
Late Intervention Effects in the Acquisition of Mandarin Sluice-like Constructions

Minqi Liu, Nina Hyams, and Victoria Mateu

University of California, Los Angeles

liuminqi@ucla.edu

Background: sluice

- **Sluice** ('sluicing' in Ross 1969): an elliptical structure where only a *wh*-phrase is overtly pronounced in an embedded clause.
- One prominent analysis of sluicing: *wh*-movement followed by TP-ellipsis (Merchant 2001; cf. Chung et al. 1995, Abe 2015 a.o.)

Movement-ellipsis

(1) English **sluices**:

a. Subject sluice:

Someone pushed John but I don't know [_{CP} **who** [_{TP} ~~*t* pushed John~~]]

The diagram shows the structure of a subject sluice. The main clause is "Someone pushed John". The embedded clause is "but I don't know" followed by a CP. The CP contains the word "who" and a TP. The TP contains a trace "t" and the verb phrase "pushed John". A curved arrow points from the trace "t" to the word "who", indicating movement. The TP is crossed out with a blue line.

b. Object sluice:

John pushed someone but I don't know [_{CP} **who** [_{TP} ~~*John pushed t*~~]]

The diagram shows the structure of an object sluice. The main clause is "John pushed someone". The embedded clause is "but I don't know" followed by a CP. The CP contains the word "who" and a TP. The TP contains the subject "John" and the verb phrase "pushed t". A curved arrow points from the trace "t" to the word "who", indicating movement. The TP is crossed out with a blue line.

Background: English sluice acquisition

Subject advantage in English sluice comprehension

Mateu et al. (2017): English-speaking children aged 3;00-6;11 generally performed significantly better on subject sluices than on object sluices.

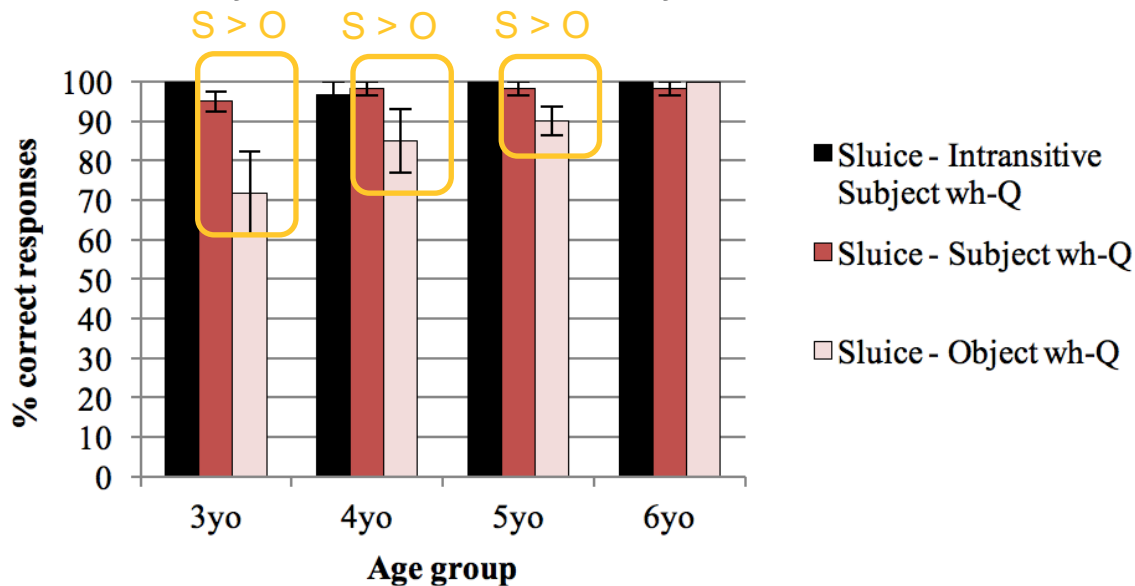


Figure 1. Results in Mateu et al. (2017)

Background: Intervention effects

- **Intervention Effects** (Hyams & Snyder 2005; Friedmann et al. 2009; Orfitelli 2012; Snyder & Hyams 2015): A dependency between a moved element X and its gap Y is harder for children to comprehend if it crosses another element Z, an intervener, that is also a potential antecedent for that gap.



