



# The Effect of Partial Semantic Feature Match in Forward Prediction and Backward Retrieval



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## Introduction

When processing long distance dependencies, do prediction and retrieval processes lead to different effects of accuracy and interference?

- Retrieval -- interference in long distance retrieval due to the decay of the representations that need to be retrieved [1]
- Prediction -- sharpened expectations facilitate parsing
  - anti-locality effect [2,3]
  - standard N400 effect [4,5]

It is not clear whether prediction simply facilitates parsing of the expected target, or is subject to interference as well (when confronted with overlapping but not fully anticipated semantic features):

- Highly constrained contextual expectation facilitates only the fully expected target, but loosely constrained expectation facilitates both the expected target and semantically related targets [6]
- semantically related targets are facilitated by contextual expectations, regardless of how constrained the expectations are [7]

## Chinese Classifier...N Dependency

- Mandarin Chinese classifiers must be used with nouns in the presence of numerals and demonstratives. Different nouns could be paired with different classifiers.

yi ke shu                      yi ge ren                      yi ju hua  
one CL<sub>tree</sub> tree                      one CL<sub>person</sub> person                      one CL<sub>sentence</sub> sentence

- The presence of a classifier obligatorily requires a N, but not vice versa  
na **ke** **shu** kaihua le                      **shu** kaihua le  
that CL<sub>tree</sub> tree bloom perf.                      tree bloom perf.  
That tree bloomed.                      The tree bloomed.

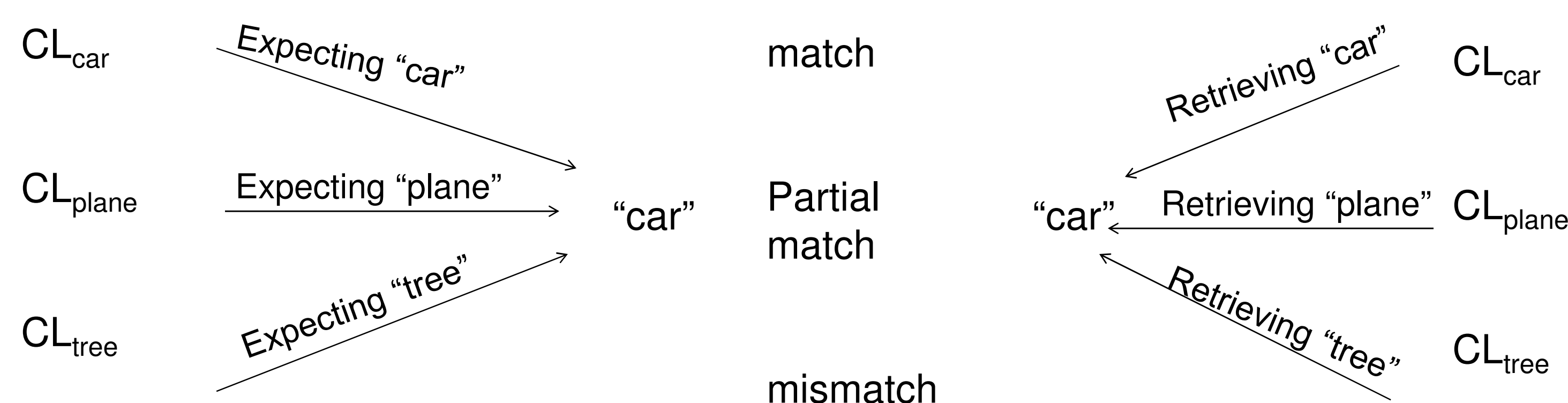
- Processing the canonical **CL...N** word order involves **forward expectation** originated at the classifier:

Zhangsan ba na-liang-**ke** henpiaoliangde **shu** zhongzaile houyuan  
Zhangsan ba that-two-CL<sub>tree</sub> very beautiful tree planted backyard  
"Zhangsan planted those two trees in the backyard."

