

# Do children know WHanything?

Acquisition of wh-ambiguity in Mandarin

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## Wh-indefinites in Mandarin

- (1) Xiaoxiao jintian mei chi shenme  
Xiaoxiao today NEG eat what
- a. Interrogative: “What didn’t Xiaoxiao eat today?”
  - b. Indefinite: “Xiaoxiao didn’t eat anything today.”

- ▶ *Wh*-indefinites are extremely rare in adult input:

## Learning problem

Contexts	Count (%)
As <i>wh</i> -questions	976 (97.7%)
<b>Total</b>	<b>999</b>

**Table 1:** Distribution of *shenme* “what” in child-directed Mandarin  
(Based on Lin 2017, Appendix A)

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In imperfectives	9 (0.9%)
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Under negation	0
With root modals	0
In positive episodic sentences	0
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## Learning problem

With limited exposure, how do children acquire the indefinite interpretation?

# Two proposals

## All-at-once hypothesis

- ▶ Proposal: Children acquire *wh*-indefinites early, and they can generalize this interpretation to all appropriate environments;
- ▶ Evidence: 4.5-year-olds correctly assign the indefinite interpretation in various environments, including ones they have virtually no exposure to.

Zhou 2013, Zhou et al. 2012, Zhou 2011, Zhou & Crain 2009

## Bit-by-bit hypothesis

- ▶ Proposal: Children build each licensing environment one by one, and gradually expand the set of licensing contexts for *wh*-indefinites.
- ▶ Evidence: Children do not produce *wh*-indefinites consistently until 4.5, and only in limited environments

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- ▶ Evidence from 4.5 years old may not be able to support the strong claim;
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- ▶ Linking hypothesis:  
Production → Knowledge
- ▶ But even adults do not produce *wh*-indefinites very frequently, so the lack of production by children before 4.5 may not be able to reflect their knowledge.

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- ▶ But even adults do not produce *wh*-indefinites very frequently, so the lack of production by children before 4.5 may not be able to reflect their knowledge.

We need to look at a **younger** range, and look at children's **interpretation** instead of production, to test the predictions of these two hypotheses properly.

## This study

1. Do 3yo know the indefinite interpretation of *shenme* “what”?  
→ Exp 1
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- ▶ Yes!
- ▶ Yes!

Bit-by-bit hypothesis:

- ▶ No!
- ▶ No!

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All-at-once hypothesis:

- ▶ Yes!
- ▶ Yes!

Bit-by-bit hypothesis:

- ▶ No!
- ▶ No!

Spoilers: our results support the All-at-once hypothesis

## Exp 1: with *dou*

- (2) Lili *shenme dou* chi le.  
Lili what DOU eat ASP  
“Lili ate everything”

- ▶ The contribution of particle *dou* is heavily debated; in this study, we use one feature of *dou* when it occurs with *wh*-words:
- ▶ When *shenme* linearly precedes the particle *dou*, the only interpretation available is the indefinite one

Cheng 1995, Li 1995, Huang 1996, Wu 1999, Dong 2009, Xiang 2008, Liu to appear, Xiang 2019, among many others

## Exp 1 *dou*: Question-Statement Task

- ▶ How do we test people's interpretation of *wh*-words?
- ▶ Problem: The two interpretations of *wh*-words change the speech act of the whole sentence!
- ▶ Question-Statement Task
  - ▶ We use participants' responses to infer their perceived speech acts and their interpretation of *shenme*:

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## Exp 1 *dou*: Question-Statement Task



- ▶ This is Xiaoxiao!
- ▶ We are going to tell her some stories.
- ▶ Let's ask her to turn around so she can't see.
- ▶ But she can talk to *you* to find out about the pictures on the screen!

# Exp 1 *dou*: Story I

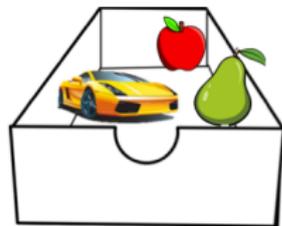


Figure 1: Teacher Kangaroo explains the winning condition: pack all three things in a box

## Exp 1 dou: Story II

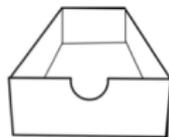
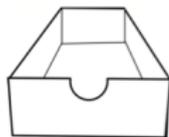
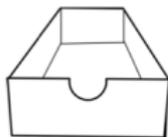


Figure 2: The three competitors are getting ready to pack!