- Intervention effects observed in:
 - Object relative clauses (Friedmann et al., 2009; Friedmann & Novogrodsky, 2004; McKee et al. , 1998)
 - Object *wh*-questions (Avrutin 2000, de Vincenzi, Arduino, Ciccarelli, 1999; Friedmann et al. 2009)
 - Object topicalization (Friedman & Lavi, 2006)
 - Raising with *seem* (Hirsch, Orfitelli, & Wexler, 2007; Orfitelli, 2012; Mateu 2016)
 - Passives (Gordon & Chafetz, 1990; Hirsch & Wexler, 2006b; Maratsos et al., 1985; Orfitelli, 2012)
 -

Background: Intervention in English sluices

- **Intervention Effects** in English subject/object sluices

(1') a. Subject sluices:

Someone pushed John but I don't know [_{CP} *who* [_{TP} ~~*t_i* pushed John~~]]



b. Object sluices:

John pushed someone but I don't know [_{CP} *who* [_{TP} *John* pushed ~~*t_i*~~]]



→ Subject advantage (Mateu et al. 2017; Mateu & Hyams, in prep)

Mandarin sluice-like strings

- In Mandarin, **sluice-like strings (henceforth S-strings)** with argument *wh*-remnants (e.g., *shei* ‘who’, *shenme* ‘what’) require the presence of *shi*, a form that is ambiguous between a copula and a (cleft-)focus marker.

(2) a. Subject S-strings:

*mouren tui-le Lisi dan wo bu zhidao *(shi) shei*
someone push-PERF Lisi but I not know SHI who
‘Someone pushed Lisi but I don’t know who.’

b. Object S-strings:

*Lisi tui-le mouren dan wo bu zhidao *(shi) shei*
Lisi push-PERF someone but I not know SHI who
‘Lisi pushed someone but I don’t know who.’

Two competing analyses (I): pseudo-sluicing

- **The pseudo-sluicing analysis** (Adams 2004; Wei 2009, 2011; Adams & Tomioka 2012; Li & Wei 2014, 2017, a.o.)

(3) *mouren_i tui-le Lisi dan wo bu zhidao pro_i *(shi) shei*
someone pushed Lisi but I not know *pro be who*
'Someone_i pushed Lisi but I don't know who (*pro_i* is).'

- Claims:
 - S-string = [*pro be wh-predicate*]
a copular structure (i.e., **pseudo-sluice**)
 - shi = **copula**
 - **No movement or ellipsis**

Evidence for pseudo-sluicing

- Evidence supporting the pseudo-sluicing analysis
 - The island-insensitivity of S-strings.
 - The silent pronoun *pro* can alternate with an overt one.
 - Novel evidence showing that *shi* is a copula under certain situations:
 - when *shi* is accented
 - when *shi* is negated

Example: (i) Island-insensitivity; (ii) Overt pronouns

- The island-insensitivity of S-strings:

(4) [*mou-ge* *yuangong* *yao* *cizhi* *de* *xiaoxi*] *chuan-le* *chulai*
some-CL employee will resign C news spread-PERF out

dan wo *bu* *zhidao* *shi* *shei*
but 1SG not know be who

‘The news that some employee will resign spread out, but I don’t know who.’

- The silent pronoun *pro* can alternate with an overt pronoun.

(5) *mouren_i* *tui-le* *Lisi* *dan wo* *bu* *zhidao* *na_i/ta_i/pro_i* **(shi)* *shei*
someone pushed Lisi but I not know that/3sg/pro be who

‘Someone_i pushed Lisi but I don’t know who (that/(s)he is).’

