Grammatical factors’ influences on relative clause attachment in Mandarin: Evidence from an interpretative judgment task

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SYNC 2014
Outline

1. RC attachment preference
   - Local vs. nonlocal
   - Animacy effects

2. Local ambiguity in Mandarin RC
   - Three-way reading in SRC
   - Two-way reading in ORC

3. The present study
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   - Methods and Materials
   - Analysis and Discussions

4. Conclusions
An ambiguous English example

(1) Someone shot the servant of the actress [who was on the balcony].
   - the actress was on the balcony (\textit{LOCAL}) - the servant
   was on the balcony (\textit{NONLOCAL})

- Local is preferred to nonlocal attachment: Arabic (Abdelghany & Fodor 1999), Basque (Gutierrez-Ziardegi et al. 2004), Chinese (Shen 2006; Cuetos & Mitchell 1988; Mitchell & Cuetos 1991), Chinese with short RC (Kuang 2010), English (Gibson et. al 2005)

- Nonlocal is preferred to local attachment: Dutch, French, German, Spanish (Gibson et. al 2005), Russian (Sekrina 2004), Italian (Ribeiro 1998, 2005)
RC attachment preferences — Resolution of ambiguity

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Desmet T, Brysbaert M, & Baecke D (2002a)

- Dutch: *NP1 of NP2 RC*
- Corpus analysis and a reading task
- If NP1 refers to a person, there is a preference to attach the relative clause to this host (in both corpus and reading data). However, if NP1 does not refer to a person, NP2 is the preferred host (only in corpus data).
Local ambiguity in Mandarin RC — An SRC example

SRC: \([V \ NP1 \ de] \ NP2\)

If set in an appropriate context, an SRC could be 3-way ambiguous.

Mandarin Example: \(V \ NP0 \ de \ NP1 \ de \ NP2\)

(2) \([\text{Zhiliao} \ yinger \ de \ yisheng \ de \ zhensuo] \ guanmenle.\)

cure baby DE1 doctor DE2 clinic close-Perf

\(\sim ([[e \ cure \ baby] \ DE1 rel [doctor] [DE2 poss clinic]]\)

“The doctor that cured the baby]’s clinic” \(\sim [[e \ cure \ baby] \ DE1 rel [doctor [DE2 poss clinic]]\)

“The doctor’s clinic that cured the baby” , \([e \ cured [baby [DE1 poss doctor]]] \ DE2 rel clinic\)

“The clinic that cured the baby’s doctor”
Local ambiguity in Mandarin RC — An ORC example

ORC: $[NP1 \ V \ de] \ \ NP2$

However, since $de$ follows a verb in ORC, possession relation cannot be established between NP1 and NP2. An ORC could only be 2-way ambiguous (without (2c)).

Mandarin Example: $NP0 \ V \ de \ NP1 \ de \ NP2$

(3) [Bingren tousu $de$ yisheng $de$ zhensuo] guanmenle.

patient sue DE1 doctor DE2 clinic close-Perf

- [[[patient [sue e]] DE1$\text{rel}$ doctor] [DE2$\text{poss}$ clinic]]
  “[The doctor that the patient sued]’s clinic”
- [[[patient [sue e]] DE1$\text{rel}$ [doctor [DE2$\text{poss}$ clinic]]]
  “The doctor’s clinic that the patient sued”
The present study — Questions

1. How are the attachment ambiguities in (2) and (3) resolved?
   - Local attachment vs. nonlocal attachment
   - The role of NP animacy

2. Could the local possessive/relative ambiguity in Mandarin SRCs contribute to their processing difficulty (compared to Mandarin ORCs)?
   - Default reading of *de*: relativizer or possession marker?

3. What is the relative time-course of availability of different types of information? For example, when is syntactic category information relevant to comprehension processes relative to conceptual semantic information?
The present study – M&M

Methods

- A centered self-paced reading task (Linger, version 2.94).
- 36 participants between 20 to 35 years old.
- Data was collected by MySQL, and analyzed by the linear mixed-effects regression model with lme4 package in R (R Core Development Team, 2008).
- After each sentence, participants were asked to answer a multiple-choice question (semantic judgment).

A simplified English example

(4) Someone shot the servant of the actress who was on the balcony.
Who was on the balcony?
A. the servant  B. the actress  C. either A or B
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**Design**

2 (RCtype: ASRC/PSRC) * 2 (Plausibility: bias/equi) * 2 (NP1 animacy: animate/inanimate) * 2 (Demonstrative: W/O)

**PSRC: PassiveMarker NP1 V de NP2**

- PSRCs share the same structure with ORCs, except for having a passive marker *bei* at the beginning of each sentence.
- Corresponding ORCs are not as natural as PSRCs.