# Exp 1 dou: Story II

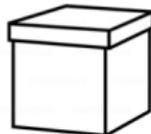
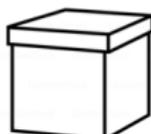
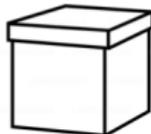


Figure 3: They packed packed packed...now they are ready!

# Exp 1 *dou*: Story IV

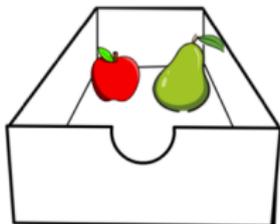


Figure 4: The critical trial (two-out-of-three condition)

## Exp 1 *dou*: Sentences (between-subject)

[+*dou*]

- (3) Xiaoyang shenme *dou* fang zai xiangzi-li le  
Lamb what DOU put in box-LOC ASP  
“Little lamb packed everything in the box.”

[-*dou*]

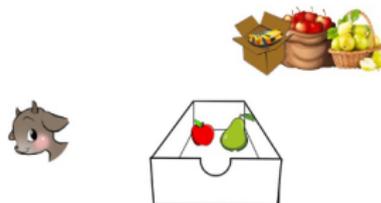
- (4) Xiaoyang ba shenme  $\emptyset$  fang zai xiangzili le  
Lamb BA what put in box ASP  
“What did Little Lamb pack in the box?”

## Exp 1 *dou*: Scenarios (within-subject)

[+*dou*] “Lamb packed everything!”

[-*dou*] “What did Lamb pack?”

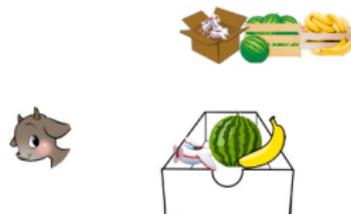
Two-out-of-three scenario:



[+*dou*] “No!”

[-*dou*] “Apple and pear!”

Three-out-of-three scenario:



[+*dou*] “Yes!”    [-*dou*] “Air-  
plane, watermelon, banana!”

## Reminder: Rationale of the task

We use participants' response to infer their perceived speech acts and their interpretation of *shenme*:

- ▶ Interrogative interpretation - *wh*-question - ✗yes/no-responses
- ▶ Indefinite interpretation - statement - ✓yes/no-responses

## Exp 1 measure: % of yes/no-response

To respond to a statement, one can use the following yes/no-markers:



小羊什么都放进箱子里了！  
Little Lamb put everything in the box!



不是。放了苹果和梨！  
No, (she) put apple and pear!



没有！  
She didn't!



笑笑说的不对！  
Xiao Xiao was wrong!



嗯嗯 ~  
Nooo!



\*shaking-head



## Exp 1 measure: % of *yes/no*-response

To respond to *wh*-questions, one can NOT use utterances with *yes/no*-markers:



小羊把什么放进箱子里了?  
What did Little Lamb put in  
the box?



## Exp 1 measure: % of *yes/no*-response

To respond to *wh*-questions, one have to name the items in the box:



小羊把什么放进箱子里了？  
What did Little Lamb put in  
the box?

苹果和梨！  
An apple and a pear!



## Exp 1 expected responses: summary

[+*dou*]

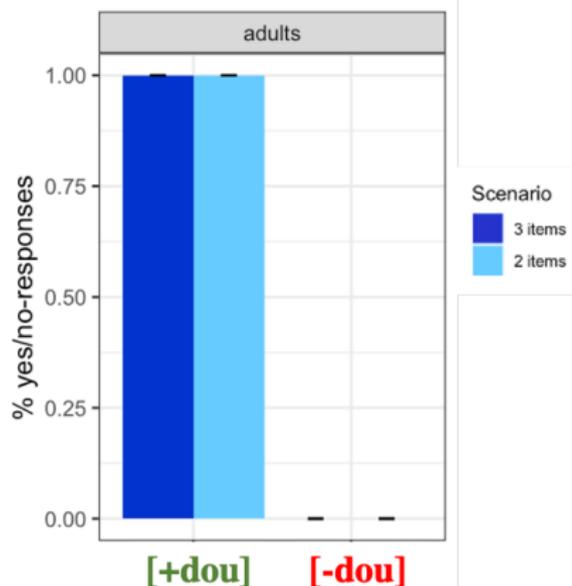
- (5) Xiaoyang shenme  
Lamb what  
*dou* fang zai  
DOU put in  
xiangzi-li le  
box-LOC ASP  
“Lamb packed every-  
thing in the box.”  
✓yes/no-response