Example: (iii) Negated or accented *shi*

- Prosodic evidence: accented *SHI*
- Negated *shi*

(6) *Mouren tou-le Lisi-de qian,*

Someone stole Lisi's money

'Someone_i stole Lisi's money...'

wo bu zhidao SHI shei, dan wo zhidao BU SHI shei

I not know *be/*FM who* but I know *not be/*FM who*

'...I don't know who it WAS, but I know who it WASN'T.'

(Strict reading; *sloppy reading)

Two competing analyses (II): sluicing

- **The sluicing (i.e., movement-ellipsis) analysis** (Chen 2004; Wang & Wu 2006; Chiu 2007; Song and Yoshida 2017, a.o.)

(7) *mouren tui-le Lisi dan wo bu zhidao* ***(shi)** $[_{FocP} shei_i [_{Foc} [_{TP} t_i \text{tui-le } Lisi]]]$
 someone pushed Lisi but I not know FM who < pushed Lisi >
 ‘Someone pushed Lisi but I don’t know who (pushed Lisi).’ (FM = focus marker)

- Claims
 - S-string = $[FM \text{wh-remnant}_i [_{TP} \dots t_i \dots]]$
 (an elliptical construction, i.e., a real **sluice**)
 - shi = **focus marker**
 - **Focus-movement** followed by TP-ellipsis

Evidence for sluicing (movement-ellipsis)

- Evidence supporting the movement-ellipsis analysis
 - The availability of sloppy readings
 - The idiomatic reconstruction
 - Novel arguments from *wh*-else sluices (in appendix)

Example: (i) sloppy readings

- The availability of sloppy readings

(8)	<i>Lisi_i</i>	<i>zhidao</i>	<i>shei</i>	<i>tou-le</i>	<i>ta_i-de</i>	<i>qian</i> ,
	Lisi _i	know	who	steal-PERF	3SG _i -GEN	money
	<i>Mali ye</i>	<i>zhidao</i>	<i>shi shei</i>	<i>ta_i-de</i>	<i>qian</i>	
	Mali too	know	FM who	steal-PERF	3SG _{i/j} -GEN	money

‘Lisi_i knows who stole his_i money...’

strict reading: ‘...Mali_j also knows who <stole his_i (=Lisi’s) money>.’

sloppy reading: ‘...Mali_j also knows who <stole her_j (=Mali’s) money>.’

Example: (ii) idiomatic reconstruction

- The idiom ‘to eat someone’s vinegar’ means ‘to be jealous of someone’.

If there is no elided structures containing the verb ‘to eat’, the ‘vinegar’ part in the S-string only has the literal but not the ideal idiomatic reading.

- (9) *Lisi_i zai chi [mou-ge ren]-de cu...*
Lisi_i PROG eat [some-CL person]-GEN vinegar
- dan wo bu zhidao shi shei-de cu_i [~~_{TP} Lisi zai — chi t_i —~~]*
but 1SG not know FM who-GEN vinegar Lisi PROG eat

‘Lisi is jealous of someone, but I don’t know who <Lisi is jealous of>’

(lit. Lisi is eating someone’s vinegar but I don’t know whose vinegar <Lisi is eating>.)

Proposal: a hybrid adult grammar

- In Mandarin, sluices and pseudo-sluices both exist and both appear as the S-strings on the surface.
- There are cases where an S-string is not ambiguous between these two structures and there is only one source of its derivation.
 - The S-string must be a pseudo-sluice with:
 - accented *SHI*
 - negated *shi*
 - The S-string must be a sluice in:
 - sloppy reading contexts
 - idiom reconstruction
 - *wh*-else sluices...

Different approaches, different predictions

- **The pseudo-sluicing derivation:**

- S-string = [*pro* be *wh*-predicate]
- No movement or ellipsis
 - no intervention effects
 - no subject advantage



Mandarin-speaking children will not perform better on subject S-strings than object S-strings.