- Processing the **N...CL** word order involves **backward retrieval** originated at the classifier:

Zhangsan zhong de **shu** li zuipiaoliangde na-liang-**ke** shi taoshu  
Zhangsan plant LINKER tree most beautiful that-two-CL<sub>tree</sub> be peach-tree.  
"Among the trees Zhangsan planted, the most beautiful two are peach trees."

- The expectation and retrieval processes share an identical set of features. The current study manipulated the feature match (semantic distance) between the CL and the predicted/retrieved N:



## Norming

In a cloze task, native Mandarin speakers (n=25) gave their preferred nouns to a list of 55 commonly used classifiers. 26 highly constrained classifiers were chosen for the current study (21/25 on average for their cloze probability).

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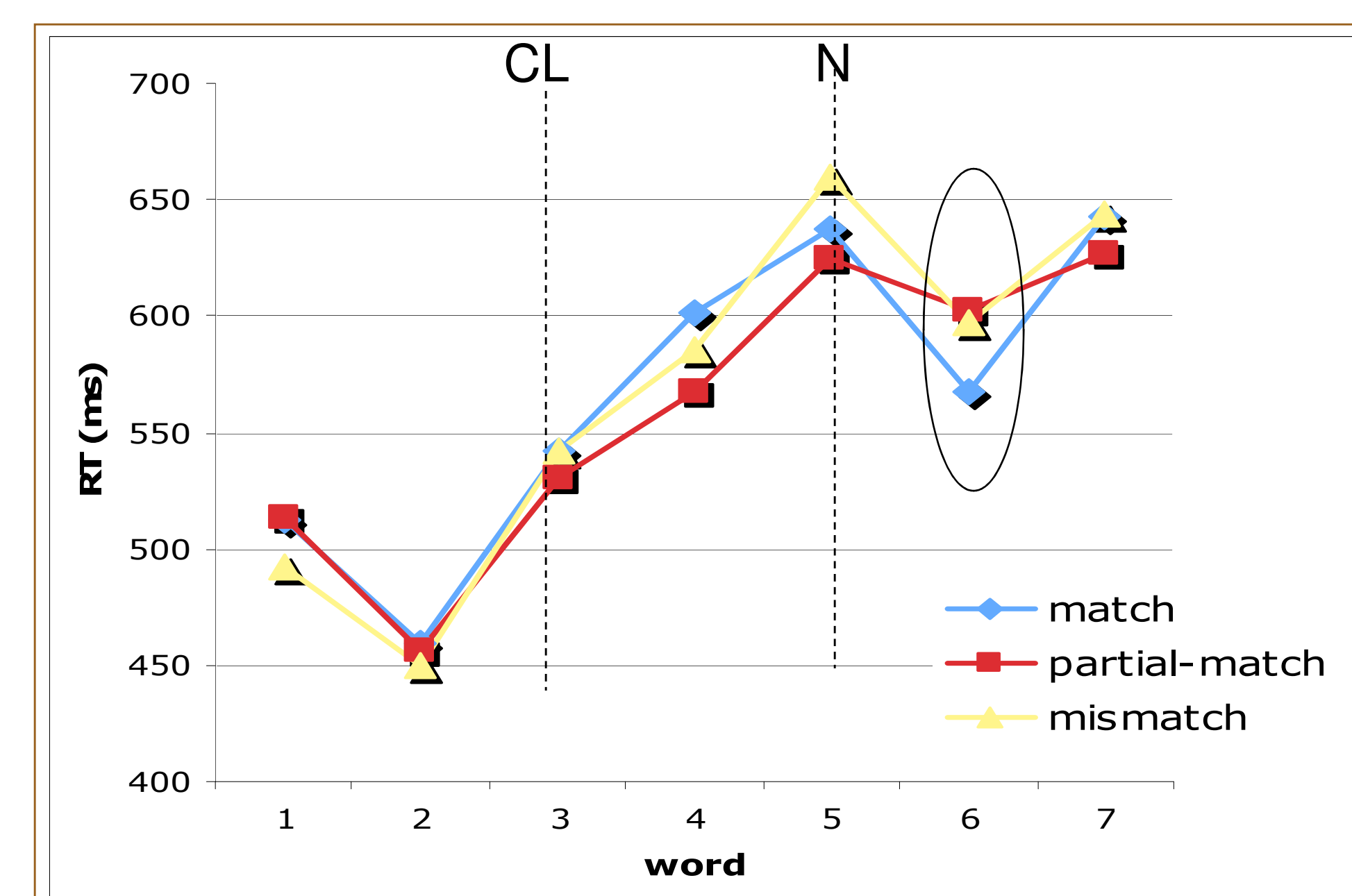
## Experiment 1: forward prediction

