

# Locality and anti-locality in the comprehension of wh-in-situ questions

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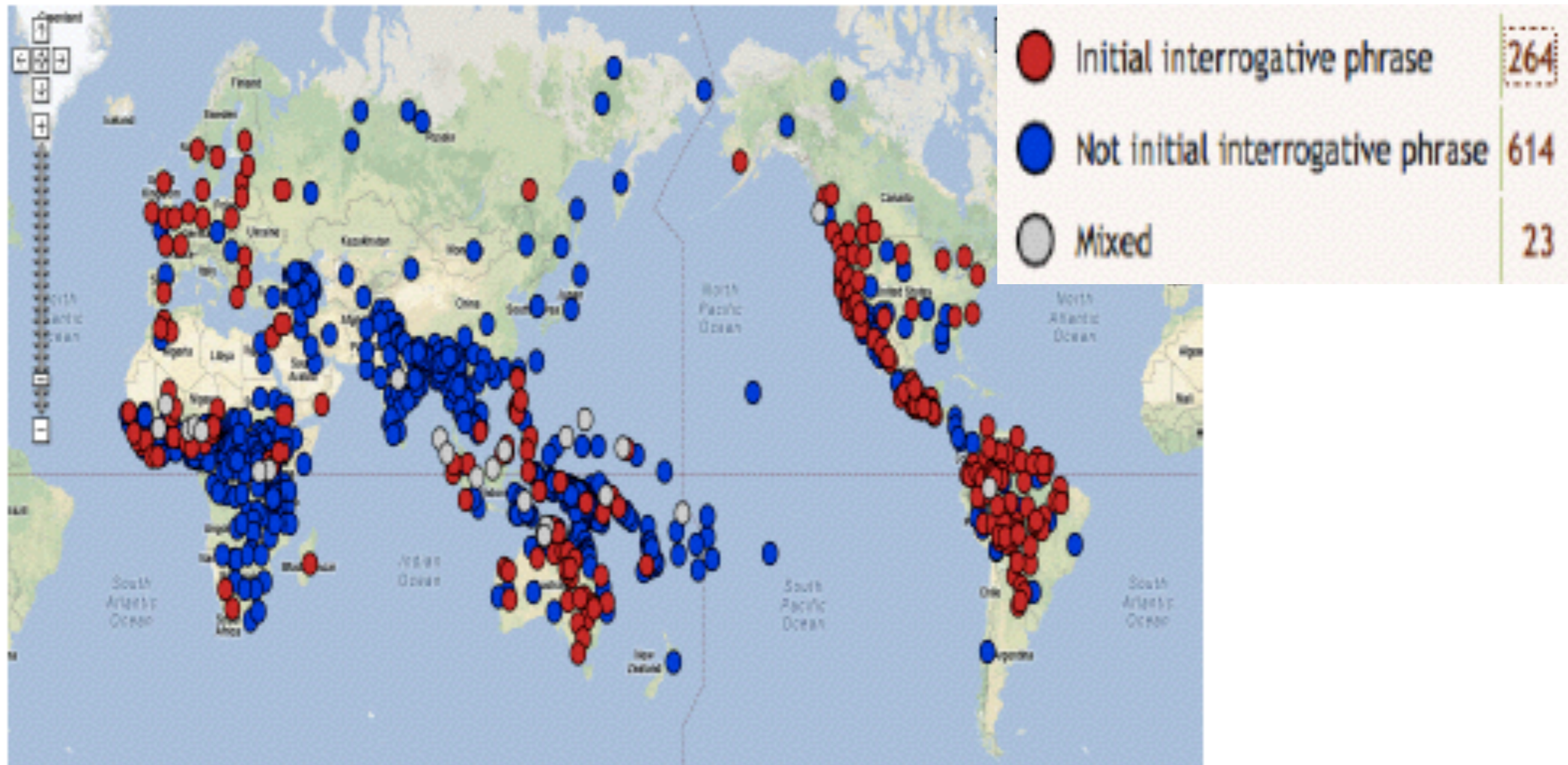


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How is grammatical  
knowledge deployed in  
language comprehension?

# Cross-linguistic variation



Dryer, Matthew S.. 2011. Position of Interrogative Phrases in Content Questions. The World Atlas of Language Structures Online.

Available online at <http://wals.info/chapter/93>

# Higher level abstraction — the grammar

**Overt** syntactic dependency

Which guest did John like \_\_\_?



约翰 喜欢 哪个 客人?

J. xihuan nage keren

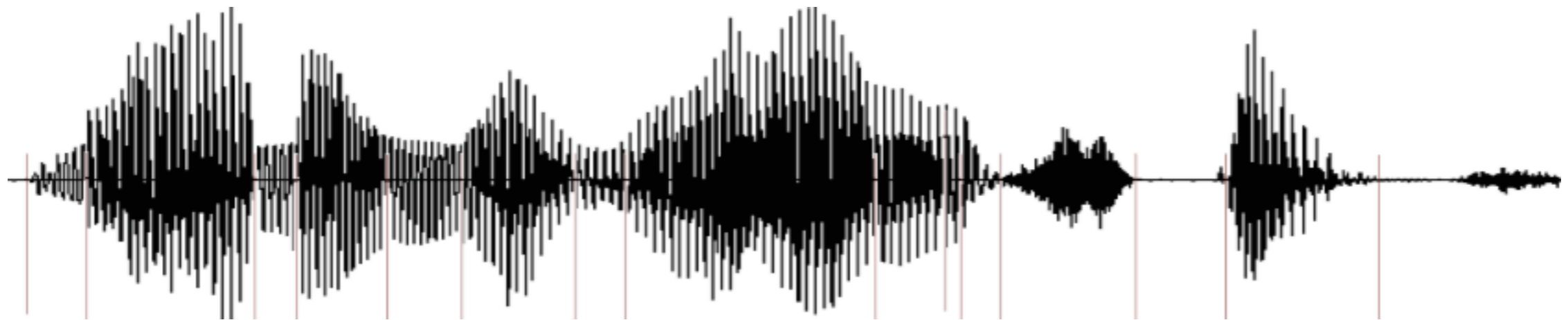
John like which-CL guest

John like which guest?



**Covert** syntactic dependency

In comprehension, the same mental structure could be established in different ways for different languages



Information encoding, maintenance and retrieval over **linear time**

## ► Experiment 1&2:

Processing evidence for a covert non-local syntactic dependency

## ▶ Experiment 3&4: Finding the scope position

Locality: sometimes we see it,  
sometimes we don't



## ▶ Experiment 5-6: Interpreting the scope

Anti-locality:

Parsing complexity (structural complexity) does not (entirely) determine the scope interpretation preference

# Syntactic assumptions

约翰	隐瞒了	什么	事?
Yuehan	yingman-le	shenme	shi
John	hide-perf	what	thing

**CP, +Q**



# Experiment 1

- ▶ The processing of a wh-in-situ sentence is sensitive to intervening CP positions
- ▶ Intervening CP positions increase processing cost

[CP +Q ... [CP ... wh-in-situ]]



- ▶ The processing of a *wh*-in-situ sentence is sensitive to intervening CP positions
- ▶ Intervening CP positions increase processing cost
- ▶ **String identical** *wh*-in-situ sentences without an intervening CP position do not show the same cost

[CP +Q ... [FP ... *wh*-in-situ]]



记者们 想知道 市长 带领 市政府 严惩了 哪些 官员。  
jizhemen xiangzhidao shizhang dailin shizhengfu yanchengle naxie guanyuan  
reporter wonder mayor lead city-council punished which-CL officials

“The reporters wondered which officials the mayor led the city council to punish.”

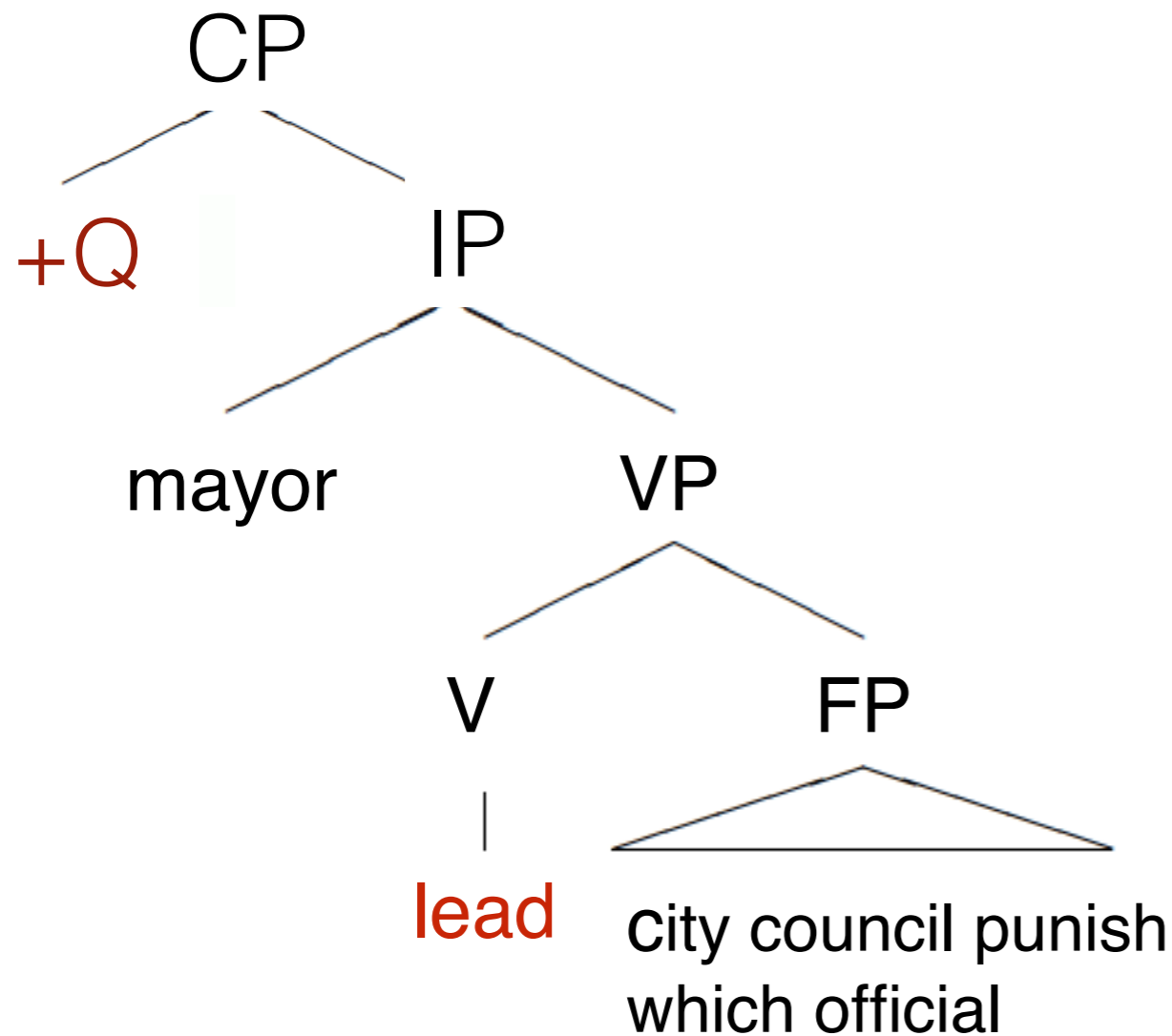
Serial Verb

记者们 想知道 市长 宣布 市政府 严惩了 哪些 官员。  
jizhemen xiangzhidao shizhang xuanbu shizhengfu yanchengle naxie guanyuan  
reporter wonder mayor announce city-council punished which-CL  
officials