- **The movement-ellipsis derivation:**

- S-string = [*FM wh*-remnant_i [~~TP~~...t_i...]]
- Focus-movement followed by TP-ellipsis
 - intervention effects
 - subject advantage



Mandarin-speaking children will perform better on subject S-strings than object S-strings.

Methods

- Subjects: 59 native Mandarin-speaking children

Age group	Age 3	Age 4	Age 5	Age 6	Total
Age range	3;00-3;10	4;00-4;11	5;00-5;11	6;00-6;08	3;0-6;08
Mean age	3;06	4;05	5;04	6;04	4;10
Number	14	15	15	15	59

- Design: $2 \times 2 \times 2$
 - 2 Sentence Types: **S-strings** vs. **full *wh*-questions**
 - 2 Extraction Positions: **subject** vs. **object**
 - 2 Animacy Conditions: **animate** arguments vs. **inanimate** arguments
 - Spoiler alert—there was no effect of animacy. From now on I will collapse the data from animate and inanimate conditions.

Materials

24 trials crossing 2 extraction positions and 2 sentence types

(10) Subject extraction

wo neng kanjian yi-ge ren zai tui lvse yifu de nansheng...

1SG can see one-CL person PROG push green clothes DE boy

‘I can see that someone is pushing the boy in green...’

a. S-string

*...ni neng kanjian **shi** **shei** ma?*

2SG can see SHI who Q

‘...can you see who?’

b. full *wh*-Q

*...ni neng kanjian **shei** zai tui lvse yifu de nansheng ma?*

2SG can see who PROG push green clothes DE boy Q

‘...can you see who is pushing the boy in green?’

Materials

24 trials crossing 2 extraction positions and 2 sentence types

(11) Object extraction

wo neng kanjian lvse yifu de nansheng zai tui yi-ge ren...
1SG can see green clothes DE boy PROG push one-CL person
'I can see that the boy in green is pushing someone...'

a. S-string

*...ni neng kanjian **shi** **shei** ma?*
2SG can see SHI who Q
'...can you see who?'

b. full *wh*-Q

*...ni neng kanjian lvse yifu de nansheng zai tui **shei** ma?*
2SG can see green clothes DE boy PROG push who Q
'...can you see who the boy in green is pushing?'

Experiment procedure

Character-selection task:



Pre-recorded questions asked by Miss Donkey:

*Wo neng kanjian yigeren zai tui lvse
yifu de nansheng, ni neng kanjian
shi shei ma?*

(‘I can see that someone is pushing
the boy in green, can you see
who?’)

(Subject S-string condition)