[-*dou*]

- (6) Xiaoyang ba  
Lamb BA  
shenme ∅ fang zai  
what put in  
xiangzili le  
box ASP  
“What did Little Lamb  
pack in the box?”  
✗yes/no-response

# Exp 1 expected responses: summary

Exactly what adults did (n=32):



## Exp 1 *dou*: Practice, fillers

- ▶ 3 practice stories to get in the habit of talking to Xiaoxiao
- ▶ At testing phase: 4 critical trials, 8 filler trials.
- ▶ Filler sentences include: 2 *how-many* questions, 2 polar questions, 2 true statements and 2 false statements to balance the number of questions, yes-responses and no-responses.

## Exp 1 *dou*: Participants

- ▶ 36 children (3;0;17-4;0;0, mean = 3;9, 18 female)
- ▶ 4 children quit before moving on to the testing phase
- ▶ 32 adults
- ▶ Participants' performance was recorded, and then their utterances were transcribed and coded based on the recording.

# Exp 1 *dou*: results

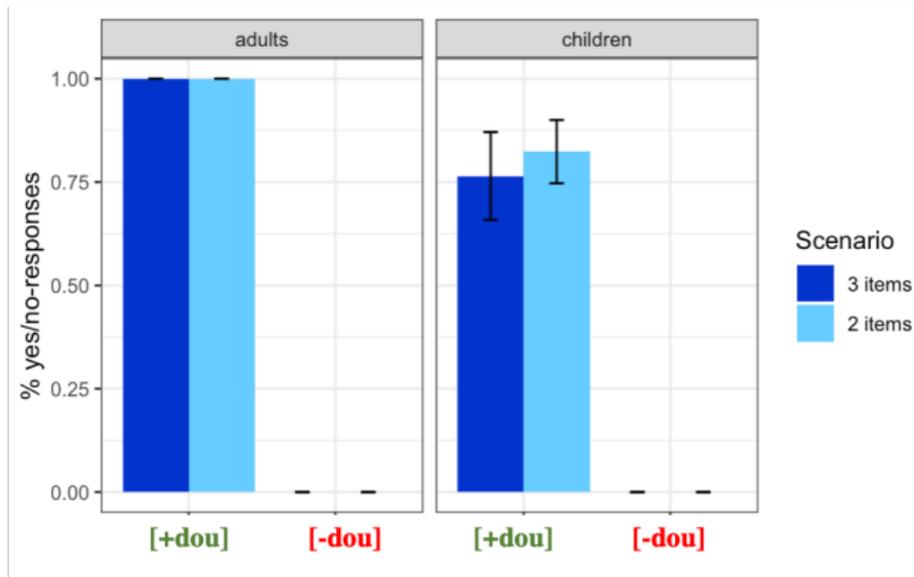


Figure 5: The percentage of *yes/no*-responses by adults and children to sentences with/without *dou*

## Exp 1 *dou*: results

Typical response in [+*dou*] condition:

- (7) Xiaoxiao ni shuo cuo le  
Xiaoxiao ni say wrong ASP  
“Xiaoxiao you are wrong.”

Child participant #107

Typical response in [-*dou*] condition:

- (8) You pingguo he li.  
Have apple and pear  
“There's an apple and a pear.”

Child participant #130

## Exp 1 *dou*: Discussion

- ▶ 3yo indeed know the indefinite interpretation of *shenme*!
  - ▶ ✓ All-at-once hypothesis
  - ▶ ✗ Bit-by-bit hypothesis
- ▶ But the bit-by-bit hypothesis can say this little exposure might be enough:
- ▶ We need to look at another environment:

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Contexts	Count (%)
In the restriction of universals (e.g. <i>dou</i> )	2 (0.2%)
In (bare) conditional clauses	3 (0.3%)
In polar questions	3 (0.3%)
In imperfectives	9 (0.9%)
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Under negation	0
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In positive episodic sentences	0