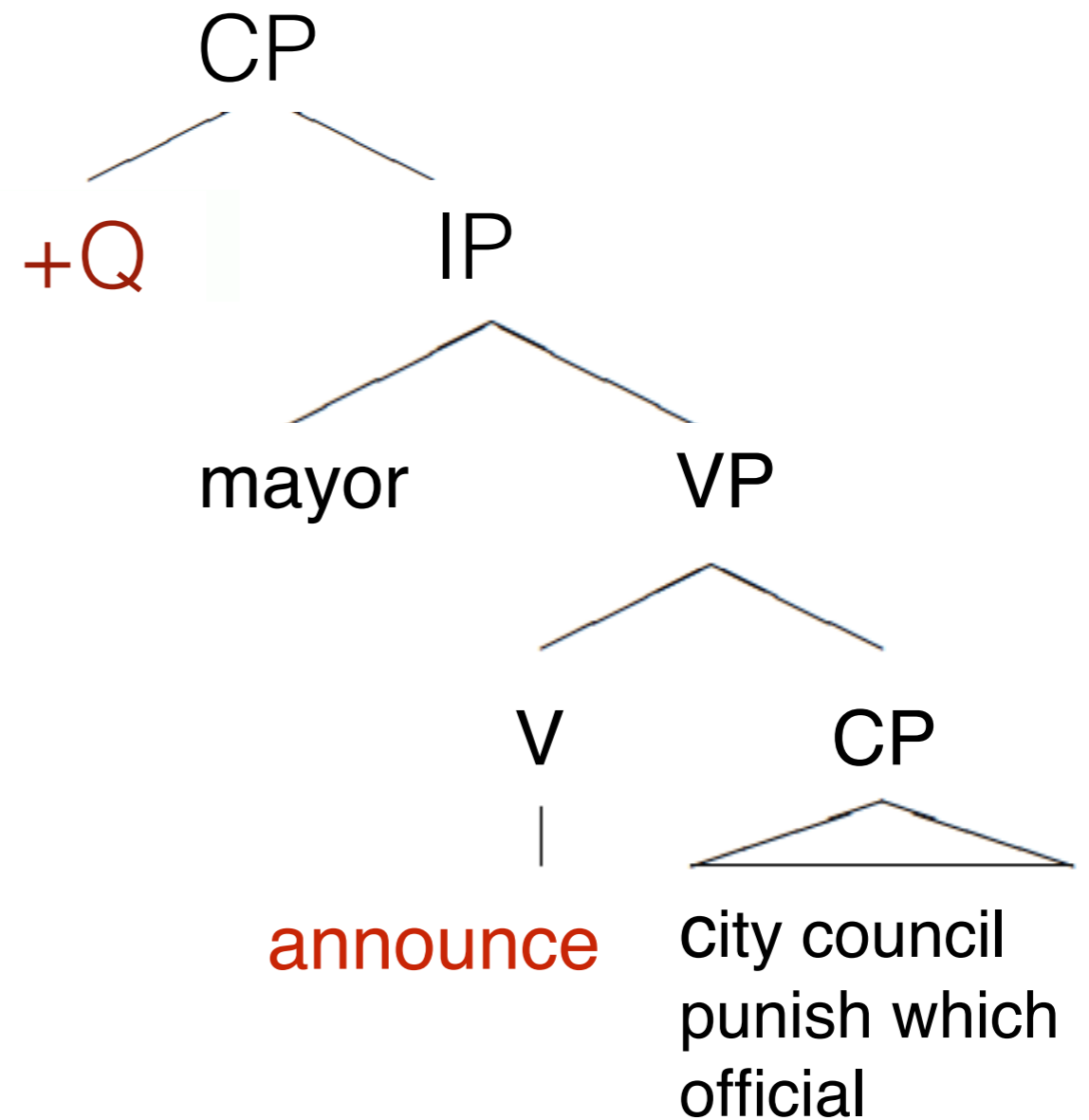
“The reporters wondered which officials the mayor announced the city council punished.”

Multi-CP

# The critical comparison



**Mono-CP structure**



**Multi-CP structure**

(Grano 2012; Paul 2005; Tang 2000)

# How to test the size of the embedded clause in Mandarin?

市长 宣布 那些 官员， 市政府 严惩了。  
shizhang xuanbu naxie guanyuan, shizhengfu yanchengle  
mayor **announce that-CL officials**, city-council punished  
“The mayor announce that those officials, the city council punished.”

\*市长 带领 那些 官员， 市政府 严惩了。  
shizhang dailin naxie guanyuan, shizhengfu yanchengle  
mayor **lead that-CL officials**, city-council punished

# Declarative conditions (complexity baseline controls)

记者们 很高兴 市长 带领 市政府 严惩了 那些 官员。  
jizhemen hengaoxing shizhang dailin shizhengfu yanchengle naxie guanyuan  
reporter happy mayor lead city-council punished that-CL officials

“The reporters were happy that the mayor led the city council to punish those officials.”

Serial Verb

记者们 很高兴 市长 宣布 市政府 严惩了 那些 官员  
jizhemen hengaoxing shizhang xuanbu shizhengfu yanchengle naxie guanyuan  
reporter happy mayor announce city-council punished that-CL officials

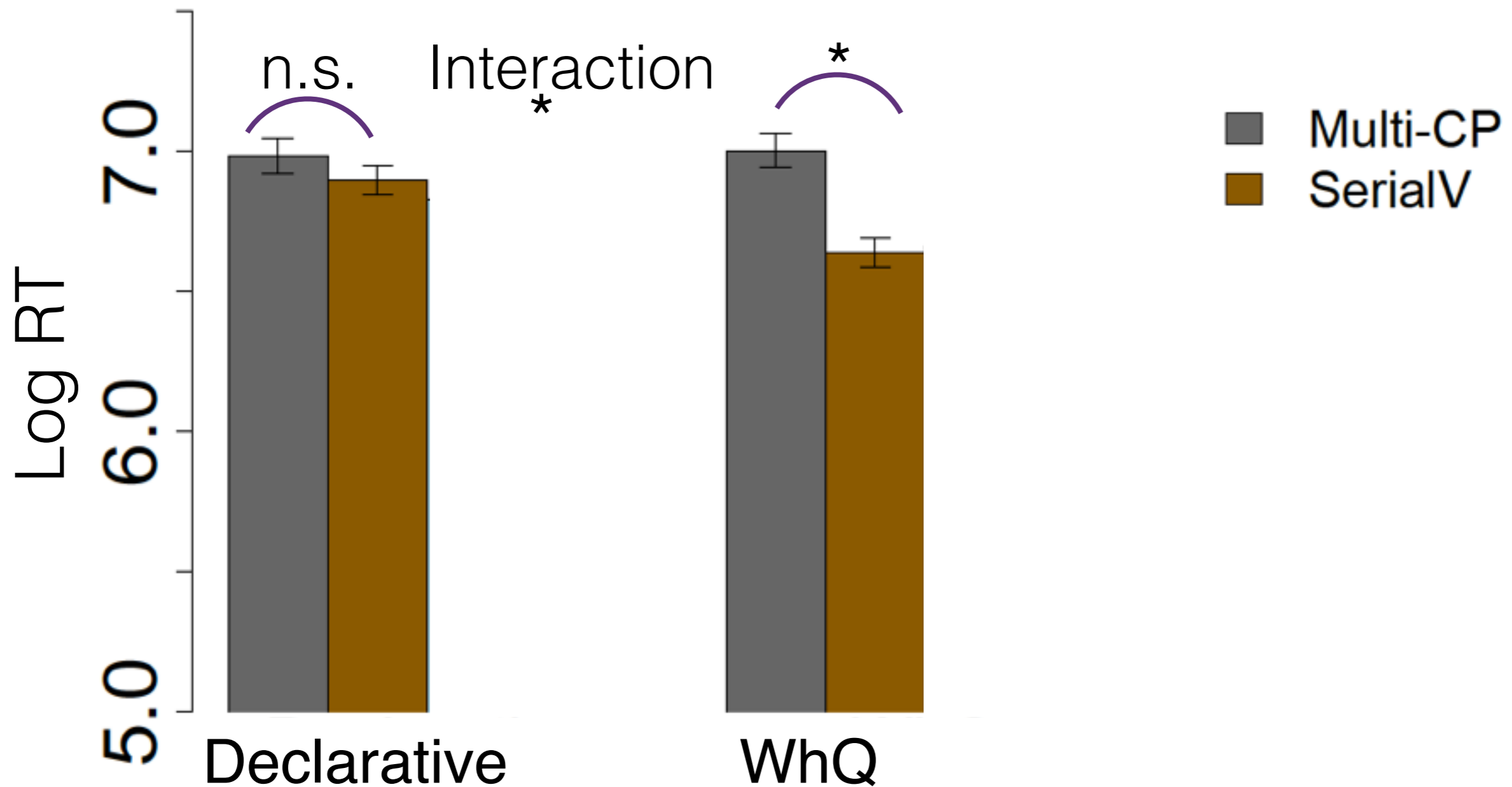
“The reporters were happy that the mayor announced the city council punished those officials.”

Multi-CP

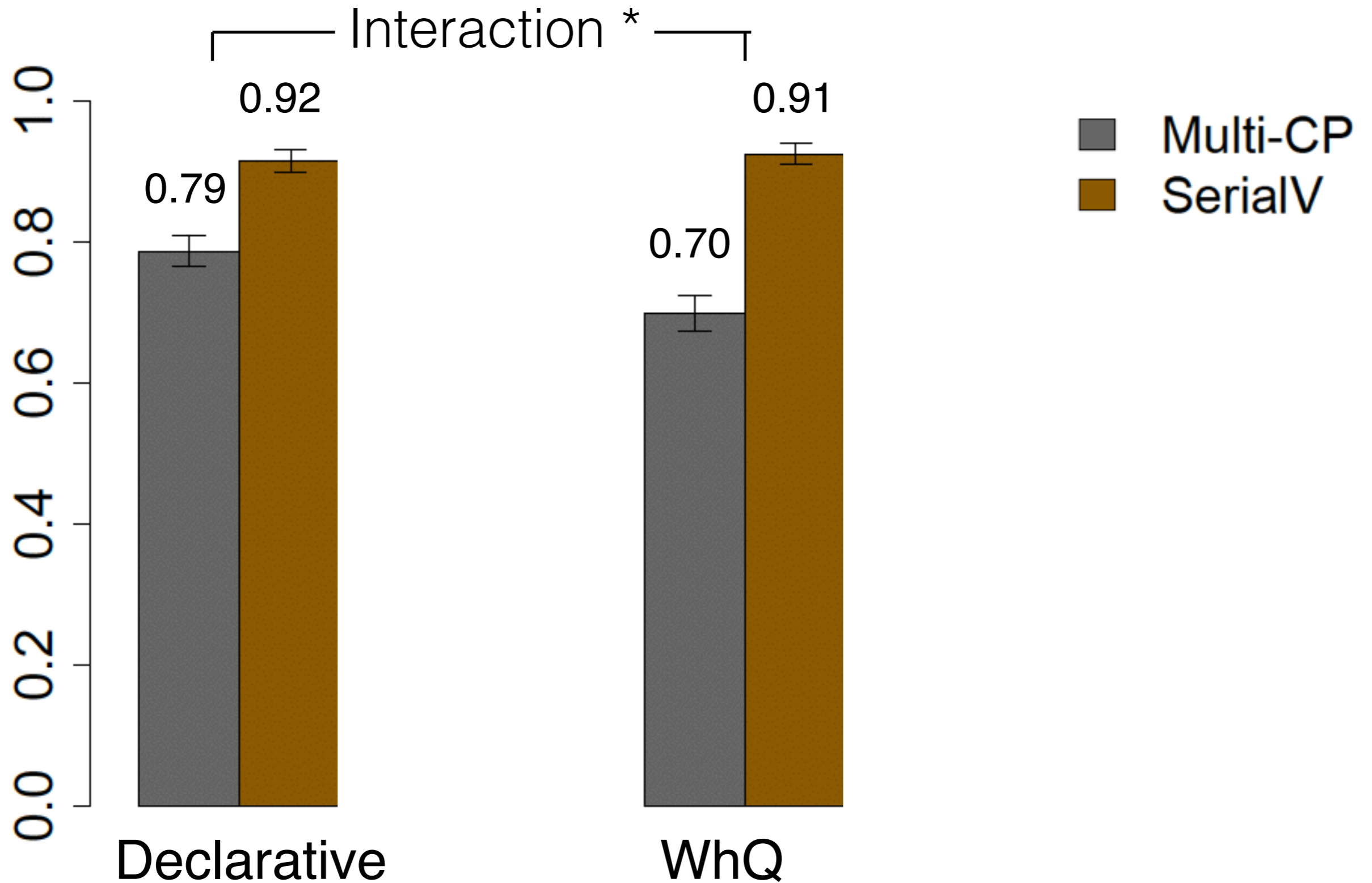


# Eyetracking reading results (n=50)

Regression-path time at the WH-morpheme



# Experiment 1: Rating results



# Experiment 2: production

Sentence completion task (N V N V\_\_\_\_\_):