Results

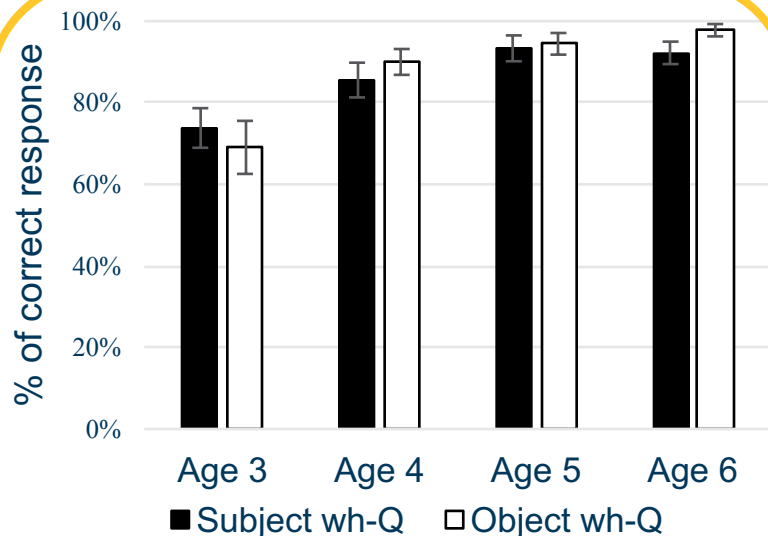


Figure 2. Results in *wh*-questions

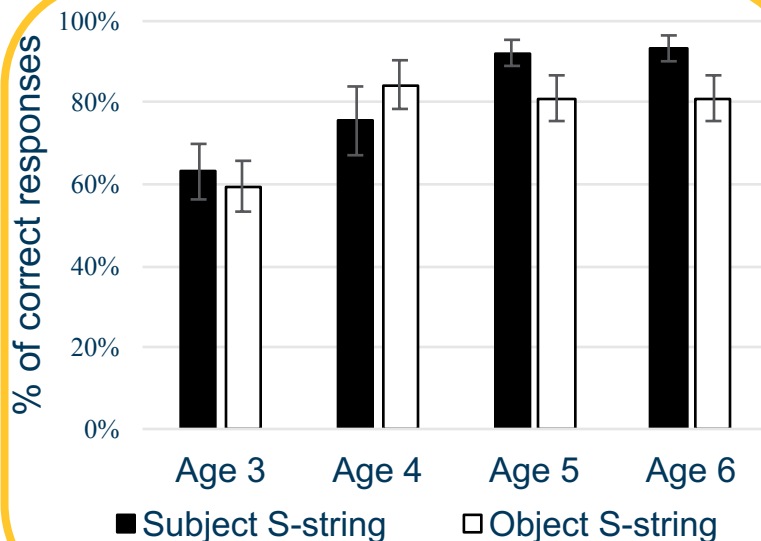
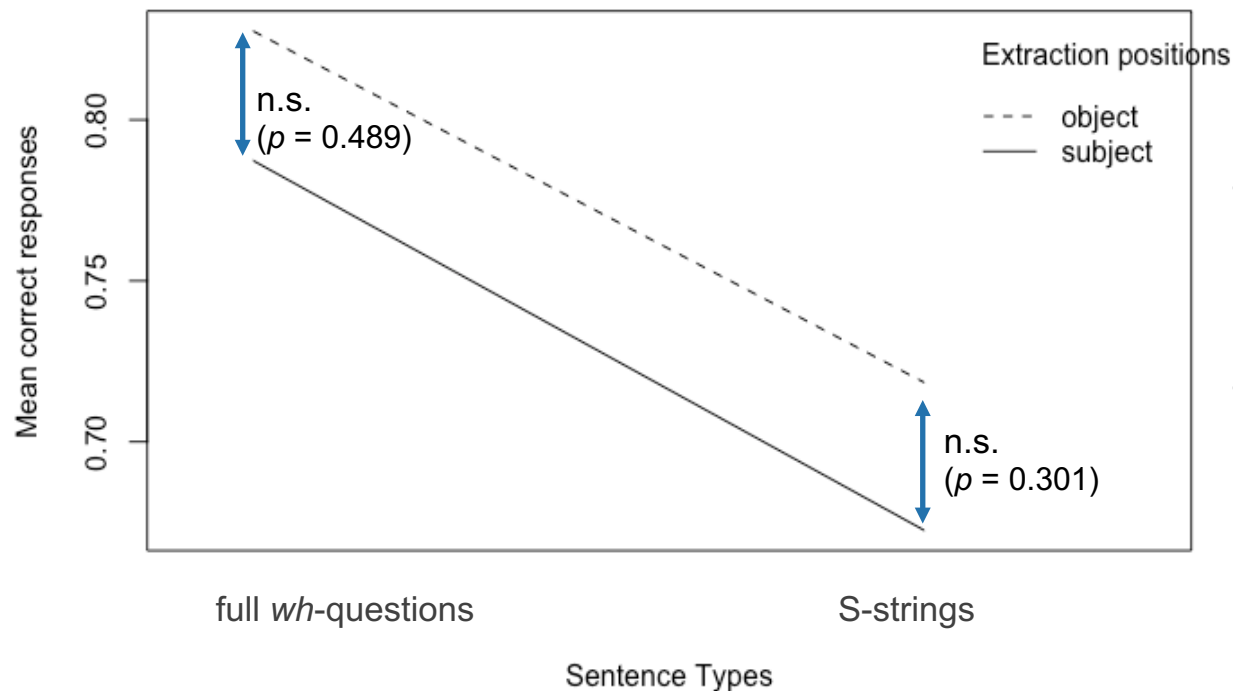