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## Exp 2: under NEG

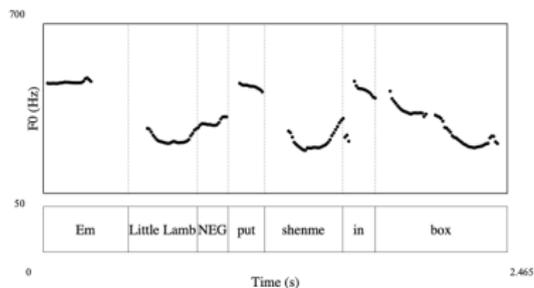
- ▶ Special feature of negated sentences: the two interpretations of *shenme* are string-identical, and disambiguated by prosody:

(9) Xiaoxiao jintian mei chi shenme  
Xiaoxiao today NEG eat what

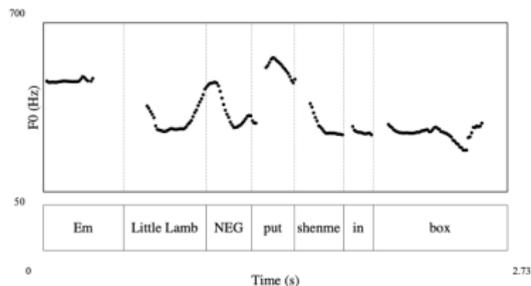
- Interrogative: “What didn’t Xiaoxiao eat today?”
- Indefinite: “Xiaoxiao didn’t eat anything today.”

# Exp 2 under NEG: prosody

Interrogative:

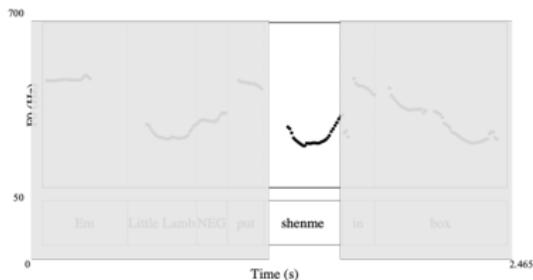


Indefinite:

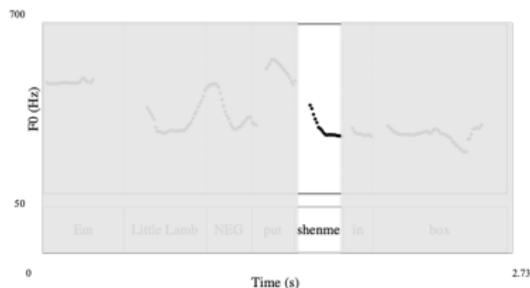


# Exp 2 under NEG: prosody

Interrogative: [+Prominence]



Indefinite: [-Prominence]



## Exp 2: Conditions

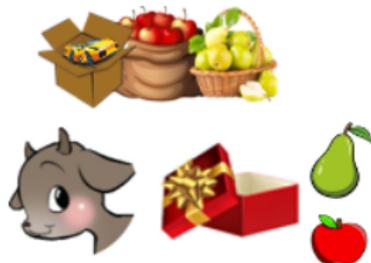
- ▶ Same set-up as Exp 1.
- ▶ Use bare indefinite NP *shuiguo* “fruits” as a comparison.

## Exp 2: Conditions

Between subject, 2\*2:

<i>Xiaoyang mei zhuang ...</i>	+Prominence	-Prominence
<i>shenme</i>	<b>What</b> didn't Little Lamb pack?	Little Lamb didn't pack <b>anything</b> .
<i>shuiguo</i>	Little Lamb didn't pack <b>fruits</b> .	Little Lamb didn't pack <b>any fruits</b> .

## Exp 2: % of yes/no responses



小羊没放什么在箱子里！  
Little Lamb didn't put  
anything in the box!



不是，放了苹果和梨！  
No, (she) put  
apple and pear!



放了！  
She did!



笑笑说的不对！  
Xiao Xiao was  
wrong!



嗯嗯～  
Nooo!



\*shaking-  
head



## Exp 2: % of yes/no responses



小羊没放什么在箱子里？

What didn't Little Lamb put in the box?



## Exp 2: other responses



小羊没放什么在箱子里？  
What didn't Little Lamb put in the box?



小汽车！  
A car!



## Exp 2: other responses



小羊没放什么在箱子里！  
Little Lamb didn't put  
anything in the box!



苹果和梨！  
An apple and a pear!