### Material (n=18)

na-san-jia  
that-three-CL<sub>plane</sub>  
Fuwong ba na-san-liang ju-da-de sirenfeiji quan dou maixialai le.  
Millionaire ba that-three-CL<sub>car</sub> huge private jet all bought  
na-san-li  
that-three-CL<sub>rice</sub>

"The millionaire bought all three huge private jets".

富翁把那三架 / 辆 / 粒 巨大的私人飞机全都买下来了。



- At the spill-over region, the N...CL showed interference from partial semantic feature match (close semantic distance); the CL...N order showed no such effect
- However the two expts. did not use the same set of classifiers, and the intervening material between CL and N was different in the two expts.

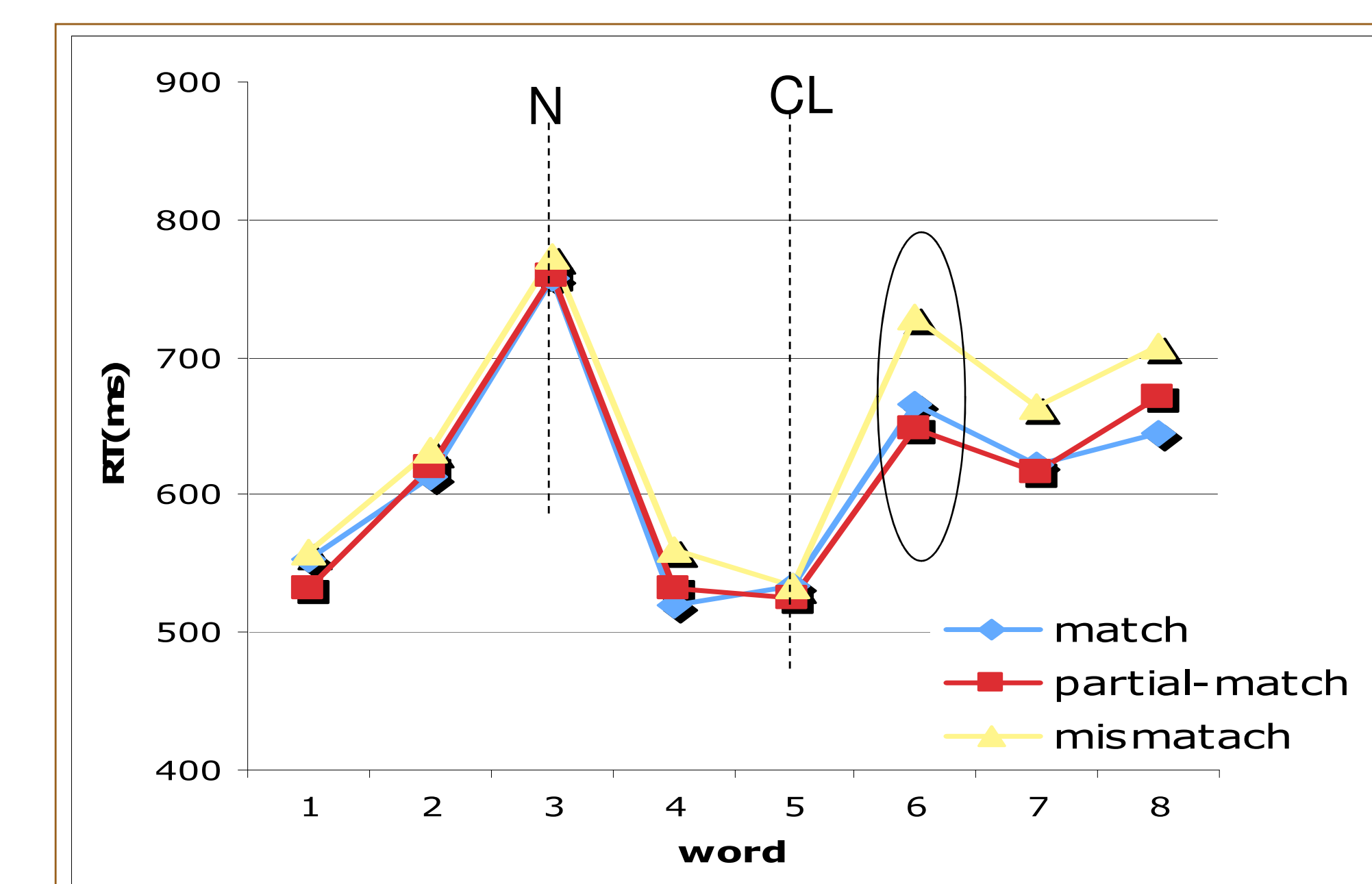
## Experiment 2: backward retrieval

### Material (n=18)

san-jia  
three-CL<sub>plane</sub>  
Jichangshang tingkaode sirenfeiji li you san-sou huangside feichang yingrenzhumu  
airport-ground parked private jet there three-CL<sub>boat</sub> yellow very draw-attention  
san-dong  
three-CL<sub>building</sub>

"Among the private jets parked on the ground, there are three yellow ones that drew lots of attention"

机场上停靠的私人飞机里有三架 / 艘 / 栋 黄色的非常引人注目。



## Experiment 3: controlling the intervening material

### Material (n=19)

na-yi-liang  
that-one-CL<sub>car</sub>  
Laozhang ba na-yi-jia hen-kuan-chang-de qiche songgei le LaoWang  
Mr.Zhang ba that-one-CL<sub>plane</sub> very-big car give Mr. Wang  
na-yi-suo  
that-one-CL<sub>school</sub>

"Mr.Zhang gave the big car to Mr.Wang."