Figure 3. Results in S-strings

- Significant effect of Age ($p < 0.001$) and Sentence Type ($p < 0.001$)
- Full *wh*-questions: no subject > object asymmetry
- S-strings: the younger (Ages 3 and 4) vs. the older (Ages 5 and 6)

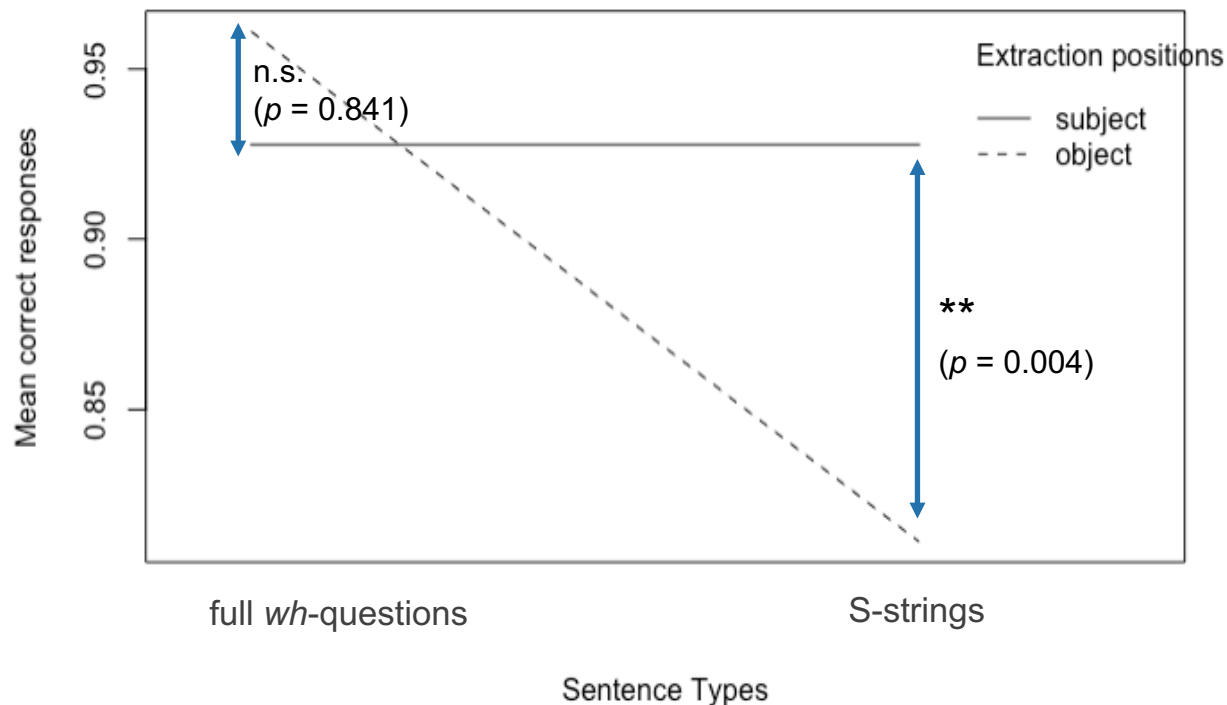
Results: SType-Position in the younger group



For children aged 3 to 4:

- There is **no sig. effect of extraction position** in either full *wh*-questions or S-strings.
- In other words, we found **no subject advantage** in younger children's comprehension of S-strings, in contrast to the English results in Mateu et al (2017)

Results: SType-Position in the older group



For children aged 5 to 6:

- There is no sig. effect of extraction positions in full *wh*-questions
- But there is a **sig. subject-advantage in S-strings.**

Interim summary

- Mandarin results:
 - Full *wh*-questions: no subject/object asymmetry at any age.
 - S-strings:
 - The younger children (Ages 3 and 4): **no subject advantage**
 - The older children (Ages 5 and 6): **subject advantage**
- There is a **subject-advantage delay** in the comprehension of Mandarin S-strings, compared to English sluices.
- Why?