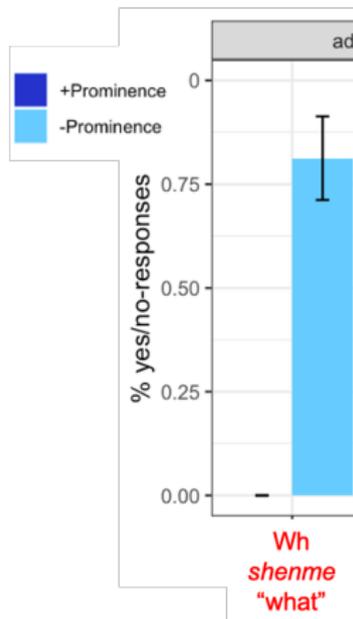
## Exp 2 responses: summary

<i>Xiaoyang mei zhuang</i> ...	[+Prominence]	[−Prominence]
<i>shenme</i>	✗yes/no-responses	✓yes/no-responses
<i>shuiguo</i>	✓yes/no-responses	✓yes/no-responses

## Exp 2 responses: summary

<i>Xiaoyang mei zhuang ...</i>	+Prominence	-Prominence
<i>shenme</i>	X yes/no-responses	✓ yes/no-responses
<i>shuiguo</i>	✓ yes/no-responses	✓ yes/no-responses

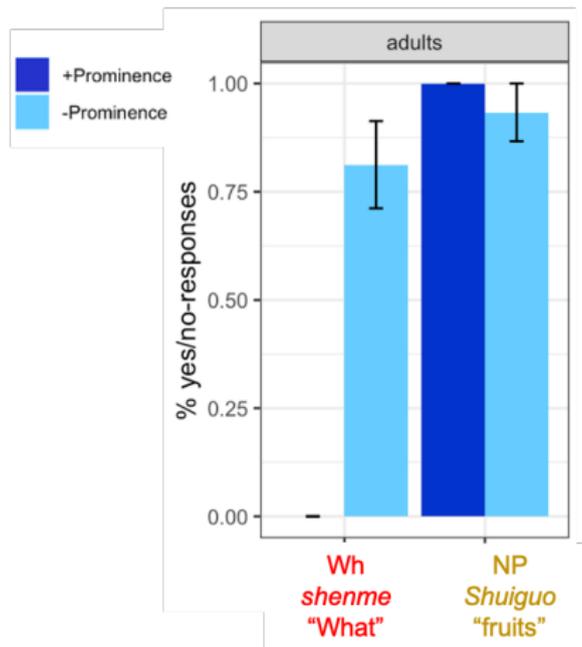
Adults (n=56) behaved exactly like this:



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<i>shuiguo</i>	✓yes/no-responses	✓yes/no-responses

Adults (n=56) behaved exactly like this:



## Exp 2: Participants

- ▶ 56 children (3;0;26-3;11;28, mean = 3;8, 35 female)
- ▶ 56 adults
- ▶ Same fillers and practices as Exp 1

## Exp 2: results

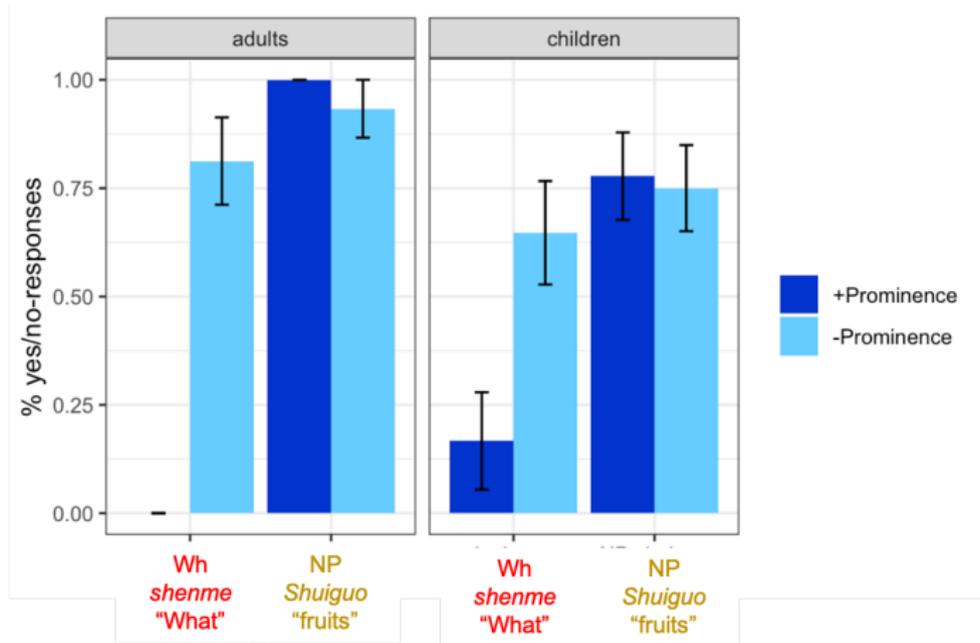


Figure 6: The percentage of *yes/no*-responses by adults and children to *wh/NP* with/without prominence

## Exp 2: responses

Typical response to **shenme** + prominence:

(10) Xiaoqiche.

