Testing the variational model: null subjects and null objects in L1 Chinese

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Null Objects from a Crosslinguistic and Developmental Perspective
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Outline

Research question

Background

Methodology

Results
  Null subjects
  Null objects
  The *ba* construction

Conclusions
Research question

‘Data from language acquisition have been taken to suggest that the nonrealization of an object is an option widely available in early stages of language development, even when the adult language severely restricts object drop (Pérez-Leroux, Pirvulescu, and Roberge, 2008; Pérez-Leroux, Pirvulescu, Roberge, and Castilla, 2013). (…)

d) If children start with a generalized null object stage, what triggers the acquisition of the relevant grammar in the domain of object expression?’
Research question

There are empirical arguments to challenge the idea that children go through a stage where they revert to null objects and objects universally. See, for example, the variation in object clitic omission in Romance (and beyond) discussed in Gavarró, Torrens and Wexler (2010).
Research question

The optional omission of object clitics is subject to cross-linguistic variation (Gavarró et al. 2010)
Research question

• The performance of Spanish children is found in other languages: Greek (Tsakali and Wexler 2004), Romanian (Babyonyshev and Marin 2005, cf. Avram 1999), SerboCroatian (Illic and Deen 2004), Albanian (Kapia 2010).

• The performance of Catalan children belongs to the language type first encountered in Italian (Schaeffer 2000) and French (Jakubowicz and colleagues).

• In languages with obligatory clitics, comprehension shows that children do not resort to a null object (Grüter 2006), unlike what happens in languages with null objects (Costa and Lobo 2010).
Research question

On the conceptual side, if children set the parameter value of the null subject/null object parameter to the + value incorrectly, since this setting defines a superset with respect to the – value, by the Subset Principle, they would be unable to reset the parameter to the correct value. (To go from superset to subset, negative evidence would be necessary, yet children have no access to negative evidence.)
For this reason, Pérez-Leroux and colleagues, at least in some of their work, assume Yang’s variational model of acquisition. Here we consider the predictions of Yang’s model for the acquisition of subjects and objects in Mandarin Chinese.
Test case: null subjects and null objects in Chinese (Huang, 1984)

(1) A: 你们 都 看 过 泰坦尼克号 了 吗？
Ni-men dou kan guo tai-tan-ni-ke-hao le ma?
2PL all see EXP Titanic PERF SFP
‘Have you seen the Titanic?’

B: 看 过 了。
Kan guo (Ø) le.
see EXP SFP
‘(We) have already seen (it).’
Embedded null subjects (Huang, 1989)

(2) 张三 说 很 喜欢 泰坦尼克号。

Zhang-san  shuo  hen  xi-huan  tai-tan-ni-ke-hao.

Zhang-san  say  very  like  Titanic

(i) 张三 i 说 [Top ej] 很 喜欢 泰坦尼克号。

‘Zhangsan_i said that (he_j-someone else in the discourse) liked the Titanic.’

(ii) 张三 i 说 [pro ei] 很 喜欢 泰坦尼克号。

‘Zhangsan_i said that (he_i-Zhangsan) liked the Titanic.’
The *ba* construction (Fahn, 1993; Tsao, 1987)

(3) Ba da-hui-lang gan zou le. (Haohao, 1;8)
BA wolf drive away PERF
(I) drove the wolf away.

- In the *ba* construction the object is preverbal, must be definite and affected, cannot be null, and can bear a Topic marker.
The variational model (Yang, 2002, 2004)

\[(4)\]

(a) For an input sentence \(S\), the child with probability \(P_i\) selects a grammar \(G_i\), analyzes \(S\) with \(G_i\)

(b) If successful, rewards \(G_i\) by increasing \(P_i\);

(c) If failure, then punishes \(G_i\) by decreasing \(P_i\).

- Learners do not select any values as their initial hypothesis.
- The rise of the target grammar is gradual (depending on the frequency of signatures, i.e. disambiguating evidence).
Methodology

Acquisition data

- 47 typically-developing, monolingual Mandarin-speaking children and their caregivers (Zhou and Chang’s corpus in the CHILDES database)
- Age range: 1;2-6;5
- 9 age groups

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
<th>IX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1;2</td>
<td>1;8</td>
<td>2;2</td>
<td>2;8</td>
<td>3;0</td>
<td>3;6</td>
<td>4;0</td>
<td>5;0</td>
<td>5;5-6;5</td>
</tr>
</tbody>
</table>

Table 1: Age groups
Methodology

- Null subjects:
  (i) Include null subjects as null topics in embedded sentences.