A follow-up corpus study

- A follow-up CHILDES corpus study (total $N = 457$; ages 0;08-6;11)

Corpus	Number	Age Range
Chang1	24	3-6
Chang2	16	3-4
Context	25	2
LiZhou	80	3-6
Tong	1	1;7-3;4
Zhou1	15	3-6
Zhou2	15	3-6
Zhou3	1	0;8-4;5
ZhouDinner	80	3-6
ZhouNarratives	200	3-6

Results of the corpus study

- Mandarin-speaking children produce copula *shi* from an early age while the focus marker *shi* first emerges at 4;03 (in clefts, never observed in S-strings)

(12) a. *Xue'er shi nvsheng* (1;03)

Xue'er be girl

'Xue'er is a girl.'

b. *zhe shi da qiqiu* (1;05)

this be big balloon

'This is a big balloon.'

c. *zhe shi shenme?* (1;10)

this be what

'What is this?'

(13) Child 1: *dao-le* (4;03)

fall-PERF

'(It) fell down.'

Child 2: *zenme nong de?*

how make DE

'What happened?'

(lit: How <did something> make <it fall>?)

Child 1: *shi ni nong de a*

FM you make DE SFP

'It was you.'

(lit: <It> was you <who> made <it fall>.)

- Of 6235 instances of *shi*, only 13 were focus marker *shi* (0.21%)

➤ **Delayed acquisition of *shi* as a FM, compared to *shi* as a copula**

Proposal: A two-stage development

- Hypothesis: **A two-stage development** for Mandarin S-strings
 - Initial stage: children adopt a pseudo-slucing analysis
shi = copula
[*pro* be *wh*-predicate]
→ no intervention effects hence no subject advantage (~ages 3-4)
 - Later stage: children also allow a sluice analysis
shi can also be a focus marker
focus movement + ellipsis analysis emerges
[FM *wh*-remnant_i [_{IP} ... *t_i* ...]]
→ subject advantage due to intervention (~ages 5-6)

Discussion

- The presence of a subject advantage in the 5- and 6-year-old groups supports the hypothesis that children have a movement-ellipsis derivation at this point (but not earlier).
- Does the later movement-ellipsis analysis push out the earlier pseudo-sluicing one?
 - If yes then all S-strings are sluices (for older children and adults).
 - 👉 ○ If no, both derivations are available and a surface S-string can be either a sluice or a pseudo-sluice.
 - Evidence from adult Mandarin.
- Why would the Mandarin-speaking child who already has pseudo-sluicing analysis (with copula *shi*) add the more complex movement+ellipsis derivation?

Conclusion

- Primary finding:

Mandarin-speaking children are **delayed** in showing a **subject advantage** in the comprehension of Mandarin S-strings, as compared to English-speaking children.

- Proposal:

This delay is due to the ambiguity of **the copula/focus marker *shi***, an issue that does not arise in English sluices.

- Recall **the hybrid analysis**: Both the pseudo-sluice and sluice derivations are part of the adult grammar of Mandarin.

Conclusion

- We hypothesize a **two-stage development**:
 - Stage I: Mandarin-speaking children initially analyze *shi* as a copula, hence provide a structurally simpler, pseudo-sluicing derivation.
 - Stage II: Once they acquire the focus properties of *shi* the movement-ellipsis (sluicing) derivation becomes available, and a subject advantage emerges as an effect of intervention.