Car

“A car.”

Child participant #281

Typical response to *shenme* - prominence:

(11) Bu dui, fang-le pingguo.

NEG right, put-ASP apple

“Wrong, she packed an apple.”

Child participant #233

## Exp 2: Discussion

- ▶ 3yo know the indefinite interpretation of *shenme* in an environment they have virtually no exposure to

# Conclusion

- ▶ 3yo know the indefinite interpretation of *shenme* in an environment they have very little exposure to (*dou*)
- ▶ ...and in an environment they have virtually no exposure to (in **NEG**ated sentence).

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## All-at-once hypothesis

- ▶ Children can generalize their knowledge about *wh*-indefinites to all appropriate environments, even ones they do not have exposure to.

## Bit-by-bit hypothesis

- ▶ Children build each licensing environment one by one, and gradually expand the set of licensing contexts for *wh*-indefinites.

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# General Discussion

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## Bit-by-bit hypothesis

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Production  $\nRightarrow$  Knowledge

# What's next?

- ▶ The All-at-once Hypothesis is a strong hypothesis! What kind of knowledge prompts kids to generalize?
  - ▶ The distribution of *wh*-indefinites in different languages vary;
  - ▶ E.g. while *wh*-indefinites in Mandarin behave like modal indefinites, in German they are restricted to VPs; in Japanese, morphological markers (e.g. *-mo*) are required; in some Mayan languages (e.g. Chuj), they are restricted to post-verbal positions.
- ▶ We need more data from other languages to develop a richer grammatical theory on the syntax and semantics of *wh*-indefinites to help us understand why Mandarin children are so ready to make the generalization.

Roelofsen et al. 2019, Kotek and Erlewine 2016, Alonso-Ovalle & Shimoyama 2014, Haida 2008, Shimoyama 2001, Bhat 2000, Haspelmath 1997

## What's next?

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# Thanks!

To the children, teachers, directors, and parents at:

- ▶ Hong Ying School, Tangjialing
- ▶ Xinglinwan Preschool associated with Chinese Academy of Science
- ▶ Shangzhuang Science Park Preschool
- ▶ Yiming Preschool, Shangzhuang
- ▶ Xintongxin Kindergarten, Chengde



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- ▶ *LSLT at UMD*, especially Shevaun Lewis
- ▶ *Workshop on Theoretical and Experimental Linguistics at Tsinghua University*, especially  
Liu Mingming, Li Haoze, Li Yafei, Yang Xiaolu, Yang Yang, Zhou Peng
- ▶ *MAPLL-TCP-TL at Kobe University*
- ▶ You!



# Questions?

- ▶ Slides are posted online at:  
`yu-an.github.io/projects`
- ▶ You can also email me:  
`yuanyang@umd.edu`

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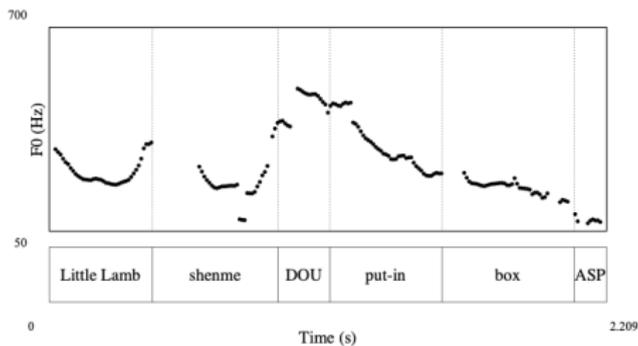
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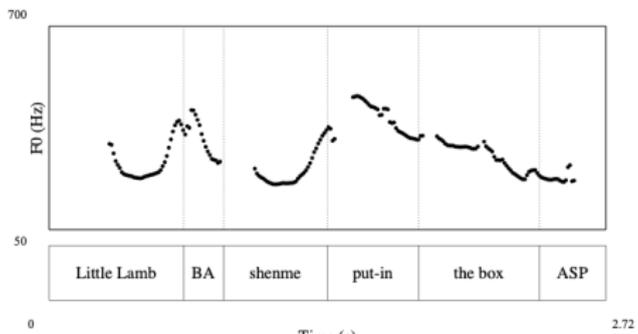
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# Exp 1 *dou*: prosody

