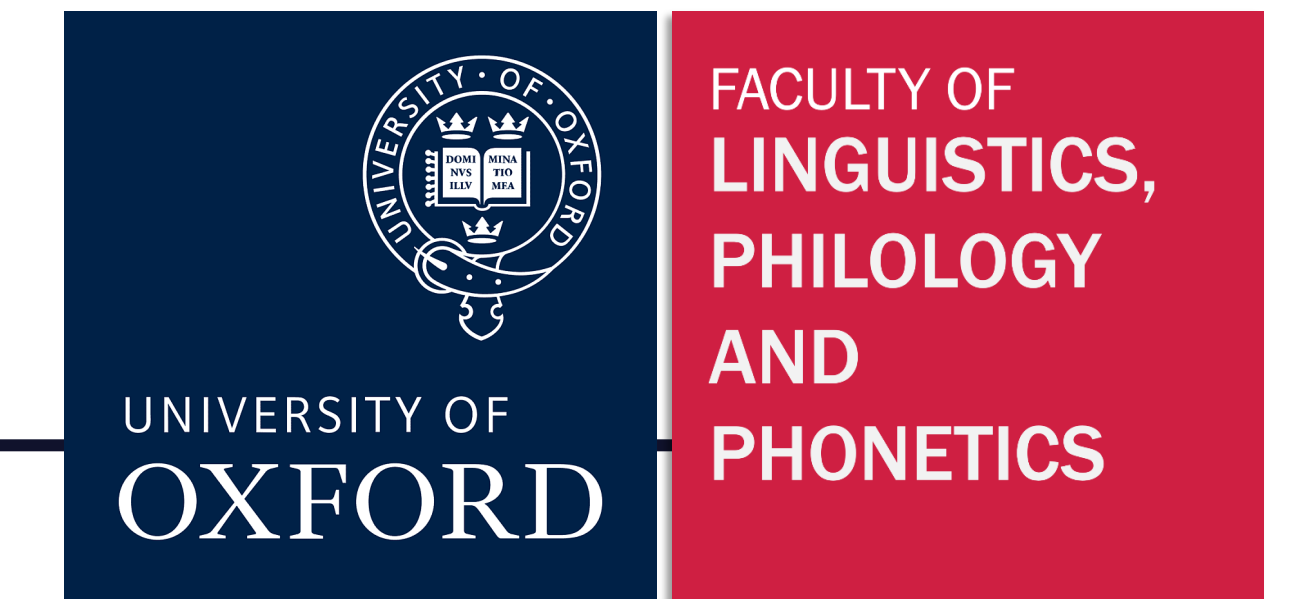


Mandarin classifier informativity gates prediction updating in Maze Reading

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Background

Prediction failures occur during sentence processing, yet it is unclear if such failures are costly. Previous research has conflicting results:

- Italian speakers **failed** to use local adjectives to update their predictions after encountering prediction-inconsistent **gender markers** [1]
 - The costs generated by prediction failures limit the overall usefulness of prediction.
- Mandarin speakers were found to use the information conveyed by the specific **classifier (CL)** to revise predictions **immediately** [2][3].
 - Rapid prediction update is possible.

Motivation

❖ Why did previous studies have different results?