老张把那一辆 / 架 / 所 很宽敞的汽车送给了老王。

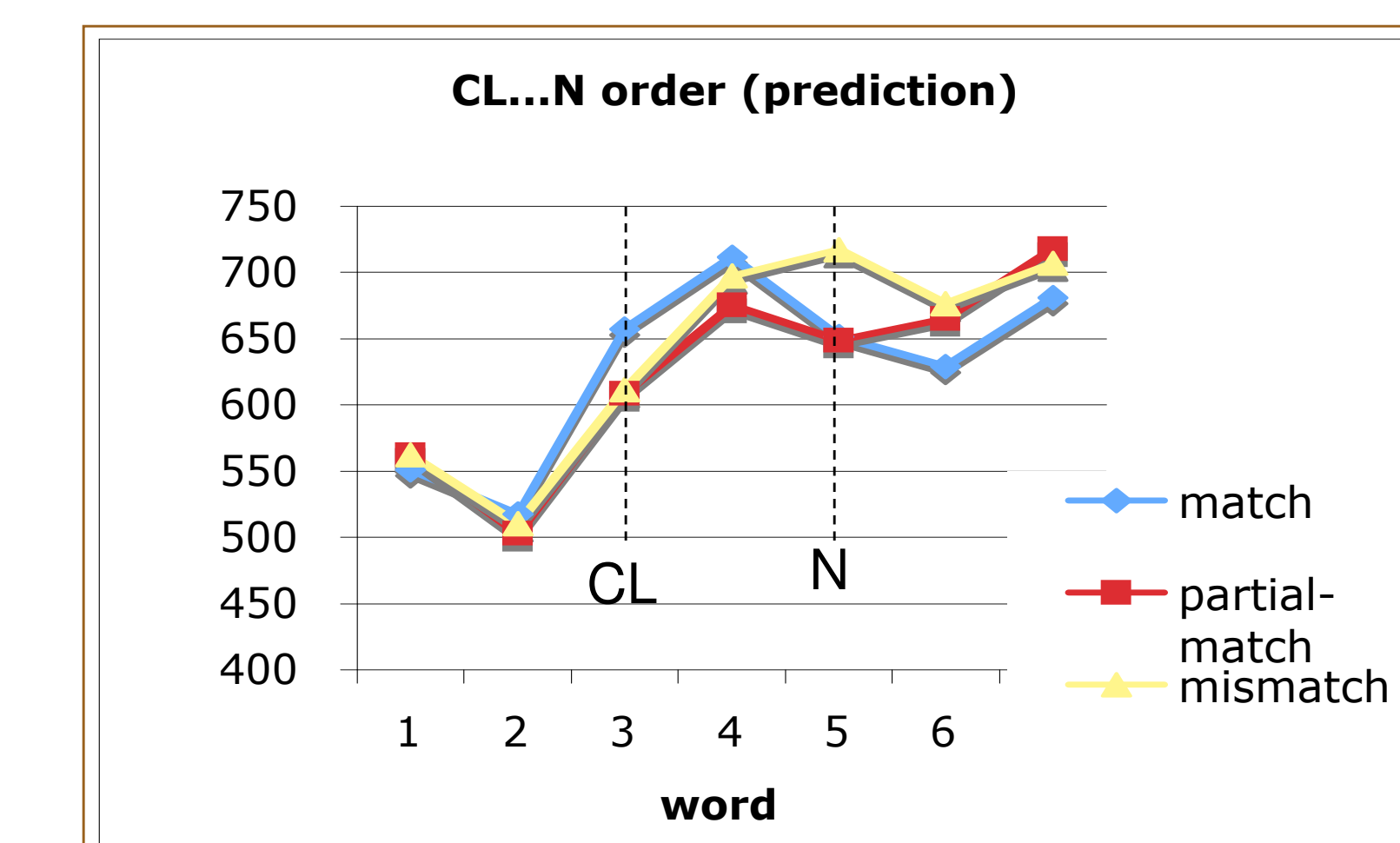
	1-7 Rating of the sentences (n=24)	1-5 Rating of the CL...N pair (n=15)
na-yi-liang	6.43	4.8
that-one-CL <sub>car</sub>		
Laozhang kaiguode qicheli zui-kuan-chang-de na-yi-jia keyizuo shigeren.	4.69	1.7
Mr.Zhang drove-RC car most-big that-one-CL <sub>plane</sub> can seat 10 people	4.04	1.7
na-yi-suo	4.00	1.4
that-one-CL <sub>school</sub>		
Laozhang kaiguode qicheli zui-kuan-chang-de na-yi-jia keyizuo shigeren.	4.04	1.7
Mr.Zhang drove-RC car most-big that-one-CL <sub>plane</sub> can seat 10 people	4.04	1.7
na-yi-suo	4.02	1.4
that-one-CL <sub>school</sub>		

"The biggest car Mr.Zhang has driven can seat 10 people".

