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Processing Verbs with Ambiguous Complement Structures

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1. Background: Expectation-based model & parsing strategy

In reading sentences, given that there is an infinite number of ways that a sentence can continue, the parser constantly deal with **uncertainty** and adjusts **expectations** about the upcoming words.

How are ambiguous complement structures processed?
1) **Expectation-based theories**: readers are more likely to expect complement structures with higher frequencies (Hale, 2001; Levy, 2008; MacDonald);
2) **Active-filler strategy**: completing a dependency at the earliest possible structural point (Fodor, 1978, 1989).

Research Questions:

What is the role of expectation in the comprehension of Chinese sentences with ambiguous complement structures?
Can frequencies of complement structures predict the expectations in comprehension?
Are sentences with different syntactic properties (such as raising & control) processed differently?

2. Research Design

Uncertainty: Verbs followed by VP or NP:

1) 玛丽 答应 （李四）去 邀请 约翰 。
Mary promise Lisi go invite John
'Mary promised (Lisi) to invite John.

20 verbs: 提醒 'remind', 央求 'beg', 批准 'allow', 同意 'agree' etc.

Syntactic properties:

Control: $NP_{1/AGENT} + V_1 + NP_{2/GOAL} + [\ PRO_{1/2}\ VP\ ]$
- 答应 'promise', 命令 'ask', 要求 'require'

Raising: $NP_{1/AGENT} + V_1 + NP_{2/AGENT} + [\ t_2\ VP\ ]$
- 提议 'suggest', 禁止 'forbid', 希望 'hope'

Corpus: Sinica Corpus was consulted for the frequencies of complement structures of the target verbs.
Completion Task: 40 native Mandarin speakers completed sentences with given fragments.
- *Zhangsan daying* _____ 'Zhangsan promised …'
- *Lisi shi Zhangsan daying* _____ 'Lisi is who Zhangsan promised …'

***Results of the Corpus Study*:**

Condition	Examples	+VP	+NP(animate)	+NP(inanimate)
VP-dominant	答应 'promise', 同意 'agree'	50%	19%	16%
NP-dominant	请求 'ask', 命令 'command'	13%	65%	11%
Control	提醒 'remind', 请求 'ask'	19%	50%	11%
Raising	期待 'expect'，想要 'want'	40%	21%	23%

Self-paced reading: the sentences were presented using a relative clause:
NP1 shi [[NP2 V1 V2] DE CL NP3]

1) 李四$_2$ 是 玛丽$_1$答应 [PRO/e_1 邀请 e_2]的 那个男孩。 [animate, control]
Lisi is Mary promise invite DE CL boy
'Lisi is the boy who Mary promised *e_1 to invite e_2.'

2) 历史$_2$ 是 玛丽$_1$答应 [PRO/e_1 选修 e_2]的 那个 科目。 [inanimate, control]
History is Mary promise study DE CL subject
'History is the subject that Mary promised *e_1 to study e_2.'

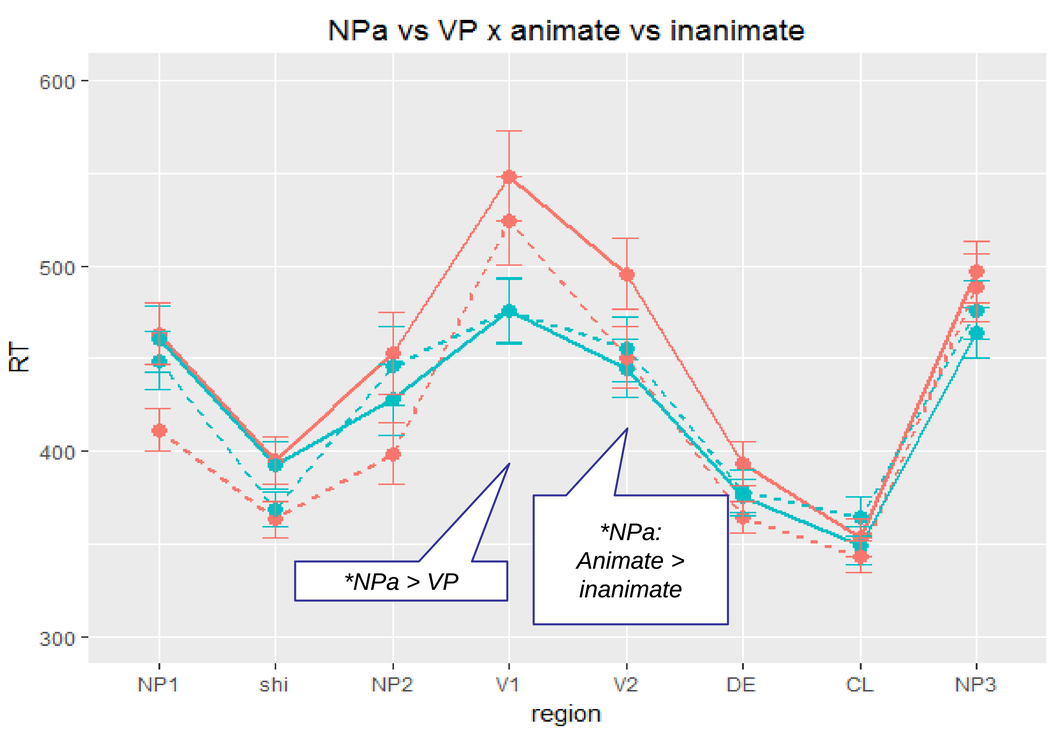
3) 李四$_2$ 是 玛丽$_1$提议[trace/e_1 邀请 e_2]的 那个男孩。 [animate, raising]
Lisi is Mary propose invite DE CL boy
'Lisi is the boy that Mary proposed *e_1 to invite e_2.'