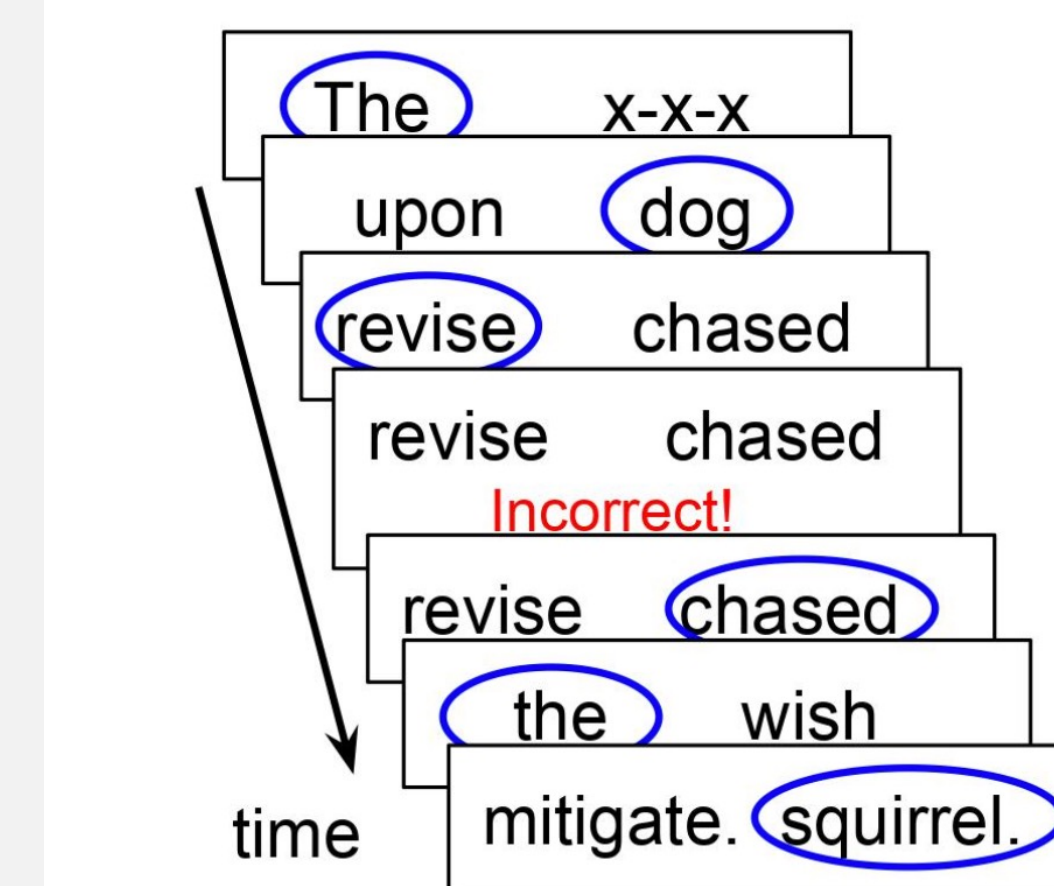
- Informativeness of error signals?
 - Specific CLs are **more informative** than gender markers, allowing Mandarin speakers to rapidly converge on a small set of candidate nouns that predictive adjectives can then usefully update over.
 - However, the **more informative** the CL is, the smaller the set of candidate nouns will be, ultimately **reducing the predictive value** of any following adjective.

❖ Will CLs be too informative to gate prediction updates?

Maze task

- Why Maze: Easy, cheap, and fewer spillover effects [4]

Context	Adjective	Sentences
Congruent	Predictive	Xiaoming walked into a beverage shop and bought one CL_bei freshly-squeezed juice to quench his thirst.
Congruent	Neutral	Xiaoming walked into a beverage shop and bought one CL_bei discounted juice to quench his thirst.
Incongruent	Predictive	Xiaoming walked into a bakery shop and bought one CL_bei freshly-squeezed juice to quench his thirst.
Incongruent	Neutral	Xiaoming walked into a bakery shop and bought one CL_bei discounted juice to quench his thirst.