记者们 想知道 市长 宣布/带领 \_\_\_\_\_

jizhemen xiangzhidao shizhang xuanbu /dailing

reporters wonder mayor announce/lead

**WH-Multi-CP  
/Serial Verb**

记者们 知道 市长 宣布/带领 \_\_\_\_\_

jizhemen zhidao shizhang xuanbu /dailing

reporters know mayor announce/lead

**Declarative-  
Multi-CP  
/Serial Verb**

# Sentence completion possibility I: Right branching structure

记者们      想知道      市长      宣布

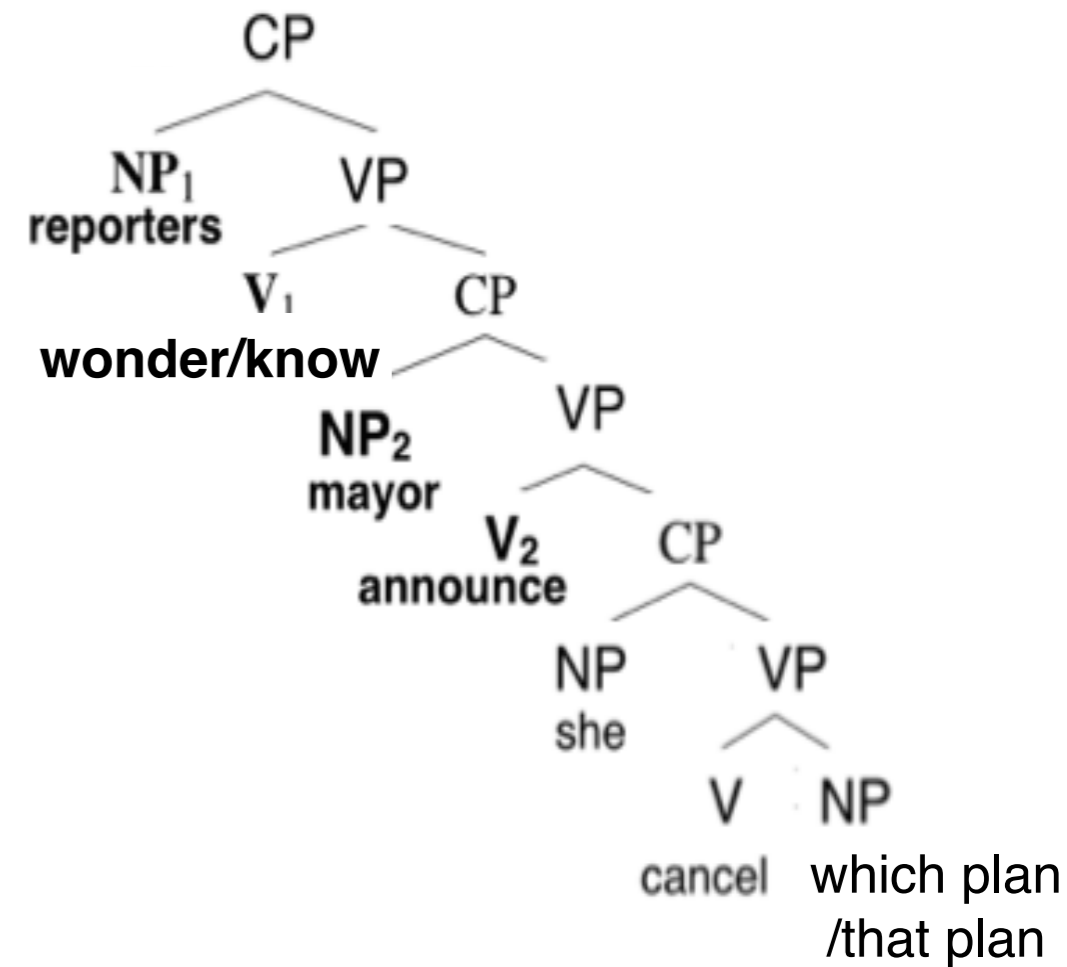
jizhemen    xiangzhidao    shizhang    xuanbu

reporters    **wonder**    mayor    **announce**

她 取消了      哪个 计划。

ta    quxiaole    nage    jihua

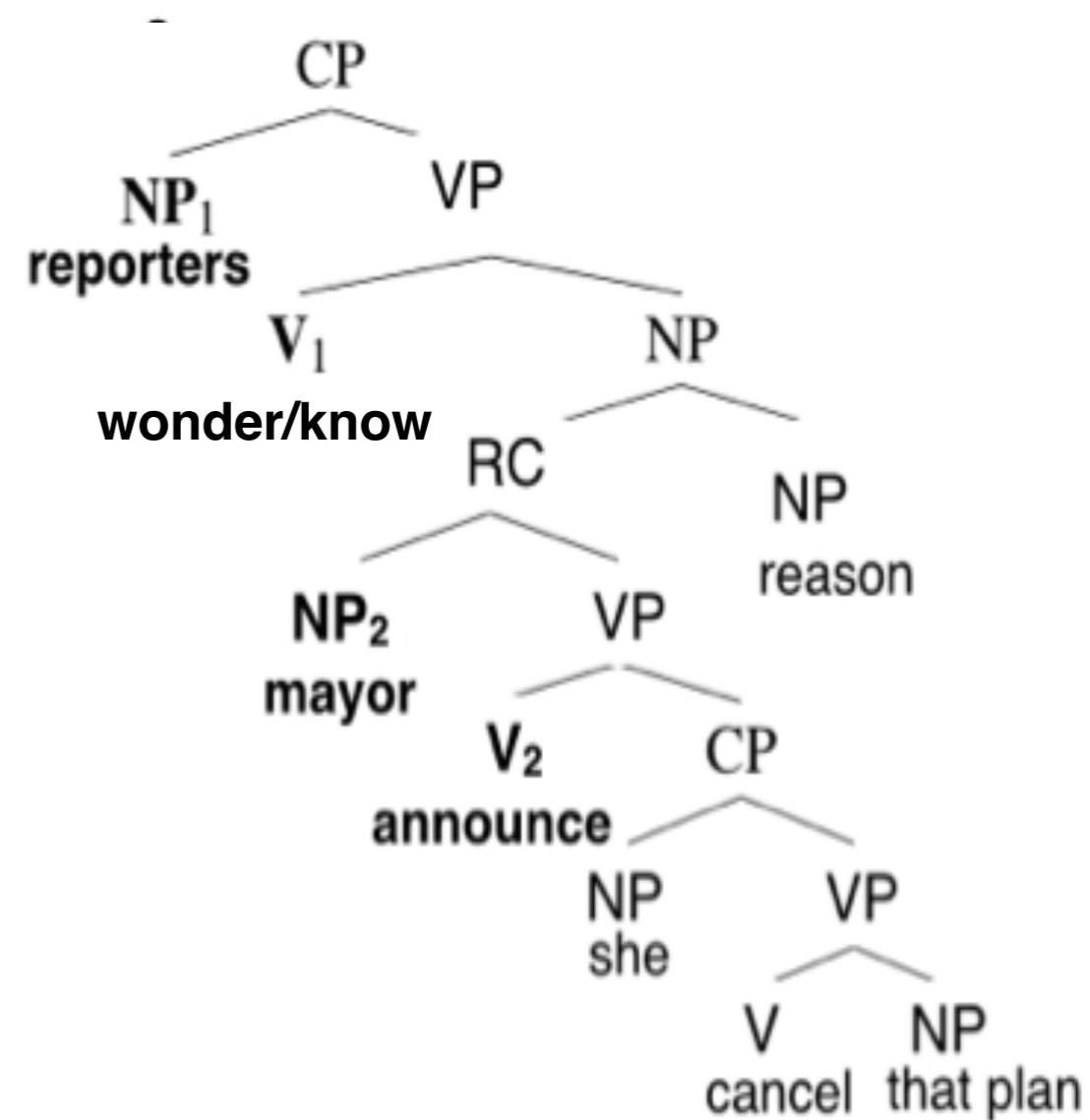
she cancel-perf.    **which plan**



“The reporters wondered which plan the mayor announced that she canceled.”

# Sentence completion possibility II: Relative clause structure

记者们 想知道 市长 宣布  
 jizhemen xiangzhidao shizhang xuanbu  
 reporters wonder mayor announce