4) 历史$_2$ 是 玛丽$_1$提议 trace/e_1 选修 e_2]的 那个 科目。 [animate, raising]
History is Mary suggest study DE CL subject
'History is the subject that Mary proposed *e_1 to study e_2.'

Participants: 42 native speakers of Mandarin Chinese
Items: 20 experiment items; each appearing either in animate or inanimate condition
Goal: Find out **to which gap position (e_1 or e_2)** readers assign the filler first.
Predictions:

	NP1	V1-e_1	V2-e_2
VP-dominant	Animate	Not assign } same	Assign at e_2 } same
	Inanimate	Not assign	Assign at e_2
NPa-dominant	Animate	Assign at e_1 } > VP	Assign at e_2 (reanalysis)
	Inanimate	Assign at e_1 (with semantic conflict) -ani > +ani	Assign at e_2 +ani > -ani
Control Verb		Assign at e_1	Assign at e_2 (reanalysis)
Raising Verb		Not assign	Assign at e_2 Control > Raising

3. Results



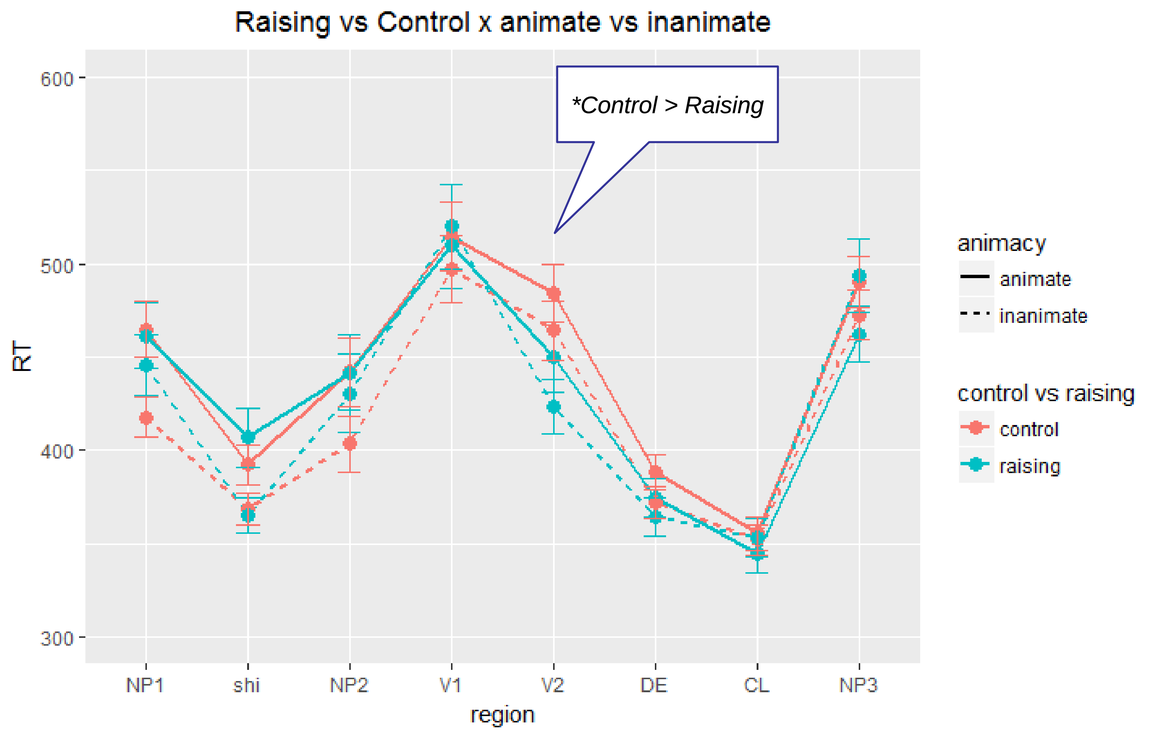


Table 1: Result: Linear Mixed Effects Model

	V1	V2
Most freq. tag	* NPa (t=-1.91)	n.s.
Animacy	n.s.	* animate>inanimate (t=-2.09)
Tag*Animacy interaction	n.s.	* NPa: animate>inanimate (t=1.80) (based on within-group t-test)

4. Discussion & Conclusion

- Readers rely on complement frequencies as their basis for making syntactic predictions.
  - Verbs with different complement frequencies are processed differently.
  - Readers expect an NP to occur for verbs with NP-dominant complements.
- Control verbs are harder to process than raising verbs.

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