- Null objects with a transitive verb:
  (i) Exclusion of VO words as V+O structures, and VP ellipsis.
  (ii) The transitive sentences were picked not only based on the main verbs used, but also the context.

- The *ba* construction:
  (i) Automated analysis: command “kwal +t*CHI +s” 把” @” and “kwal +t*MOT +s” 把” @”.

- Immediate imitations & repetitions & ‘chunks’ were discarded.
Null subjects

• Let us assume as a first working hypothesis that subjects and objects may be considered separately.

• Null subjects in all sentences heard by children (including fragments, imperatives, etc.) appear in 21.5% of the total number of sentences (N=8810).
## Results

### Null subjects

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Child Production</th>
<th>Child-Directed Speech</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>1;2</td>
<td>100</td>
<td>18/18</td>
</tr>
<tr>
<td>1;8</td>
<td>58.43</td>
<td>52/89</td>
</tr>
<tr>
<td>2;2</td>
<td>51.05</td>
<td>97/190</td>
</tr>
<tr>
<td>2;8</td>
<td>61.67</td>
<td>74/120</td>
</tr>
<tr>
<td>3;0</td>
<td>46.15</td>
<td>54/117</td>
</tr>
<tr>
<td>3;6</td>
<td>42.22</td>
<td>57/135</td>
</tr>
<tr>
<td>4;0</td>
<td>58.90</td>
<td>129/219</td>
</tr>
<tr>
<td>5;0</td>
<td>35.10</td>
<td>119/339</td>
</tr>
<tr>
<td>5;5-6;5</td>
<td>49.49</td>
<td>97/196</td>
</tr>
<tr>
<td>Mean</td>
<td><strong>48.98</strong></td>
<td><strong>49.83</strong></td>
</tr>
</tbody>
</table>

**Table 2:** Percentage and number of NS over all sentences (only include sequences with a verb)
Results

Null subjects

Fig. 1 Developmental curve of subject omission in child- and child-directed speech
Results

Null subjects

(7) MOT: 告诉 阿姨 小 白兔 吃 什么？
Gao-su a-yi xiao bai-tu chi shen-me?
tell auntie little rabbit eat what
‘Tell the auntie what rabbits eat.’

CHI: 吃 萝卜
Chi luo-bo.
(Ø) eat radish
‘(They) eat radish.’
(Xu’er, 1;8)
Results

Null subjects

Fig. 2 Developmental curve of null subjects by the Chinese children by MLU and child-directed speech
Interim Summary

Null subjects

Findings

- Whether analysed by age or by MLU, the performance of Chinese children in null subject production is already adult-like at a very early age (at 1;8 or at MLU Stage II).
Results

Null objects

- Null objects in all sentences heard by children appear in 8.6% of the total number of sentences (N=8810).
Results
Null objects

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Child Production</th>
<th>Child-Directed Speech</th>
</tr>
</thead>
<tbody>
<tr>
<td>1;2</td>
<td>100</td>
<td>43.05</td>
</tr>
<tr>
<td>1;8</td>
<td>42.86</td>
<td>38.67</td>
</tr>
<tr>
<td>2;2</td>
<td>34.57</td>
<td>26.73</td>
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<tr>
<td>2;8</td>
<td>41.77</td>
<td>32.93</td>
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<td>3;6</td>
<td>31.31</td>
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<td>4;0</td>
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<td>32.26</td>
</tr>
<tr>
<td>Mean</td>
<td>33.19</td>
<td>34.42</td>
</tr>
</tbody>
</table>

Table 3: Percentage and number of null objects found (only transitive sentences considered)
Results

Null objects

Fig. 3 Developmental curve of object omission in child- and child-directed speech
Null objects

(8) a MOT: 你要 做 哈？
ni yao zuo ha
2SG want do Q
‘What do you want to do?'

CHI: 我 要 拿 这个。
wo yao na zhe-ge
1SG want take this
‘I want to take this.’

b. %act: CHI is taking the pen out.