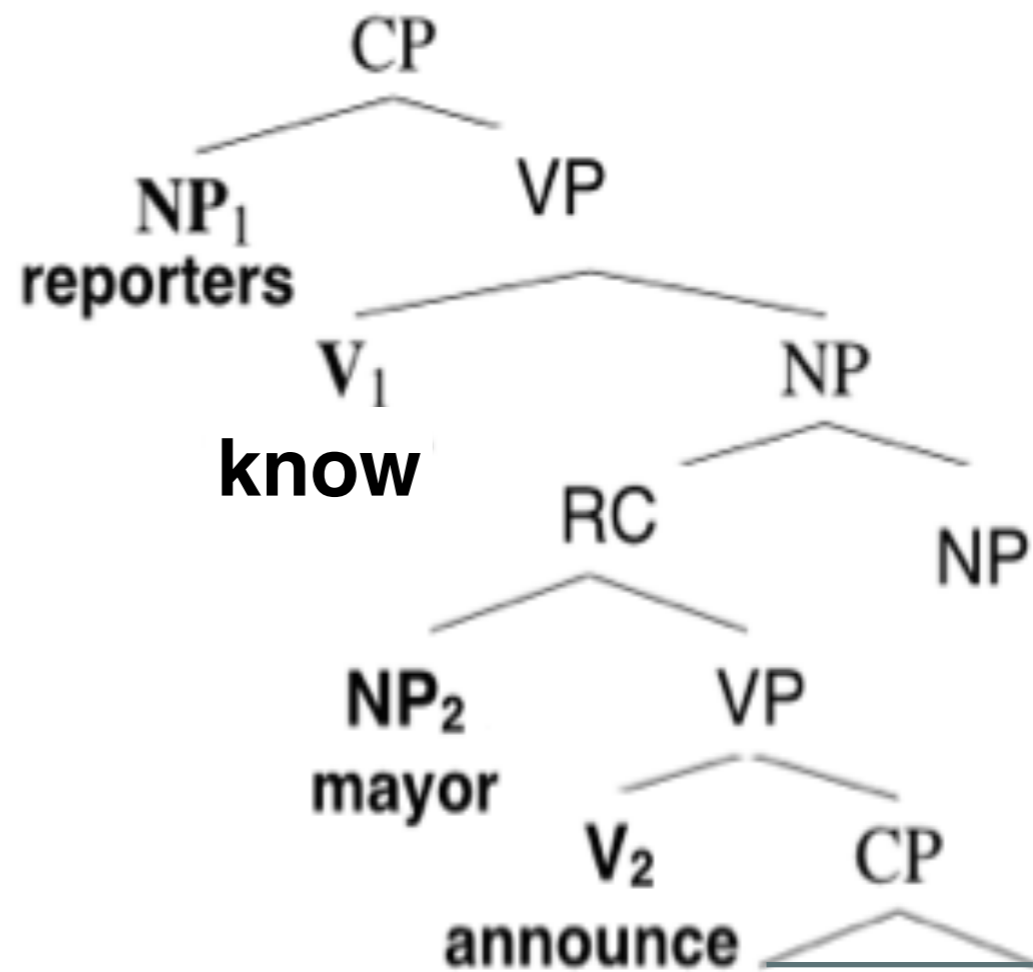
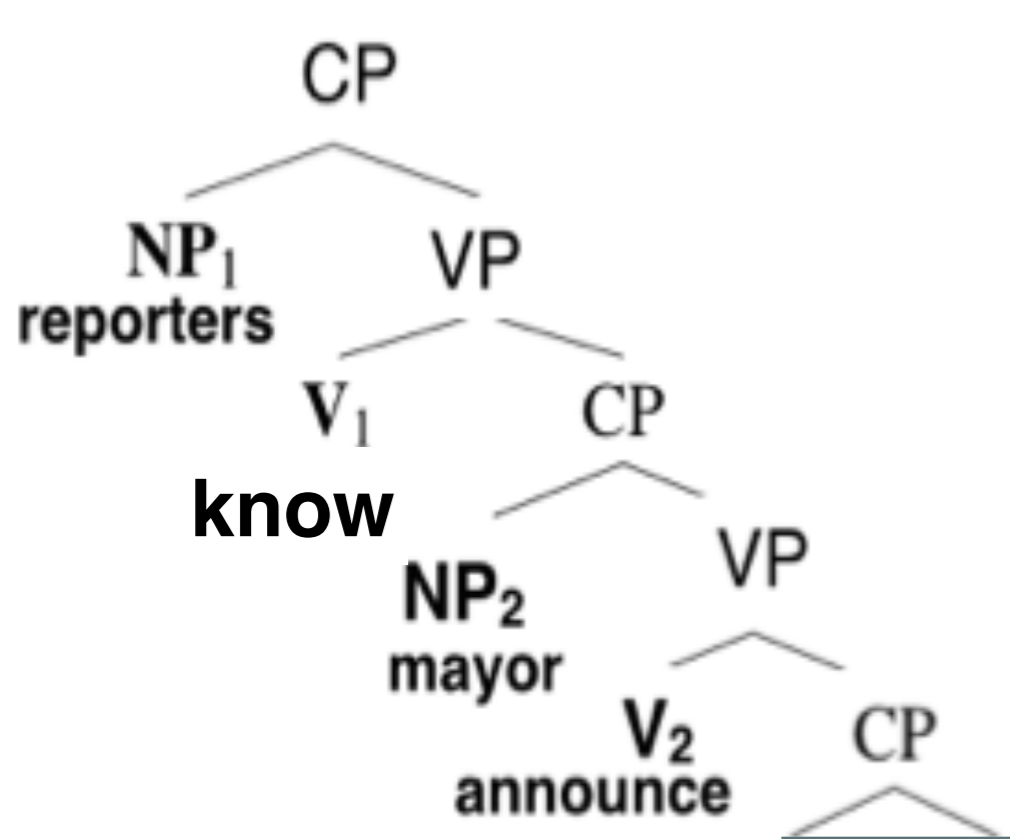
她 取消了 那个 计划 的 原因。  
 ta quxiaole nage jihua DE yuanyin  
 she cancel-perf. that plan DE reason

“The reporters wondered about the reason that the mayor announced that she canceled that plan”

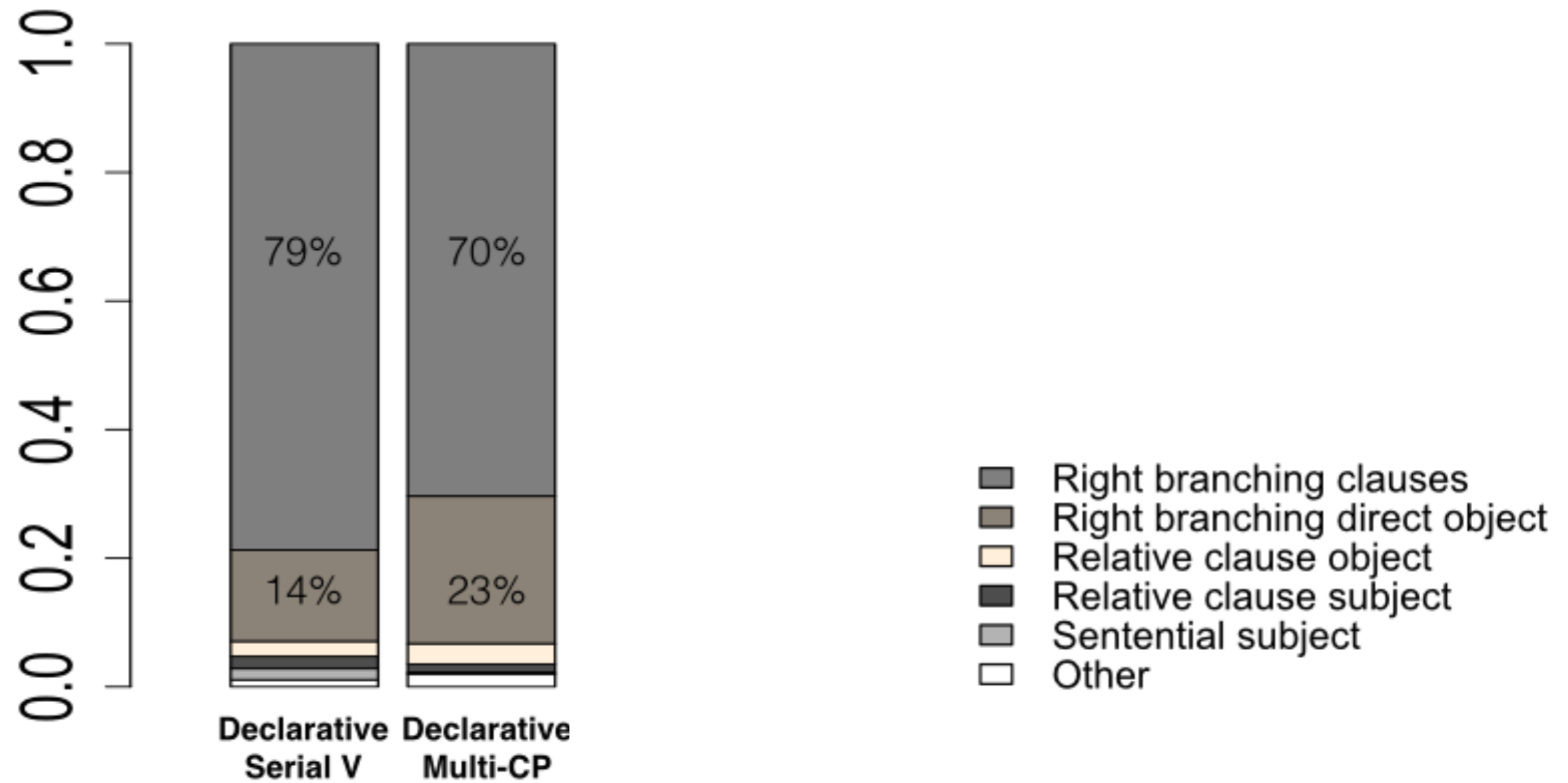
# Local complexity:

## Right branching vs. relative clauses

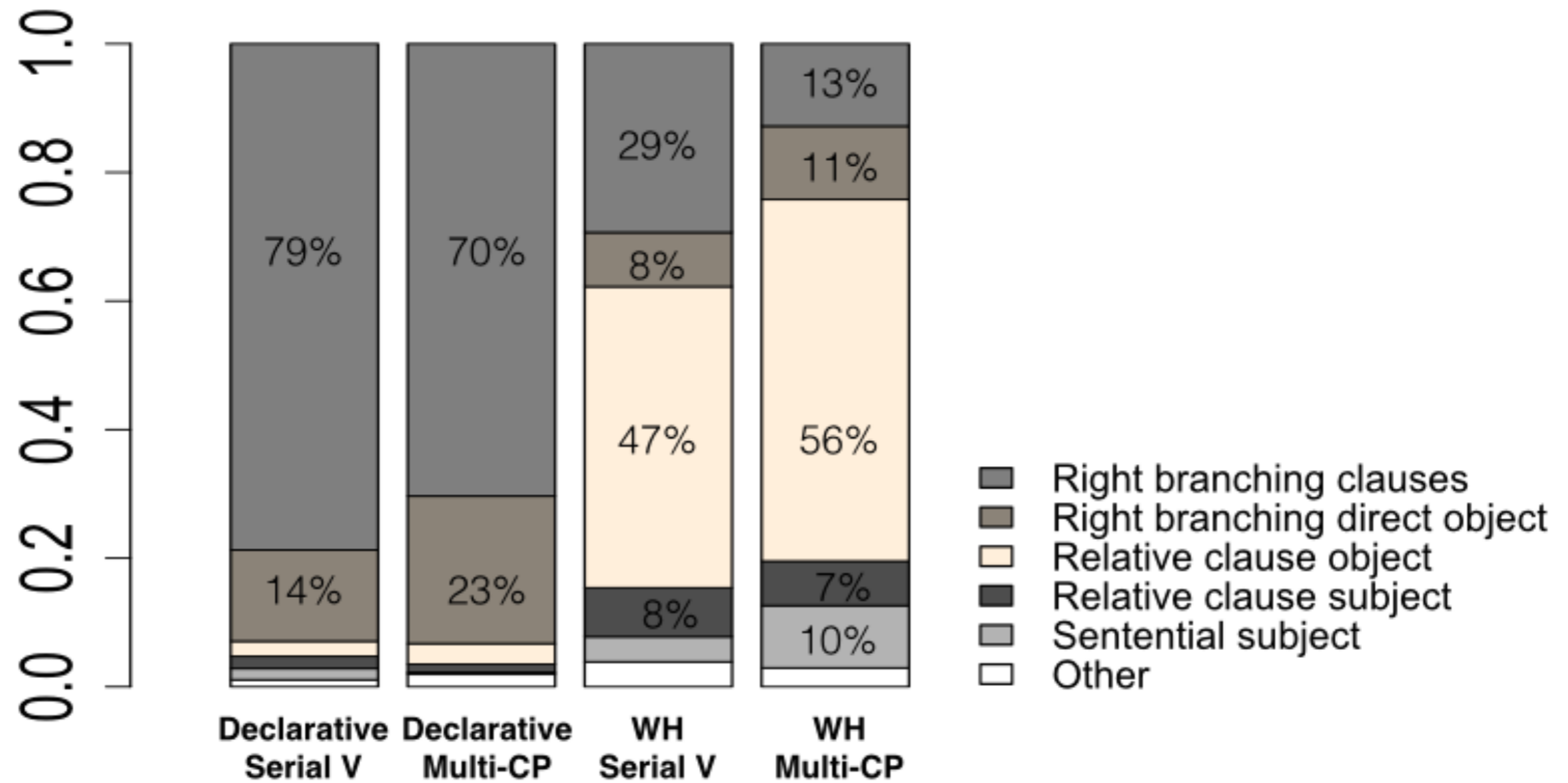
N1 V1 N2 V2 \_\_\_\_\_



# Sentence completion results

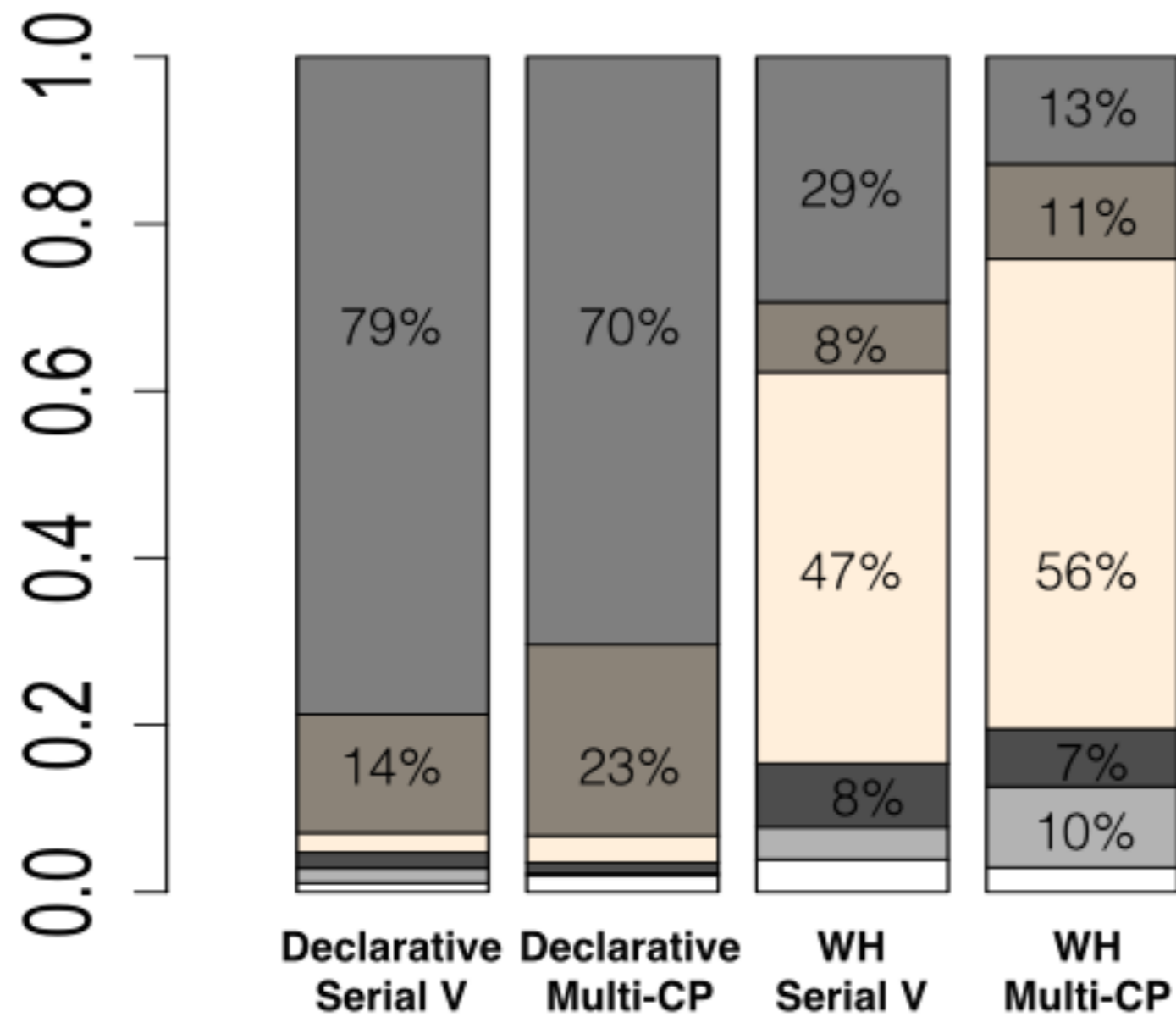


# Experiment 2 results





# Experiment 2 results



Speakers avoid producing a covert long distance dependency at the cost of producing an otherwise dispreferred structure

# Experiment 1 & 2 summary

Both comprehension and production data suggest the construction of a covert dependency for wh-in-situ constructions

**Comprehension:** The parser is sensitive to the intervening CP boundaries

**Production:** speakers avoid wh-in-situ constructions in order to avoid the long distance covert wh-dependency

# Evidence for locality?

$V_{\text{wonder}}[\text{CP1 } +Q \dots V_{\text{announce}}[\text{CP2} \dots \text{wh}]]$  **more costly**

$V_{\text{wonder}}[\text{CP1 } +Q \dots V_{\text{lead}}[\text{FP} \dots \text{wh}]]$

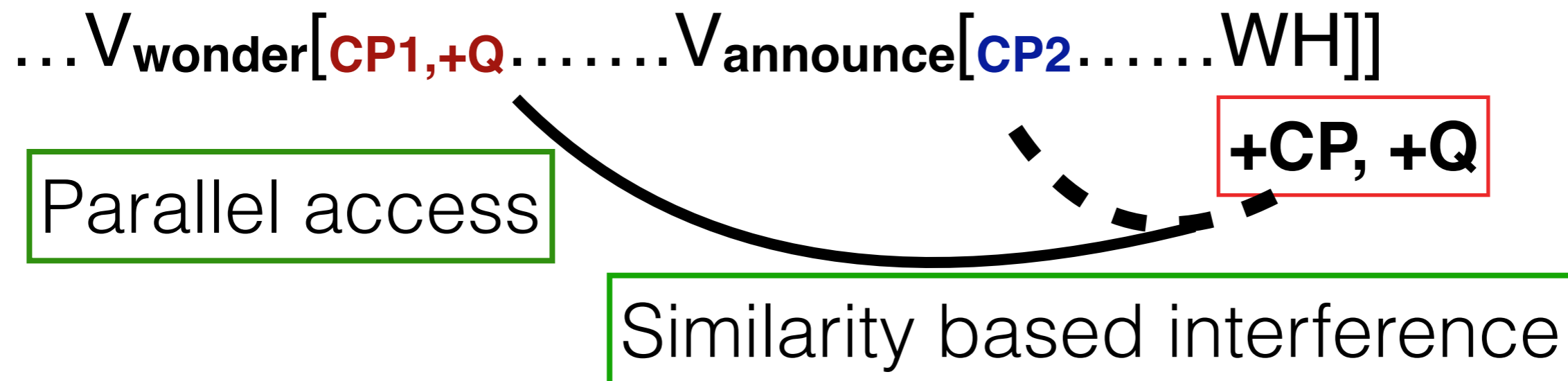
# Evidence for locality?

$V_{\text{wonder}}[\text{CP1 } +Q \dots V_{\text{announce}}[\text{CP2} \dots \text{wh}]]$  **more costly**

$V_{\text{wonder}}[\text{CP1 } +Q \dots V_{\text{lead}}[\text{FP} \dots \text{wh}]]$

Not necessarily

scope taking in processing can be modeled under the general cue-based memory retrieval framework (e.g. Lewis & Vasishth 2005; Van Dyke & McElree 2006)



# English presents the opposite pattern

## CP intervener

The journalist who the union member believed that the tax policy **had** intensely agitated was planning a series of articles.

**easier**

## TP intervener

The journalist who the union member believed the tax policy **to have** intensely agitated was planning a series of articles.

**harder**

Experiment 3&4:  
when do we see locality, when we don't

...V[CP1...V[CP2...WH]



Does the parser access the local CP2 faster?

...find out[CP1... know[CP2, +Q ... WH]]



**Success**

...find out[CP1... believe[CP2, -Q ... WH]]



**Failure**



小王 打听到 工程队 知道 村民们 扩建了 哪座 水坝.

W datingdao gongchendui zhidao cunminmen kuojianle nazuo shuiba

Mr. W. **find out** construction-team **know** villagers rebuild **which-CL dam**

“Mr. W. **found out which dam** the construction team **knew** the villagers rebuilt.”

“Mr. W. **found out** the construction team **knew which dam** the villagers rebuilt.”

**Multiclausal, CP2+Q**

小王 打听到 工程队 相信 村民们 扩建了 哪座 水坝.

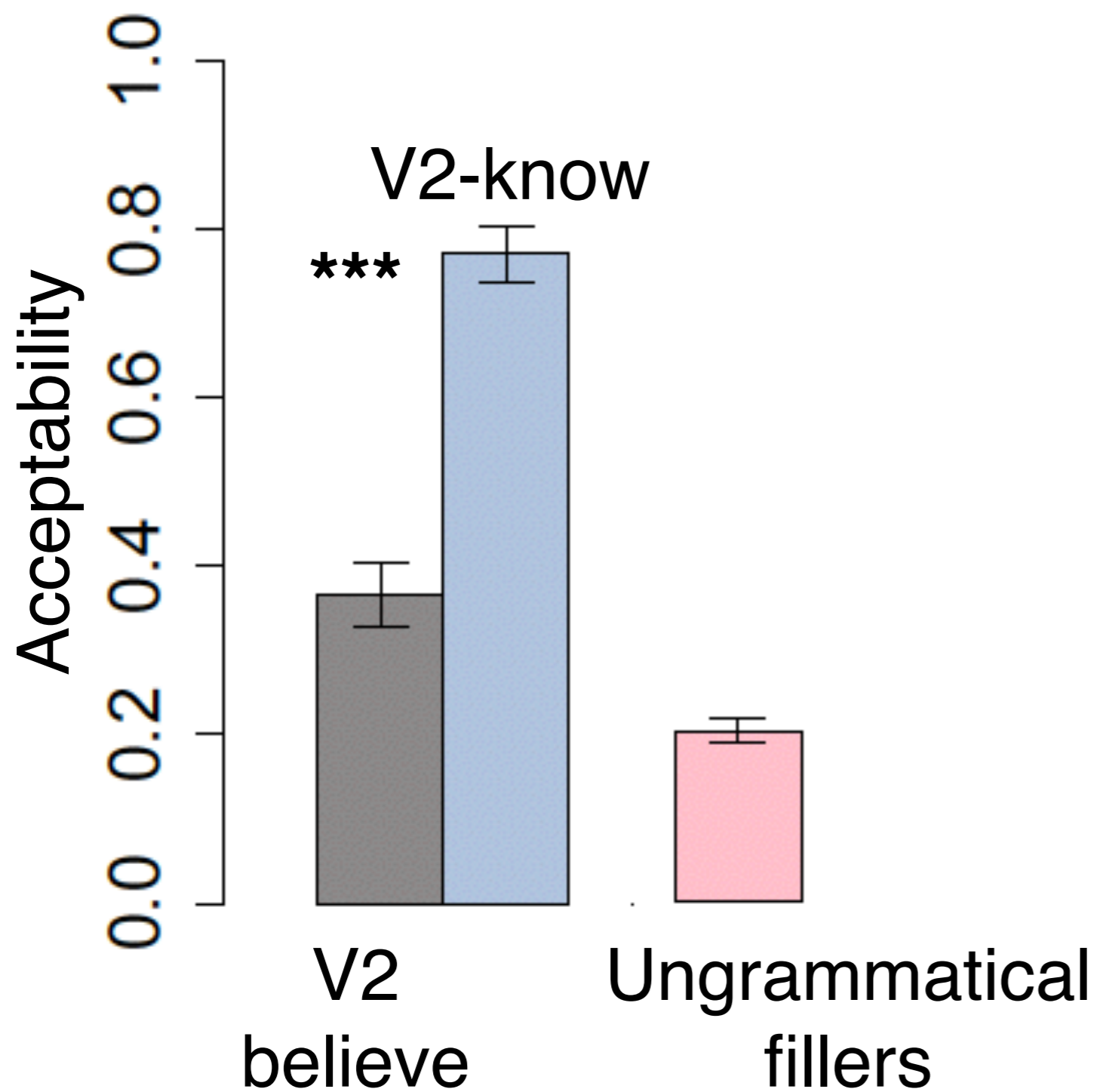
W datingdao gongchendui zhidao cunminmen kuojianle nazuo shuiba

Mr. W. **find out** construction-team **believe** villagers rebuild **which-CL dam**