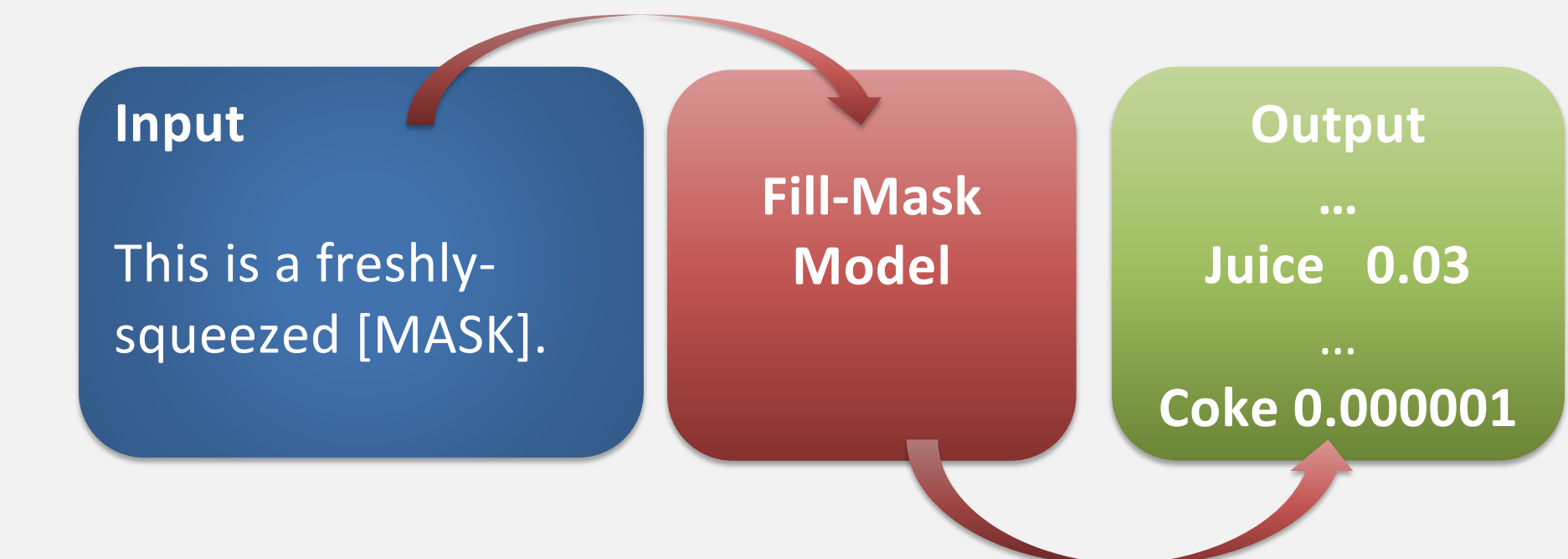


- 40 native Mandarin speakers; read word-by-word:
 - For each word, they were asked to choose between a correct word and a distractor.
 - Distractors were automatically generated using [5]
- 32 experimental items + 64 fillers