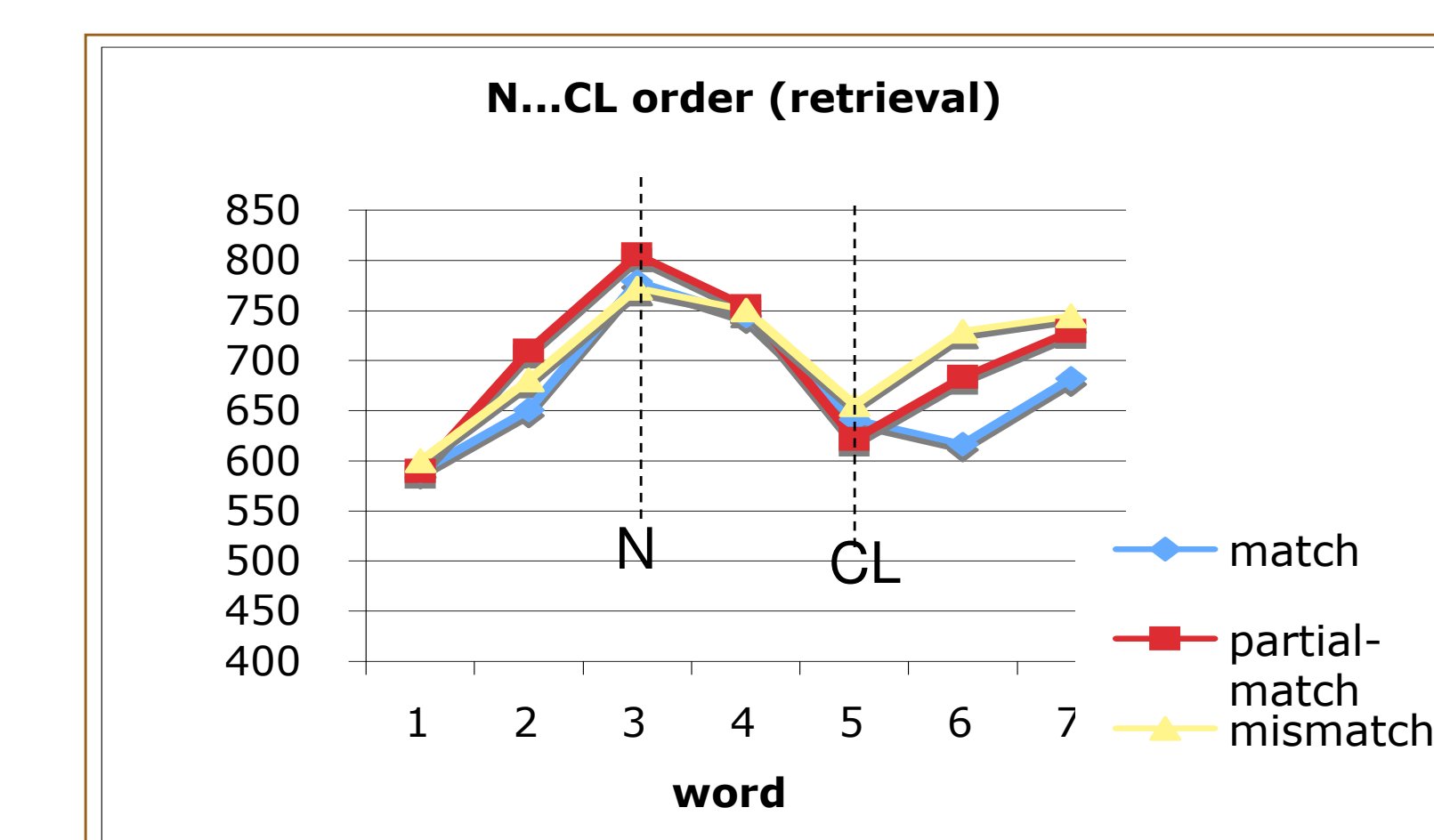
老张开过的汽车里最宽敞的那一辆 / 架 / 所 可以做十个人。

1-7 Rating of the sentences (n=24)      1-5 Rating of the CL...N pair (n=15)

## RT(n=51)



Interference at the critical word (N), and a numerical trend (n.s.) at the spill-over showing no interference effect



No effect at the critical word (CL), and interference at the first spill-over, recovery at the second spill-over

## Discussion

- **The effect of close semantic distance:** both prediction and retrieval processes are affected by close semantic distance, even when the set of predictive/retrieval features is highly constrained.

- **Difference between prediction and retrieval processes:** The effects of grammaticality and interference appeared online immediately when there is an expectation at the critical word; when there is only retrieval without prediction, the same effect was delayed. This suggests prediction and retrieval may play different roles in the dynamics of parsing

- Future work will determine whether prediction process can lead to faster recovery from the interference.

## References

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