[+*dou*]

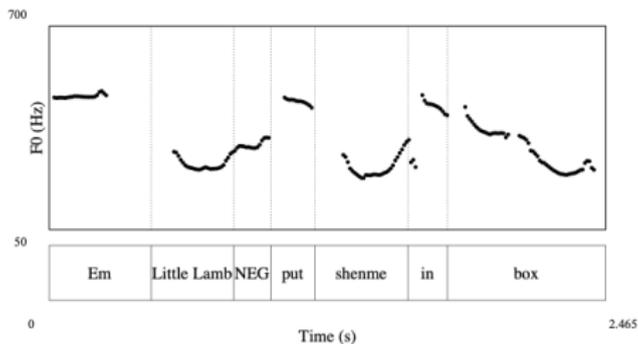


[-*dou*]

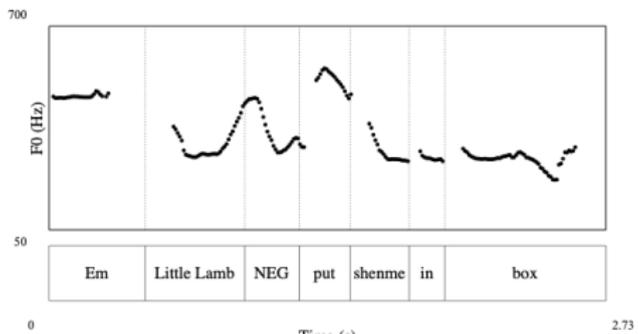


# Exp 2 under NEG: prosody

*shenme* [+Prominence]

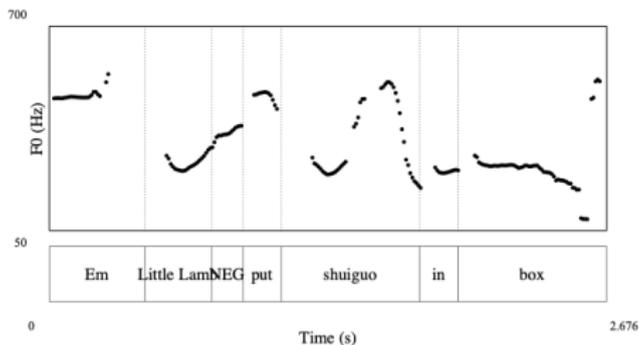


*shenme* [-Prominence]

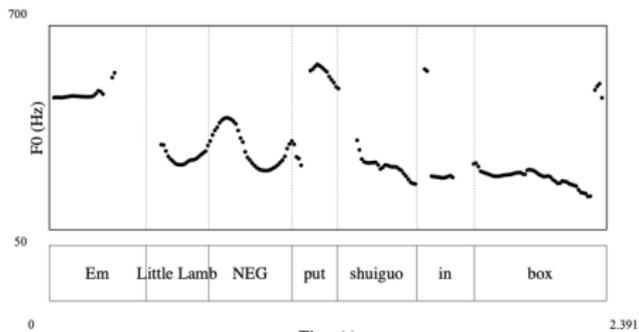


# Exp 2 under NEG: prosody

*shuiguo* [+Prominence]



*shuiguo* [-Prominence]



## Exp 2: The 3-item requirement



For some speakers, *shenme* under **NEG** can be interpreted as “not much” instead of “not anything”:

- (12) Xiaoyang mei fang shenme zai xiangzili.  
Lamb NEG put what in box-LOC  
“Little Lamb didn’t put much in the box.”

Ding et al. 1961, Chao 1968, Zhu 1982, Lv 1985, Huang and Crain 2014 among others

## Exp 2: % of yes/no responses



小羊没放什么在箱子里！  
Little Lamb didn't put  
anything in the box!



不是，放了苹果和梨！  
No, (she) put  
apple and pear!



放了！  
She did!



笑笑说的不对！  
Xiao Xiao was  
wrong!



嗯嗯～  
Nooo!



\*shaking-  
head