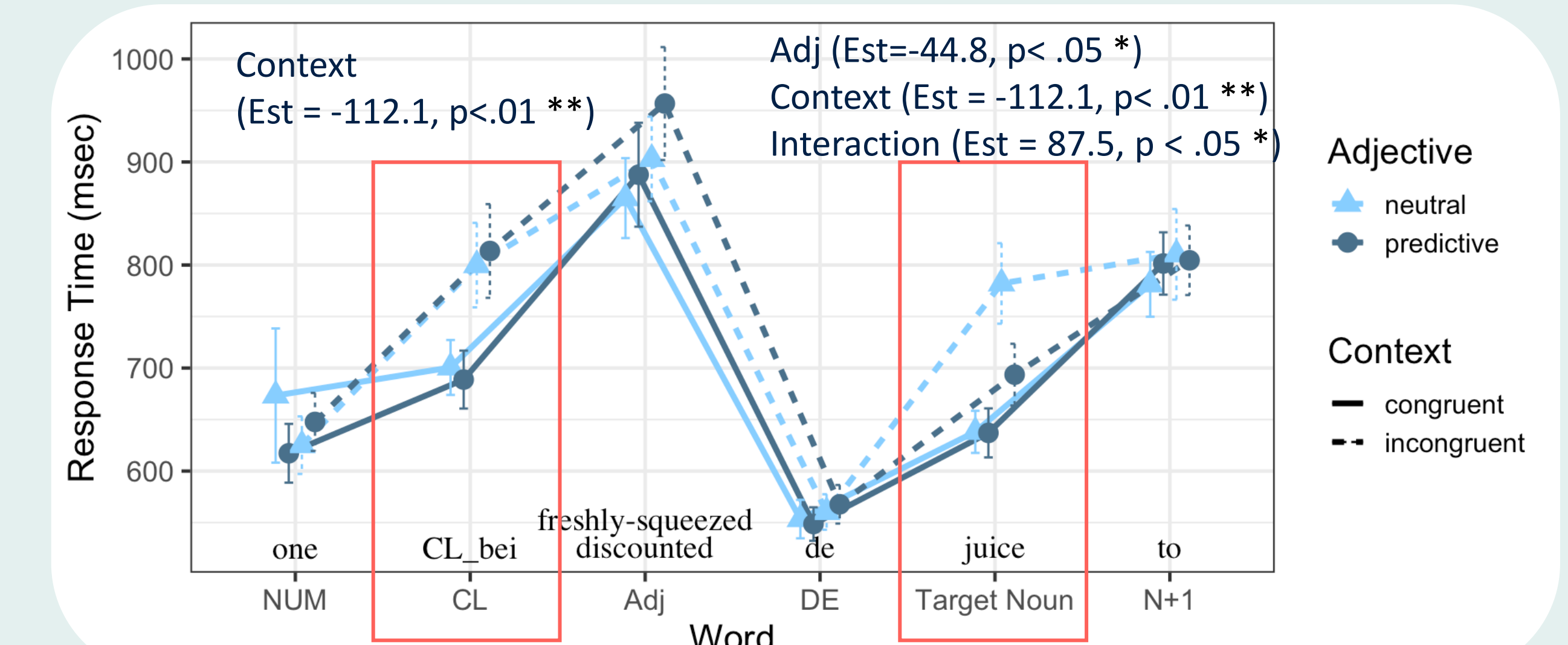
The informativeness of CLs

- We calculated the informativeness of CLs in an LLM-based Fill-Mask Model.

Input	Target noun	Prob (CL-N)	Log_Prob (CL-N)
One CL_ba [MASK]	Key	0.12	-0.93
One CL_chuang [MASK]	Cotton quilt	0.007	-2.13
One CL_zuo [MASK]	Mountain	0.002	-2.74
One CL_kuai [MASK]	Cake	0.0006	-3.26
One CL_pian [MASK]	Cloud	0.00004	-4.35



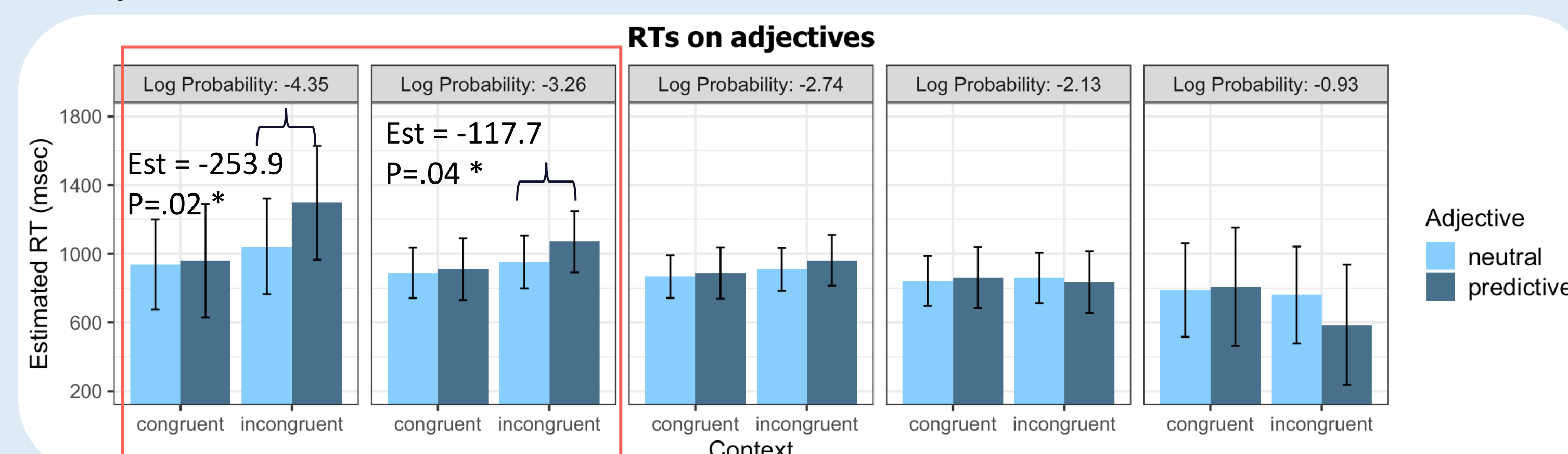
Results (overall)