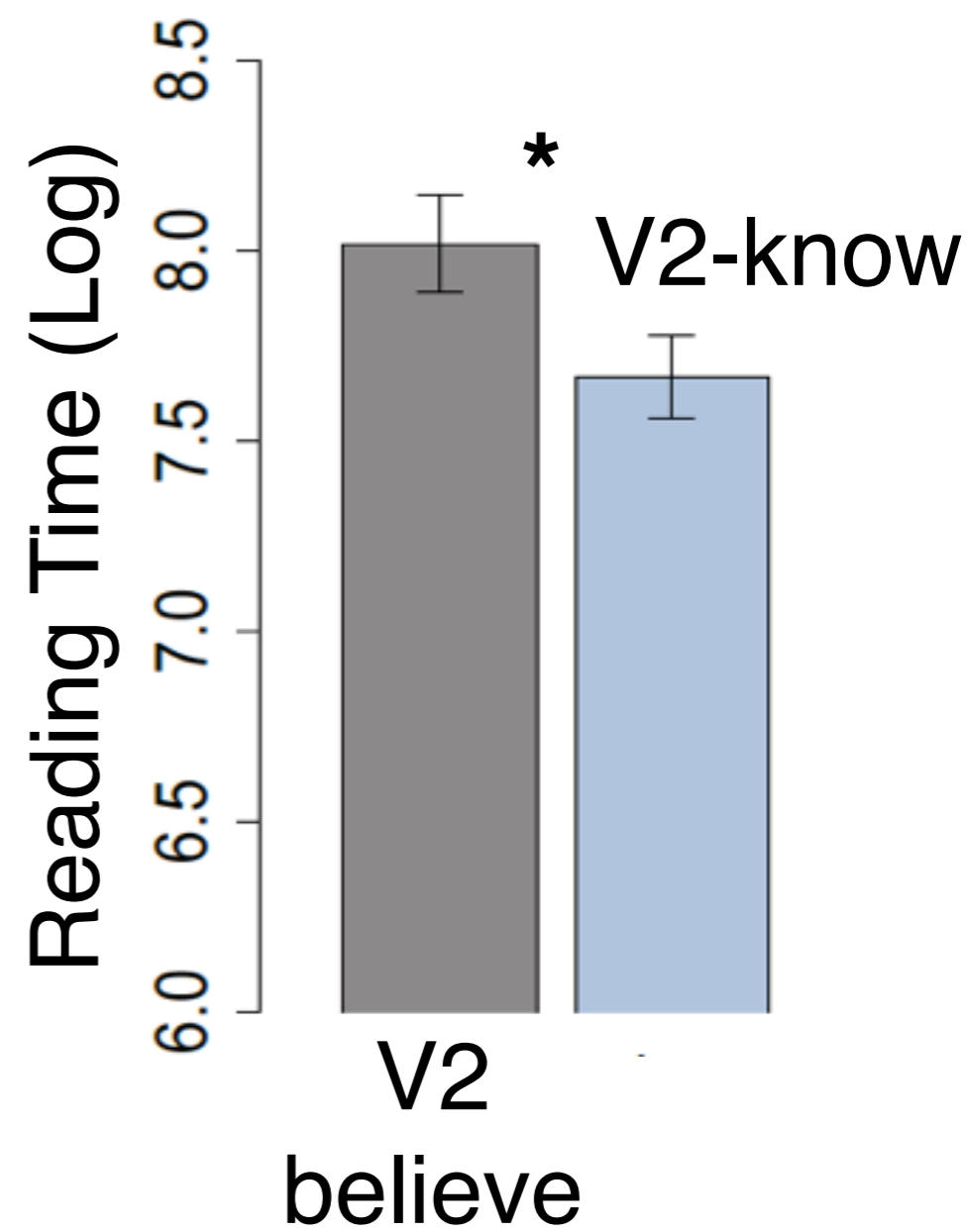
“Mr. W. **found out which dam** the team **believe** the villagers rebuilt.”

**Multiclausal, CP2-Q**

## Acceptability Judgment



## Regression Path Reading Time at the in-situ WH phrase



...know [**CP1**...find out[**CP2** ... *WH*]



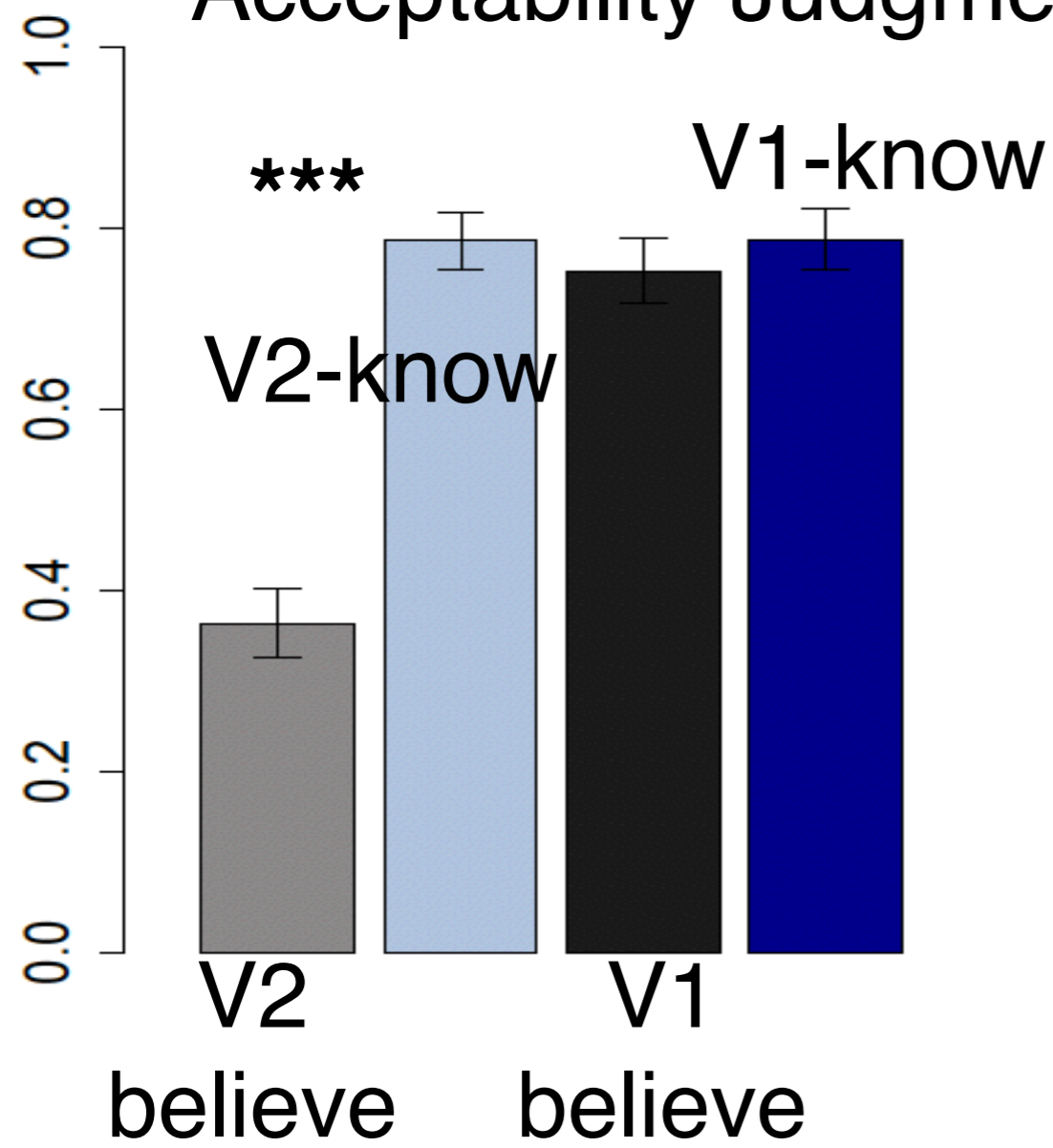
**Success**

...believe [**CP1, -Q**...find out[**CP2** ... *WH*]

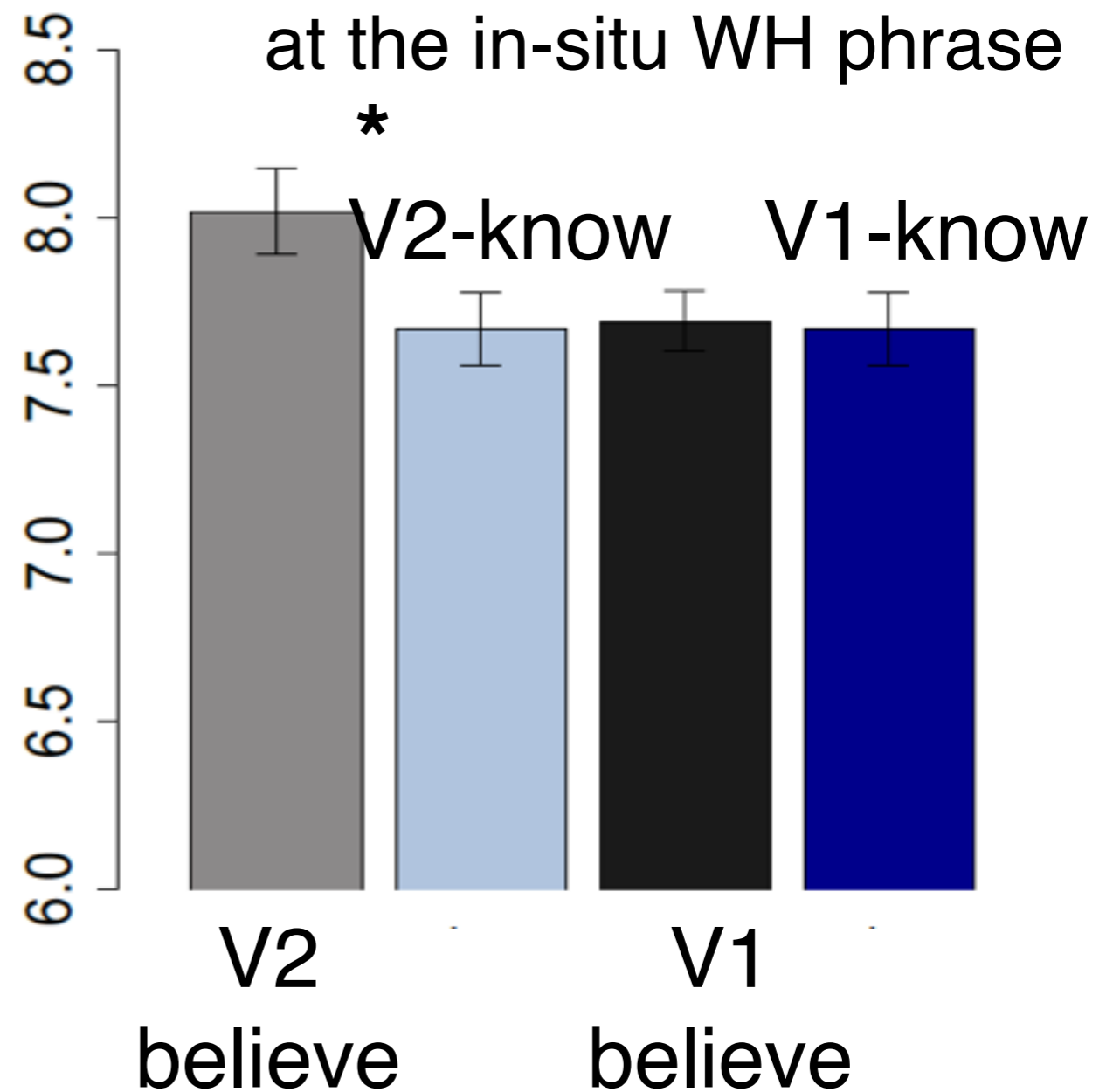


**Success**

## Acceptability Judgment



## Regression Path Reading Time at the in-situ WH phrase



# Evidence for locality

...find out[**CP1**... know[**CP2** ... *WH*]] **easy**

...find out[**CP1**... believe[**CP2**, **-Q** ... *WH*]] **hard**

...know [**CP1**...find out[**CP2** ... *WH*]] **easy**

...believe [**CP1**, **-Q**...find out[**CP2** ... *WH*]] **easy**

# Removing the locality effect

...wonder[CP, +Q.....]



A predictive +Q feature is incrementally encoded

...wonder[CP1, +Q... know[CP2 ... WH]]

Multiclausal, CP2+Q

...wonder[CP1, +Q... believe[CP2, -Q ... WH]]

Multiclausal, CP2-Q

小王 想弄明白 工程队 知道 村民们 扩建了 哪座水坝。  
W xiangnongmingbai gongchendui zhidao cunminmen kuojianle nazuo shuiba  
Mr. W. **wonder** construction-team **know** villagers rebuild **which-CL dam**

“Mr. W. **wondered which dam** the team **knew** the villagers rebuilt.”

