

Do children know *whanything*? Acquisition of *wh*-ambiguity in Mandarin

Wh-words in Mandarin can either function as *wh*-interrogative words or as indefinites (Huang 1982, a.o.). Children produce interrogative-*wh* from early on, suggesting that they have this interpretation, but it is unclear when they pick up on the non-interrogative interpretation, as they rarely produce them, and it is also rarely used in their input (Lin et al. 2014). What makes this acquisition problem particularly complicated is that Mandarin lacks *wh*-movement, so the same string (1) can have a *wh*-question interpretation or a declarative interpretation. The two interpretations are however modulated by prosody: with phonological prominence on *shenme*, (1) has to be a *wh*-question and without prominence, a declarative (Cheng 1991, a.o.). Studies show that adults can use this difference in prosody to disambiguate (1) (Yang 2018 a.o.), but it is unclear how or when children start to become sensitive to the role of prosody in interpretation. To make matters worse, non-interrogative *wh* is not always associated with lack of prominence: certain environments block the *wh*-interrogative interpretation. For instance, when *shenme* is in the scope of *dou* like in (3), the sentence is unambiguously a declarative (Huang 1982 a.o.), and yet *shenme* is associated with phonological prominence. Thus, children need to be sensitive to the syntactic/semantic environment that licenses the distribution of the two interpretations, and recognize which ones allow the distinction in prosody. Given all these challenges, how do children figure out the non-interrogative interpretation of *wh*-words? Before we can answer this *how* question, we need know *when* when children acquire the various ways of distinguishing non-interrogative *wh* words from interrogative ones and when they acquire the nuanced role that prosody plays in interpreting *wh*-words. In this study we try to establish a lower bound by testing whether 3-year-olds are aware of both interpretations of *wh*-words and are able to use prosody and *dou* to distinguish them.

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| <p>(1) Xiaoyang mei fang <i>shenme</i> zai xiangzili
Lamb NEG put what in box
a. [wh+Prominence]: What didn't Lamb put in the box?
b. [wh-Prominence]: Lamb didn't put anything in the box.</p> | <p>(2) Xiaoyang mei fang <i>shuiguo</i> zai xiangzili
Lamb NEG put fruits in box
a. [NP+Prominence]:Lamb didn't put any fruits in the box.
b. [NP-Prominence]: Lamb didn't put any fruits in the box.</p> |
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Previous studies find that children above age four (Zhou et al. 2012) can use prosodic information to interpret *wh*-words, but by using elicited production and natural production data in CHILDES corpora, Lin (2017) argues that children initially analyze *shenme* as a *wh*-quantifier and reanalyze it as a referentially deficient quantifier after age 4. However, lack of production doesn't entail lack of comprehension (after all non-interrogative uses are also rarely produced by adults), and furthermore, production data cannot reflect sensitivity to prosodic cues. In this study, we show that 3-year-olds have both interpretations and can use the prosodic distinction on *shenme* (Exp 1) or *dou* (Exp 2) to arrive at the correct interpretation.



Fig 1. Goal: pack two fruits and a toy car in a box Fig 2. Critical trial type

Exp 1 uses a question/statement task to show that children use prosody as a cue to interpretation. The study adopts a between-subject 2 (critical word, *shenme* vs. bare NP) by 2 (prosody on the critical word, [+/-prominence]) design with four trials in each condition, demonstrated by (1) and (2). Phonological prominence on *shenme* in (1) gives rise to a *wh*-question interpretation, as in (1a); while lack of prominence forces a declarative interpretation, as in (1b). The NP control-condition replaces *shenme* with a bare-indefinite NP, resulting in a declarative sentence, irrespective of prominence (2). Participants should give “yes/no” type of responses to all declaratives, but not to *wh*-questions. In the task, participants listen to stories about a competition with an onscreen character Xiaoxiao. While children are allowed to see the

pictures, Xiaoxiao is asked to turn around during the stories so she cannot see the outcome of each competition, which allows her utterances to either be questions or statements. In the testing phase, participants are given four stories about packing contests, each with three contestants competing to win a gold medal if they pack two fruits and a car (Fig 1), two of which are filler trials. In a critical trial (Fig 2), Xiaoxiao delivers either (1) or (2), with or without prominence on the critical word. Participants are also given three practice stories before the testing phase. **Results** from 60 children (3;0-4;0, mean 3;8) and 60 adults are shown in Fig 3. A mixed effects logistic regression model reveals an interaction between prominence and *shenme*/NP ($B = -1.29, p < 0.001$), and no difference between children and adults ($B = -0.74, p > 0.1$): in the [-prominence] condition, children answer in the same way as in the indefinite NP condition, showing that they recognize the non-interrogative interpretation when *shenme* lacks prominence.