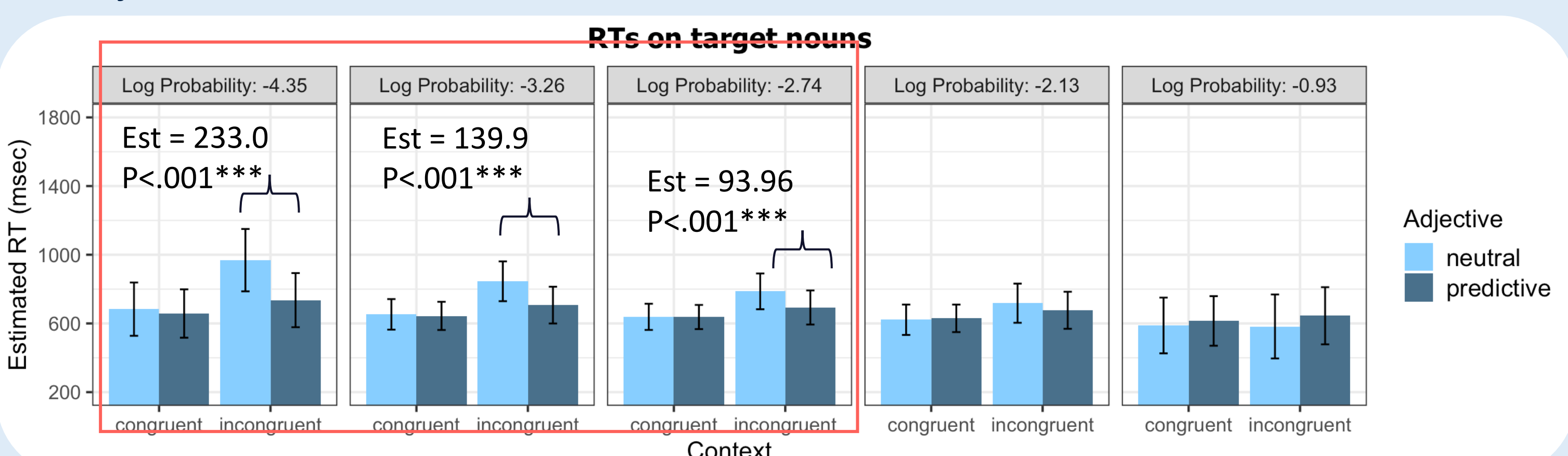
- Target nouns were facilitated by predictive adjectives **only in incongruent conditions**.

Results (by informativeness)

- For **adjectives**, predictive adjectives were read significantly **slower** than neutral adjectives at **lower CL-N Prob** levels:



- For **target nouns**, neutral adjectives elicited significantly **higher RTs** than predictive adjectives at **lower CL-N Prob** levels:



*Figures are drawn informativity quartile (0%, 25%, 50%, 75%, 100%) and ordered from lower to higher informativity.

- On **adjectives**, we found main effects of Context and CL-N Prob, an interaction between, and a marginal three-way interaction.

	Est	SE	t	p
Adj	-135.7	125.4	-1.08	.288
Context	220.0	99.2	2.22	.027*
CL-N Prob	-94.5	35.2	-2.69	.012*
Adj:Context	308.0	196.6	1.57	.118
Adj:CL-N prob	-63.0	45.1	-1.40	.173
CL-N Prob:Context	101.7	35.7	2.84	.004**
Adj:Context:CL_N Prob	124.0	71.0	1.75	.081 .

- On **target nouns**, we found main effect of CL-N Prob, interactions between Context and CL-N Prob, and between Adjective and CL-N Prob, and a marginal three-way interaction.

	Est	SE	t	p
Adj	91.6	63.1	1.45	.156
Context	33.9	59.6	0.57	.570
CL-N Prob	-45.0	16.0	-2.81	.009**
Adj:Context	-102.0	115.1	-0.89	.376
Adj:CL-N prob	50.8	22.7	2.23	.033*
CL-N Prob:Context	49.6	20.9	2.37	.018*
Adj:Context:CL_N Prob	-71.2	41.5	-1.71	.087 .

Discussions & Conclusion

- The overall results align with previous studies on rapidly prediction updates driven by Mandarin CLs [2][3].
- CL informativity gates prediction updating:**
 - Higher informative CLs → reduced processing costs of predictive adjectives → reduced the facilitation effects of predictive adjectives on target nouns
 - Highly informative CLs → less useful subsequent cues
 - There may be a goldilocks zone of informativity in which local predictability is most usefully applied to smoothly update sentence contexts.
- Maze reading may have a lower bound on RTs, or there may be a ceiling on the facilitation effects of predictions.