Question:

The trigger from Stage I to Stage II: input-driven (data indicating the presence of elided structures), grammatically-driven (acquisition of clefts), or both?

Selected references

- [1] Adams, P. W. (2004). The structure of sluicing in Mandarin Chinese. In *Penn Working Papers in Linguistics*, 10.1: 1-16. University of Pennsylvania.
- [2] Chiu, L. L. (2007). A Focus-movement account on Chinese multiple sluicing. *Nanzan Linguistics: Special Issue*, 1, 23-31.
- [3] Friedmann, N., A. Belletti, & L. Rizzi. (2009). Relativized relatives: Types of intervention in the acquisition of A-bar dependencies. *Lingua* 119. 67-88.
- [4] Mateu, V., N. Hyams & L. Winans (2017). Intervention effects in early grammar: Evidence from sluicing. Talk presented at BUCLD 42.
- [5] Merchant, J. (2001). *The syntax of silence: sluicing, islands, and the theory of ellipsis*. Oxford: Oxford University Press.
- [6] Wang, C. A. A., & Wu, H. H. I. (2006). Sluicing and focus movement in wh-in-situ languages. *University of Pennsylvania Working Papers in Linguistics*, 12(1), 30.

Thank you!

Many thanks to Anoop Mahajan, Jesse Harris, the audience at GALA 14 and the UCLA Psycholinguistics Seminar for their valuable input throughout the project.

Thanks to the UCLA Committee on Research for the Faculty Senate Grand to Nina Hyams for 2019-2020.

Thanks especially to the children and their parents who participated in the experiments for their patience and support.



Appendix: island insensitivity

- (10) *Lisi zhao-le [yi-ge hui shuo liang-men yuyan de ren],*
Lisi find-PERF one-CL can speak two-CL language C person

‘Lisi found a person who can speak two languages...’

complex NP islands

dan wo bu zhidao [shi na liang-men (yuyan)]
but 1SG not know be which two-CL languages
‘...but I don’t know which two (languages).’

- (11) *Lisi_i [yinwei <e_i> kan-le yi-ge jiemu] hen shangxin,*
Lisi because watch-PERF one-CL show very sad

‘Lisi_i was very sad because <he_i> watched a show...’

adjunct CP islands

dan wo bu zhidao [shi shenme/nage jiemu]
but 1SG not know be what/ which show
‘...but I don’t know what/which show.’

Appendix: island insensitivity

(12) *[you yi-ge ren yao cizhi de xiaoxi] chuan-le chulai*
there.be one-CL person will resign C news spread-PERF out

‘The news that a person will resign spread out...’

dan wo bu zhidao [shi shei]

but 1SG not know be who

‘...but I don’t know who.’

RC

(13) *Lisi mai-le yi-tao [fangzi], dan wo bu zhidao [shi duo da]*
Lisi buy-PERF one-CL house but 1SG not know be how big

‘Lisi bought a house but I don’t know how big.’

the left branch condition

Appendix: *wh*-else sluices

- (14) Lisi_i jiao-le Mali_j, wo bu zhidao hai **you** shei [_{TP} ~~Lisi jiao-le~~ ___ / ___ ~~jiao-le Mali~~]
Lisi called Mali I not know additionally exist who
'Lisi called Mali. I don't know who else <Lisi called / called Mali>.'

Appendix: no s>o asymmetry in full *wh*-Q's

We found no subject/object asymmetry in full *wh*-questions at any age.

- One possible explanation is that Mandarin is a *wh*-in-situ language, viz., there is no overt *wh*-movement, thus the intervention effect is not triggered in full *wh*-questions.
- However, in a *wh*-movement language like English, there is also no intervention effect in full *wh*-questions among 3- 6-year olds either (Mateu et al. 2017).
- Therefore, a more plausible account is that by age 3 children are fully adult-like with respect to *wh*-questions, and hence show no intervention effect, i.e. no subject/object asymmetry.