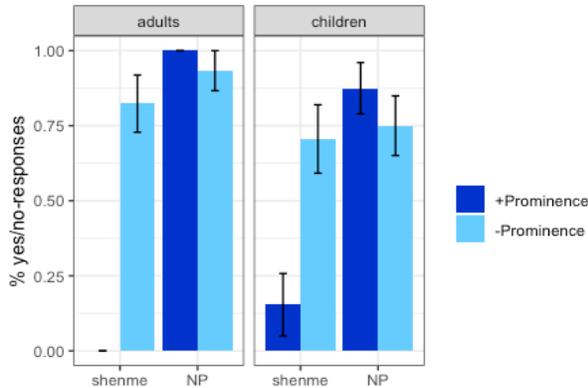


Fig 3. % of yes/no responses in Exp 1

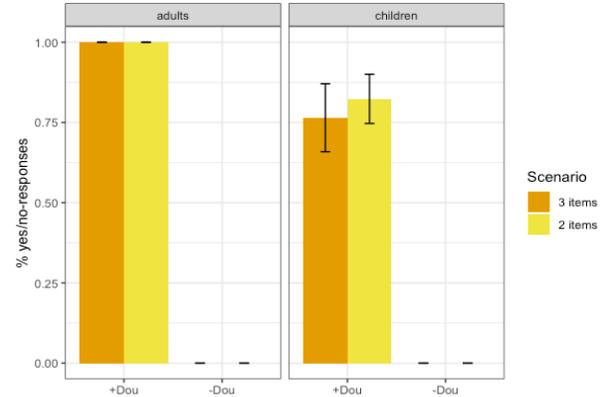


Fig 4. % of yes/no responses in Exp 2

Exp 2 uses a similar task to test whether 3-year-olds have adult-like interpretation of *wh*-words when the two interpretations are not distinguished by prosody. To this end, we use *dou*-sentences like (3) where *shenme* can only receive a non-interrogative interpretation (Cheng 1991, among others) but must be associated with prominence, and *ba*-sentences like (4) where *shenme* also carries prominence but can only receive the interrogative interpretation. This study adopts a 2*2 design, with presence/absence of *dou* between-subject and type of scenario (whether Lamb packed 2 or 3 items in the box) within subject. Participants should give yes-responses to (3) in 3-item scenarios, no-responses in 2-item scenarios, but should not use either in response to (4). **Results** from 30 children (3;0-4;0, mean 3;6) and 30 adults are shown in Fig 4. A mixed effects logistic regression model reveals that the presence of *dou* elicits significantly more yes/no responses ($B = 189.79, p < 0.001$), no effect of scenario ($B = 75.98, p > 0.1$), and no difference between children and adults ($B = -67.08, p > 0.1$): both adults and children only respond “yes/no” to *dou*-sentences. These results show that children know that co-occurrence with *dou* requires the non-interrogative interpretation, suggesting that children are sensitive to the influence of syntactic/semantic constraint on the interpretation and the prosody of *wh*-words.

- (3) Xiaoyang *shenme dou* zhuangjin xiangzili le. (4) Xiaoyang *ba shenme* zhuangjin xiangzili le
 Lamb what DOU put-in box ASP Lamb BA what put-in box ASP
 [+Dou]: “Lamb put everything in the box.” [-Dou]: “What did Lamb put in the box?”

Discussion The results from these two experiments suggest that 3-year-olds have the non-interrogative interpretation of *shenme*. Furthermore, they know the distinction in prosody of the two interpretations in negated sentences (Exp 1), and that the presence/absence of *dou* (regardless of prosody) distinguishes the two interpretations (Exp 2).

Selected References: Cheng 1991. Typology of *wh*-questions. Zhou, Su, Crain, Gao, & Zhan. 2012. Children’s use of phonological information in ambiguity resolution: A view from Mandarin Chinese. Lin 2017. Distributionally constrained items in child language: the acquisition of superweak NPI *shenme* ‘a/some’ in Mandarin Chinese. Yang 2018. The two sides of *wh*-indeterminates in Mandarin: A prosodic and process account.