CHI: 妈妈 拿 好。
ma-ma na hao
mom take well
‘Mom, take (it) well.’
Results
Null objects

Fig. 4 Developmental curve of object drop by Chinese children by MLU and child-directed speech
Interim Summary
Null objects

Findings

• Whether analysed by age or by MLU, the performance of Chinese children in null object production is adult-like at a very early age (at 1;8 or at MLU stage II).
Interim Summary
Variational model

Findings

• The input frequency of null objects (8.6%) is very low compared to that of null subjects (21.5%), which means the prediction of the variational model would be a significantly longer variational stage with null objects than with null subjects (should subjects and objects be analysed separately by children). But this is not the case.
Overall rate of $[\pm \text{Null Topic}]$ in the adults’ production

Should subjects and objects be analysed together by children:

<table>
<thead>
<tr>
<th>Rewards $[+\text{Null Subject}]$</th>
<th>1892/3797</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rewards $[-\text{Null Subject}]$</td>
<td>1905/3797</td>
</tr>
<tr>
<td>Rewards $[+\text{Null Object}]$</td>
<td>760/1910</td>
</tr>
<tr>
<td>Rewards $[-\text{Null Object}]$</td>
<td>1150/1910</td>
</tr>
</tbody>
</table>

$([-\text{Null Subj}]+[-\text{Null Obj}])-\left([+\text{Null Subj}]+[+\text{Null Obj}]\right)\% = (53.5-46.5) = 7\%$

Table 4: Quantitative evidence in child-directed Chinese in favor of the $[-\text{Null Topic}]$ grammar
Discussion

Legate & Yang (2007)

• The numerical advantage of Chinese [+Null Topic] grammar is much lower than the advantage of the [+Tense] grammar of English (–11.6% vs. 5.8%).

• Under Yang’s model, Chinese children will converge to a Null Topic grammar even much later than English-speaking children acquire a Tense grammar (i.e. more than 3;5).

• However, both quantitatively and qualitatively, Chinese children are already performing at ceiling levels at age 1;8.
Results

The *ba* construction

- The adult usage frequency of the *ba* construction in the input constitutes 3.1% over all the utterances (N=8810) analysed.
## Results

### The *ba* construction

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Child Production %</th>
<th>Child-Directed Speech %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>1;2</td>
<td>0.00</td>
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<td>2;8</td>
<td>2.53</td>
<td>9.76</td>
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<td>3;0</td>
<td>3.53</td>
<td>12.87</td>
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<td>3;6</td>
<td>2.02</td>
<td>12.56</td>
</tr>
<tr>
<td>4;0</td>
<td>10.19</td>
<td>11.14</td>
</tr>
<tr>
<td>5;0</td>
<td>9.44</td>
<td>6.79</td>
</tr>
<tr>
<td>5;5-6;5</td>
<td>10.10</td>
<td>10.75</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>4.90</strong></td>
<td><strong>12.90</strong></td>
</tr>
</tbody>
</table>

**Table 5:** Percentage and number of *ba* constructions against transitive sentences
Results

The *ba* construction

Fig. 5 Developmental curve of the *ba* construction in child- and child-directed speech
Results by MLU

The *ba* construction

Fig. 6 Developmental curve of the *ba* construction against transitive sentences by MLU and child-directed speech
Interim Summary
The *ba* construction

Findings

- The *ba* construction is not attested until age 1;8.
- By MLU 3.5, the presence of the *ba* construction is reaching adult levels.
- All sentences with *ba* produced by children included the obligatory post-*ba* NP from the first occurrence (age 1;8), like those of adults.
Interim Summary
The \textit{ba} construction

- The relatively high frequency of null objects in Chinese and the low frequency of the \textit{ba} construction in the input should lead children to drop objects (i.e., post-\textit{ba} NP) in this construction at least at the early stage. However, this prediction is not fulfilled: even at age 1;8 children produce post-\textit{ba} NPs in the \textit{ba} construction consistently. There is no variational stage such as the one expected in the variational model.
Conclusions

- Chinese children show an adult-like grammar of null subjects and null objects at age 1;8 or MLU stage II.
- With respect to the *ba* construction, there was no child for whom both values were seen to be competing in the earliest stage, since all the children considered produced overt objects, like adults, from the first occurrence.
- No variational stage is attested. Our findings show that setting of these parameters is quick, despite how much (or little) unambiguous evidence there is in the input.
Conclusions

• If we assume (with e.g. the triggering model) that the child starts with a –Null Topic setting, upon encountering null topics in Chinese, the child will set the parameter correctly to the + value.
• The setting of the ba parameter (dependent on the acquisition of a functional element) follows the same procedure. This captures the facts and no conflict arises with the Subset Principle.
• We do not assume a +Null Topic/+Null Object grammar as a (universal) starting point in acquisition.
Acknowledgements

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