**Multiclausal, CP2+Q**

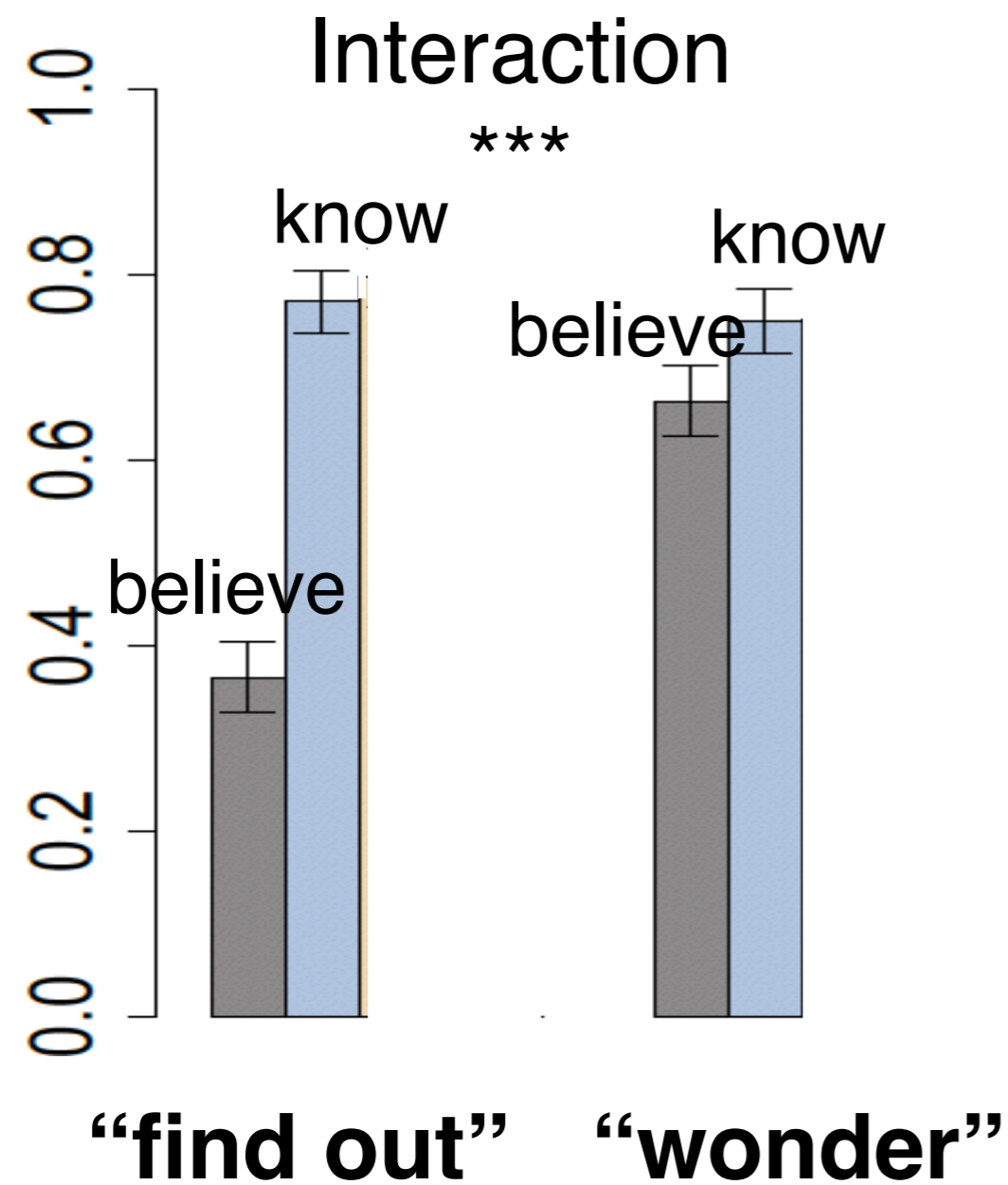
小王 想弄明白 工程队 相信 村民们 扩建了 哪座水坝。  
W xiangnongmingbai gongchendui xiangxin cunminmen kuojianle nazuo shuiba  
Mr. W. **wonder** construction-team **believe** villagers rebuild **which-CL dam**

“Mr. W. **wondered which dam** the team **believed** the villagers rebuilt.”

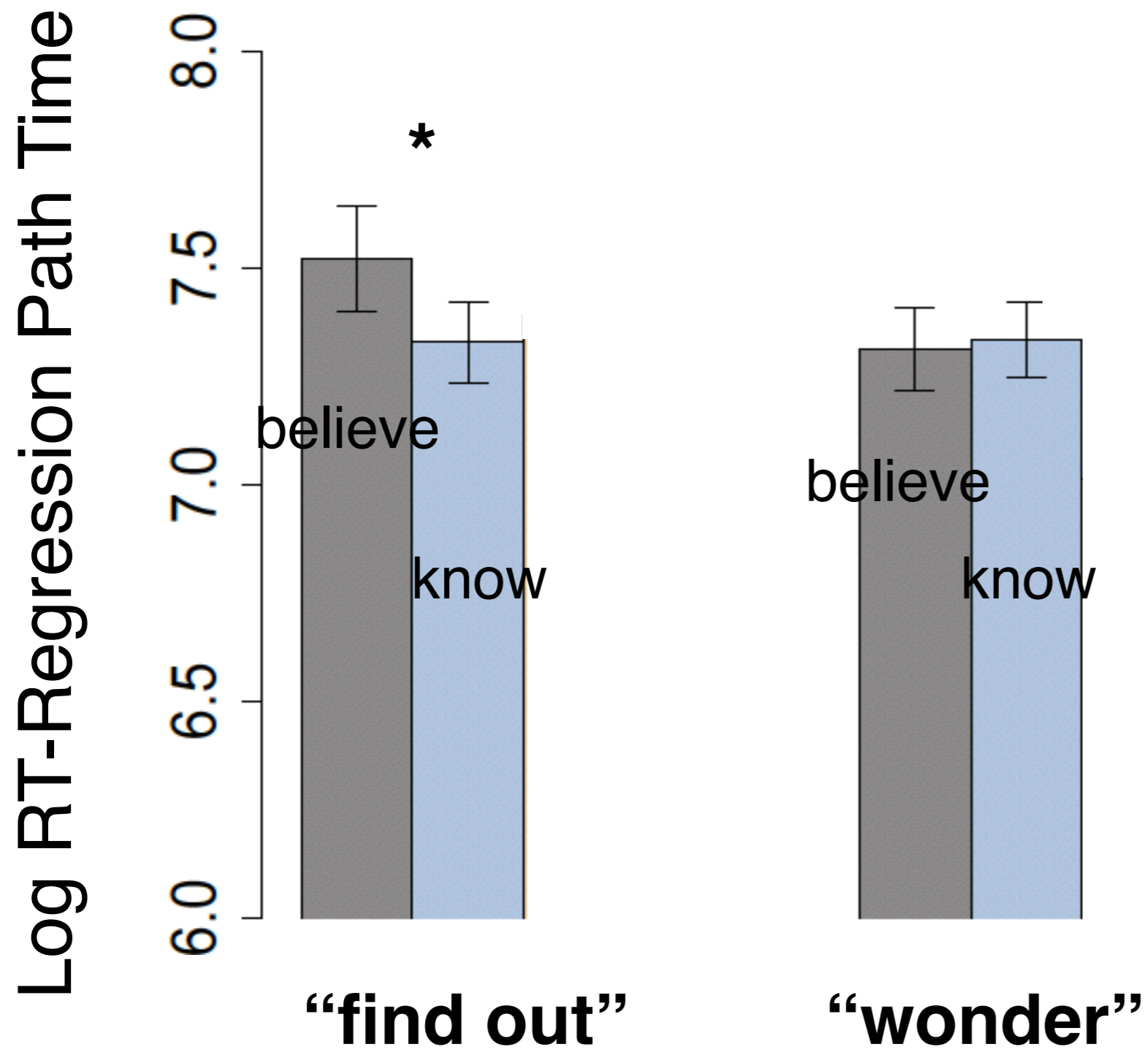
**Multiclausal, CP2-Q**



# Acceptability Judgment



# Reading time at the wh-in-situ phrase



...wonder[CP1, +Q...V[CP2...WH]

+CP, +Q

retrieval cues

...find out [CP1...V[CP2...WH]

Reanalysis needed!

The most recent CP site is more activated  
(less memory decay) in memory;  
available for reanalysis earlier

# Expt 3-4 Summary

- ▶ Constructing a covert dependency in Chinese is constrained by the language specific word order, which modulates information encoding and retrieval.
- ▶ If a distant scope position is incrementally encoded with a very salient [+Q] feature, e.g. a predictive feature, no locality is observed
- ▶ otherwise, local scope sites are accessed first, leading to a locality effect.

# **Experiment 5**

## **Truth value judgment task (subj n=57)**

### **Context:**

At a recent archaeology conference, Emily said that her research team found evidence to prove that a famous ancient city was actually built by aliens. But she didn't release the name of the city.

## Target sentence (ambiguous)

a. Emily **announced** her team **discovered** aliens built **which city**.

o **True**

Indicate **low** scope reading

“Emily announced her team discovered **which city** was built by aliens.”

o **False**

Indicate **high** scope reading

“Emily announced **which city** her team discovered was built by aliens.”

## Target sentence (ambiguous)

b. Emily **hid** her team **discovered** aliens built **which city**.

o **True**

Indicate **high** scope reading

“Emily hid (the fact that) **which city** her team discovered was built by aliens.”

o **False**

Indicate **low** scope reading

“Emily hid (the fact that) her team discovered **which city** was built by aliens.”

## Target sentence (unambiguous)

c. Emily **announced** her team **believed** aliens built **which city**.

o **True**

parsing failure

o **False**

Indicate **high** scope reading

“Emily announced **which city** her team believed was built by aliens.”



## Target sentence (unambiguous)

d. Emily **hid** her team **believed** aliens built **which city**.