**Mandarin Example**

(5) [Bei bingren tousu de yisheng de zhensuo] guanmenle. by patient sue DE1 doctor DE2 clinic close-Perf

"[The doctor that was sued by the patients]'s clinic"

"The doctor’s clinic that was sued by the patients"
The present study – M&M

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[[by patient [sue e ]] DE1rel doctor] [DE2poss clinic]
“[The doctor that was sued by the patients]’s clinic”
[[by patient [sue e ]] DE1rel [doctor [DE2poss clinic]]]
“The doctor’s clinic that was sued by the patients”
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One complete group of stimuli: doctor/clinic (ASRC)

(6) NP1 Animate (AI) w/o dem
   - cure baby DE1 doctor DE2 clinic close-Perf (EQUI) - kiss baby DE1 doctor DE2 clinic close-Perf (BIAS) - cure baby DE1 dem doctor DE2 clinic close-Perf (EQUI) - kiss baby DE1 dem doctor DE2 clinic close-Perf (BIAS)

(7) NP1 Inanimate (IA) w/o dem
   - cure baby DE1 clinic DE2 doctor close-Perf (EQUI) - kiss baby DE1 clinic DE2 doctor close-Perf (BIAS) - cure baby DE1 dem clinic DE2 doctor close-Perf (EQUI) - kiss baby DE1 dem clinic DE2 doctor close-Perf (BIAS)
Design

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One complete group of stimuli example: doctor/clinic (PSRC)

(8) NP1 Animate (AI) w/o dem before head NP1
  ↓ by patient sue DE1 doctor DE2 clinic close-Perf (EQUI) ↓ by patient slap DE1 doctor DE2 clinic close-Perf (BIAS)

(9) NP1 Inanimate (IA) w/o dem before NP1
  ↓ by patient sue DE1 clinic DE2 doctor close-Perf (EQUI) ↓ by patient slap DE1 clinic DE2 doctor close-Perf (BIAS)
The present study – M&M

Materials

- 16 pairs of NP1/NP2 with part(animate)/whole(inanimate) relation. In total there are 256 stimuli.
- In each condition, 6 sentences are picked out plus 48 fillers, making up one complete version of experimental stimuli (144 sentences). Four different versions are created.
- Stimuli were presented to participants in a random order.

16 pairs of animate NP1/inanimate NP2 with part-whole relation

- doctor/clinic, star/TV station, writer/publishing house, investor/gallery
- president/country, president/company, employee/embassy, student/institute
- actress/troupe, pilot/airline, salesman/insurance company, anchor/radio station
- teacher/school, accountant/agency, lawyer/court, personal trainer/fitness center
The present study — Analysis

Statistical analysis over the semantic judgment task responses

Only significant main effects and interactions are shown in this table.

<table>
<thead>
<tr>
<th>Effects</th>
<th>t values</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQUI</td>
<td>-7.133</td>
</tr>
<tr>
<td>BIASAnimate vs. BIASInanimate</td>
<td>4.757</td>
</tr>
<tr>
<td>PSRCNoDemAnimateBIAS</td>
<td>2.09</td>
</tr>
<tr>
<td>PSRCDemAnimateEQUI</td>
<td>-2.181</td>
</tr>
</tbody>
</table>

Table: Mixed effects linear model fixed effects on judgment task
The present study — Analysis

- Animate NP attachment preference:
  Within EQUI condition, animate NP attachment percentage is significantly higher than inanimate NP attachment percentage ($t = 19.16$).

![Bar chart showing percentage of animate NP attachment in BIAS and EQUI conditions.](image-url)
The present study — Analysis

- Local NP attachment preference \((t = 4.757)\): there were more choices of the inanimate NP in IA than in AI condition. Inanimate NP in IA condition is the local NP.
ASRCs are harder to process than PSRCs ($t = 2.09$): Active/NoDem/BIAS/AI condition is the only one without any cues to cancel the local ambiguity, thus the extra resources needed might be the reason for lower rate of correctness.

![Bar chart showing percentage of animate NP attachment in BIAS ANIMATE condition: Demonstrative and RC type interaction](image)
The present study — Analysis

- The combined cue of being modified by a demonstrative and PSRC pushes integration of an NP as head of RC. ($t = -2.181$)

**Figure 4.** Percentage of animate NP attachment in EQUI ANIMATE condition: Demonstrative and RC type interaction
Conclusions

- There is an animate NP attachment preference for Mandarin RCs.
- There is a local NP attachment preference for Mandarin RCs.
- A(S)RCs may be difficult to process partly due to an ambiguity not present in ORCs (or PSRCs), though we need the online data to confirm this.
- The combined cue of being modified by a demonstrative and in a passive sentence structure pushes integration of an NP as the head of RC.
References I

References II

Jiwon Yun et. al (2014) in press
References III