- o **True**

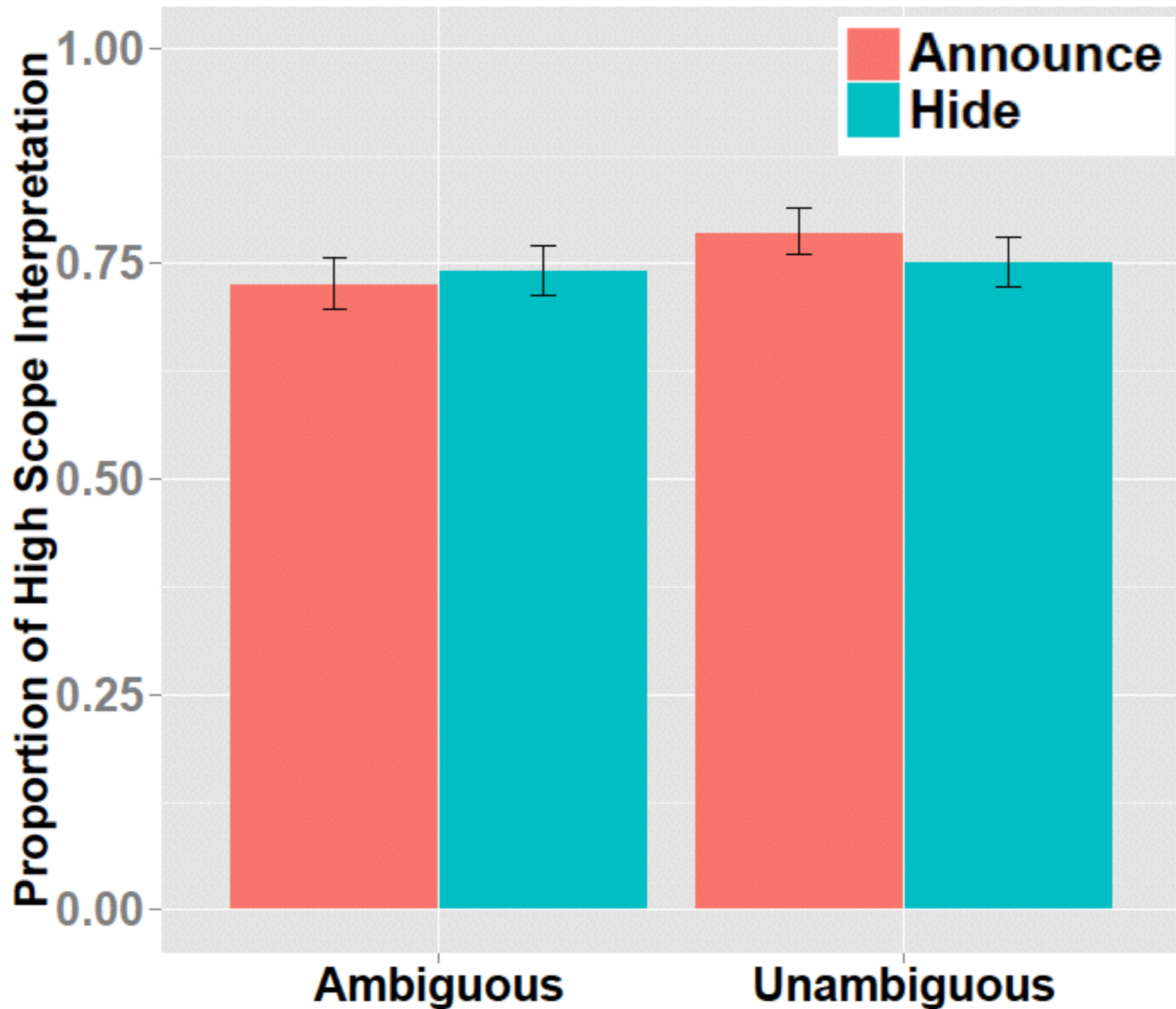
Indicate **high** scope reading

“Emily hid (the fact that) **which city** her team believed was built by aliens.”

- o **False**

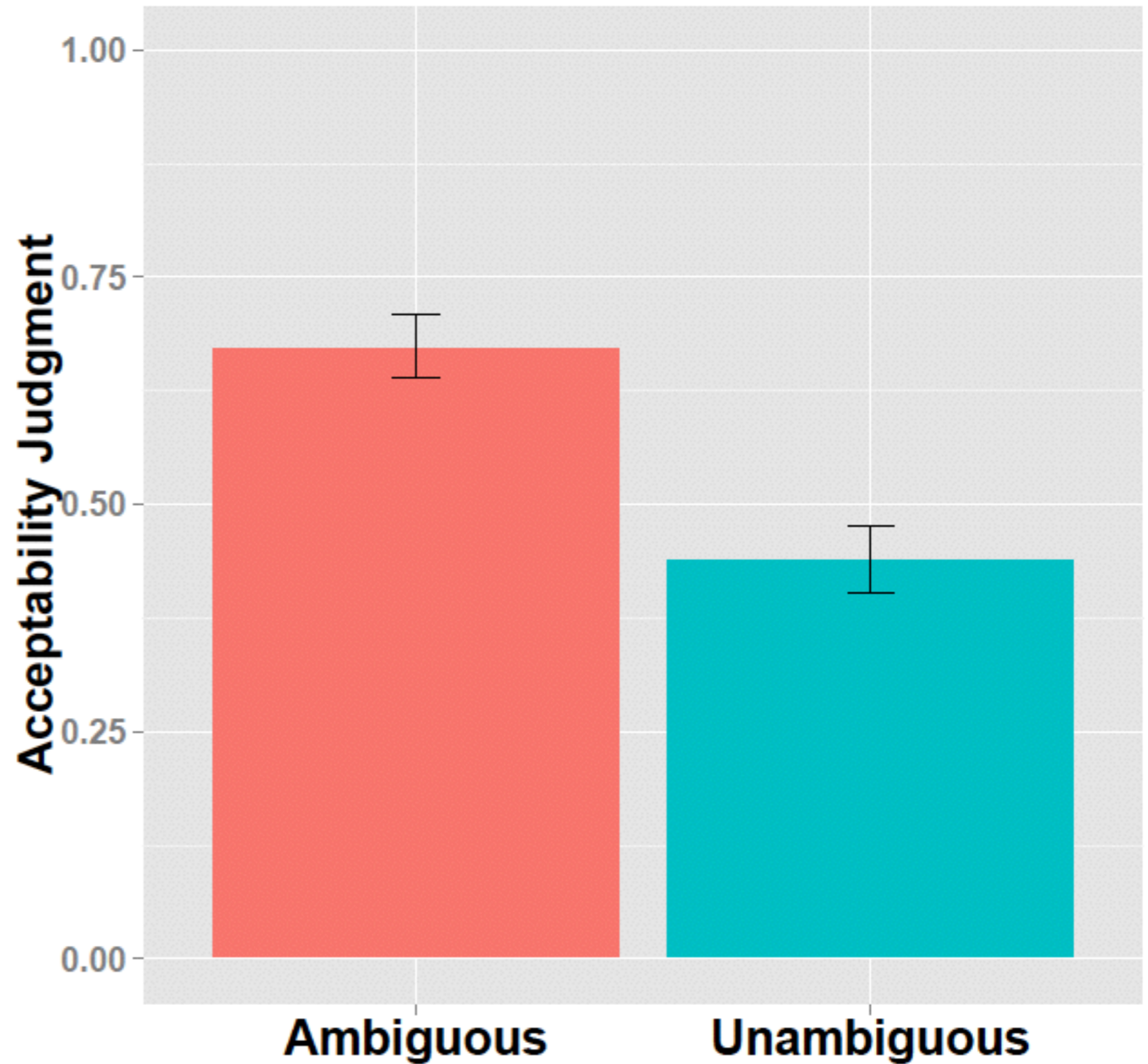
parsing failure

# Proportion of High Scope Readings



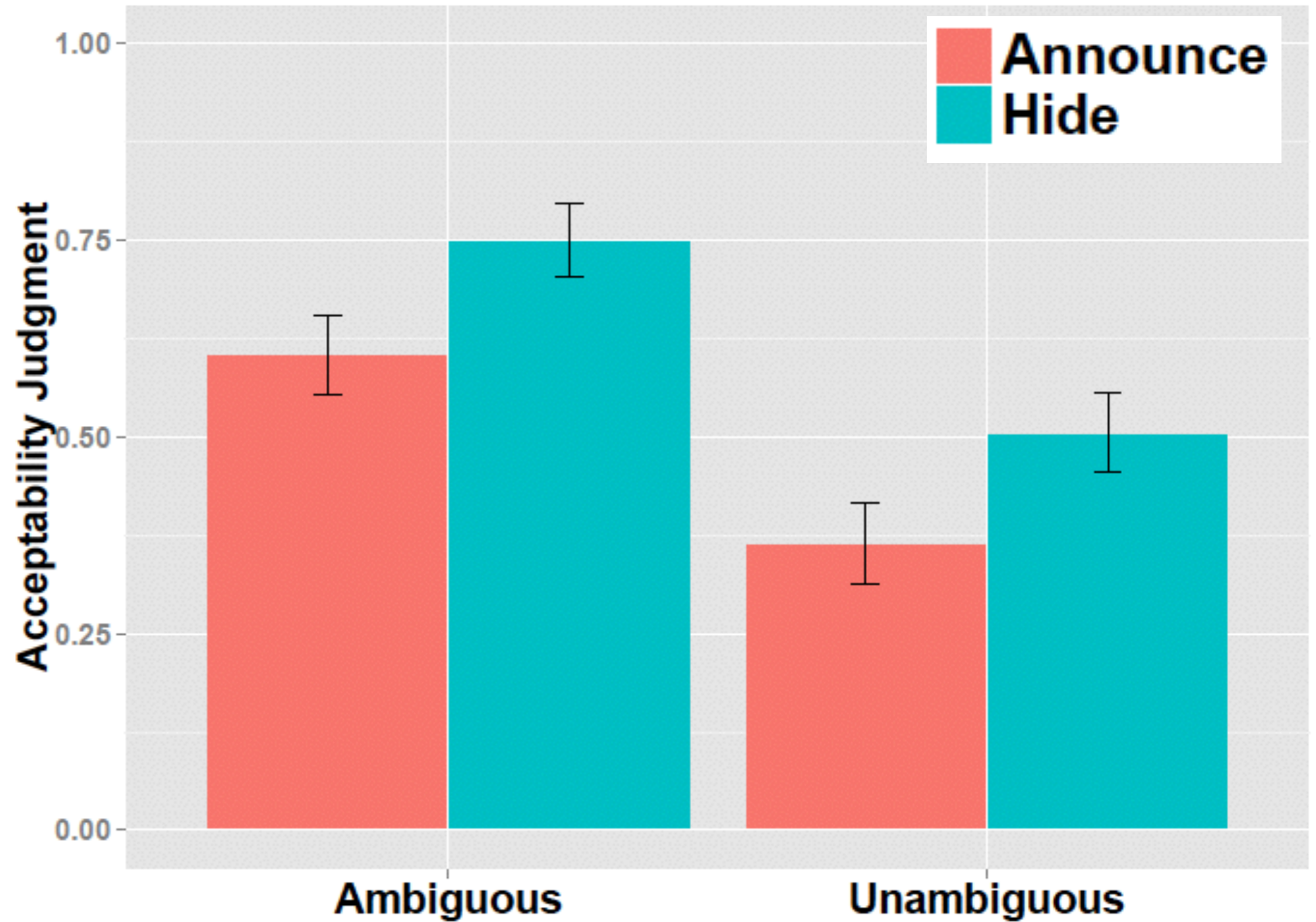
# Experiment 6

## Acceptability in context



# Experiment 6

## Acceptability in context



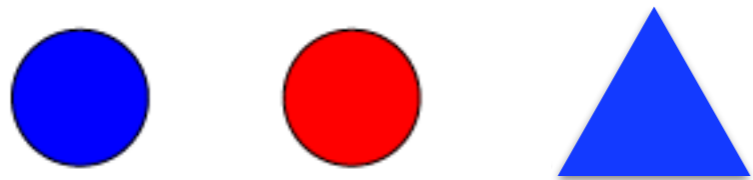
# The puzzle

- ▶ Ambiguity is resolved towards a marked interpretation
- ▶ High scope readings are preferred for ambiguous sentences, despite their enhanced parsing complexity

Mismatch between parsing complexity and comprehension bias

# Sketching two possible directions

- ▶ Ambiguity resolution is influenced by cost-based implicature



“The blue thing”

▶ Ambiguity resolution is influenced by cost-based implicature



“The blue thing”

Is the unambiguous form for the high scope interpretation more costly?

Emily announced **which city** her team discovered aliens built \_\_\_\_.

**High scope**

Emily announced her team discovered **which city** aliens built \_\_\_\_.

**Low scope**

In principle, Mandarin allows wh-phrases to be fronted via topicalization.



# Sketching two possible directions (II)

- ▶ The high scope reading is more relevant given the implicit QUD raised by the context

## Context:

At a recent archaeology conference, Emily said that her research team found evidence to prove that a famous ancient city was actually built by aliens. **But she didn't release the name of the city.**

The concessive “but” expresses a denial to an implicit QUD (“Did Emily release the name of the city?”)

Umbach, 2005

**Emily announced her team discovered  
aliens built which city.**

**High scope:** Emily announced **which city**  
her team discovered was built by aliens.

Emily announced the answer to the question “  
which city did her team discover was built by  
aliens?”

# Conclusions

To comprehend (and produce) a wh-in-situ construction in Chinese:

- ▶ Grammatical representations
- ▶ Mechanisms that build the structure
- ▶ Mechanisms that decide the ultimate interpretation

**Thank you!**