

Exhaustivity and at-issueness: Evidence from L1 Acquisition of Mandarin*

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1. Introduction

In the theoretical literature on exhaustivity, two types of structures have been frequently discussed: structures with at-issue exhaustivity, like *only* in (1a), and structures like *it*-clefts in (1b), which encode non-at-issue exhaustivity. In a scenario where Mary, Sue, and Jane are eating fruits, (1a) and (1b) both carry the exhaustive inference that no one else ate an apple.

- (1) a. Only [Mary]_F ate an apple.
- b. It is [Mary]_F who ate an apple.

This study takes this distinction to first language acquisition, examining whether children understand the at-issueness differences among structures encoding exhaustivity. Previous studies on the acquisition of exhaustivity in *only*-type of structures shows conflicting results: while some suggest children have trouble interpreting the exhaustive inference of *only* (Paterson et al. 2003, Paterson et al. 2006, among others), others suggest that they have problem with the scope *only* but not exhaustivity (e.g. Crain et al. 1994, Yang 1999, Jing et al. 2005, Notley et al. 2009, Zhou & Crain 2010, Berger & Höhle 2012). However, their investigation mainly focus on at-issue exhaustivity. The questions are, then, how would children interpret non-at-issue exhaustivity, and do they distinguish between the two types of exhaustivity? This study will try to answer these questions with experimental results from Mandarin-speaking children.

We will begin our investigation with the most typical structures encoding at-issue exhaustivity (*zhiyou* “only” sentences) and non-at-issue exhaustivity (*shi...de* (SD) clefts). Results from Experiment 1 (Section 3) suggest that the two structures are not interpreted in

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the same way by Mandarin-speaking six-year-olds. We then use Experiment 2 (Section 4) to address the question whether this difference in acquisition paths is due to at-issueness distinction by testing children’s understanding of other non-at-issue exhaustivity constructions, pseudo-clefts (PC clefts) and plain focus sentences (PF). This follow-up experiment indicates that children are adult-like when interpreting non-at-issue exhaustivity. Taking stock of findings of the two experiments, we can conclude that six-year-olds are sensitive to the at-issue/non-at-issue distinction among structures encoding exhaustivity (Section 5).

2. Background

2.1 At-issueness and exhaustivity

An at-issue inference directly addresses the Question Under Discussion (QUD, Roberts 1996, Simons et al. 2010), and thus can be directly assented or dissented. Under this definition, *only* encodes at-issue exhaustivity while *it*-clefts encode non-at-issue exhaustivity. As exemplified by (2) and (3), when correcting the exhaustive inference in speaker A’s utterance, it is natural to use “no” for at-issue exhaustivity, but for non-at-issue content, a “yes, but . . .” type of correction is preferred (Destruel et al. 2015).

- (2) A: (Sue didn’t come to the party;) it is John who came.
 B: Yes, but Mary also came.
 B’: ?? No, because Mary also came.
- (3) A: Only John came.
 B: #Yes, but Mary also came.
 B’: No, because Mary also came.

Mandarin patterns with English regarding the type of response used with clefts, suggesting that exhaustivity of *zhiyou* (ZY) is at issue, of SD cleft is non-at-issue:

- (4) A: Zhiyou Zhangsan chidao le.
 Only Zhangsan late ASP
 “Only Zhangsan was late.”¹ ZY
 B: No, Lisi was also late.
 B’: # Yes, but Lisi was also late.
- (5) A: Shi Zhangsan chidao de.
 SHI Zhangsan late DE
 “It is Zhangsan who was late.” SD

¹Throughout this paper, ASP: aspect marker, SHI: focus marker/copula, DE: possessive marker/focus marker, LOC: localizer, CLS: classifier, SFP: Sentence final particles, DOU: adverbial quantification particle

- B: # No, Lisi was also late.
B': Yes, but Lisi was also late.

2.2 Acquisition of exhaustivity

As mentioned above, previous acquisition studies on exhaustivity have been largely conducted in the context of probing into children's acquisition of restrictive particle *only* (e.g. Crain et al. 1994, Paterson et al. 2003, Yang 1999, Berger & Höhle 2012), while few has compared exhaustivity among different structures (see for example Heizmann 2012), especially from the perspective of at-issueness of exhaustivity in these structures.

Particular to our interest is the study by Zhou and Crain comparing Mandarin-speaking children's understanding of *zhiyou* "only" and SD clefts (Zhou & Crain 2010). As detailed in the last subsection, the two structures encode at-issue and non-at-issue exhaustivity respectively. Zhou and Crain find that children interpret (6) as "Mr. Pig only got a silver coin and nothing else" instead of the adult-interpretation "Only Mr. Pig got a silver coin and nobody else did." The result for SD clefts replicates that of *zhiyou*.

- (6) *Zhiyou* [zhuxiansheng]_F nadao le yinsede yingbi.
Only Mr. Pig get ASP silver coin
"Only Mr. Pig got a silver coin."

Although their main focus is to use exhaustivity as an indicator for the comprehension of the two structures, their results imply that speakers do not draw the line between at-issue and non-at-issue exhaustivity. We therefore wish to re-examine children's understanding of these two structures, with special attention to the contribution of at-issueness on the interpretation of exhaustivity.

3. Experiment 1

In this experiment, a Truth Value Judgment Task (TVJ, Crain & Thornton 1998) similar to that in Zhou & Crain (2010) is conducted. In a typical trial, the child participant listens to either an exhaustive story (**Exh Condition**) or a non-exhaustive story (**Non-Exh Condition**) acted out by the experimenter, and then she or he is asked to judge a comment like (7) made by the toy robot.² If their judgment is false, they are asked to explain "What really happened?" To avoid potential interactions between ZY sentences and SD clefts, we adopted a between-subject design such that each subject is tested on one type of sentence.

- (7) a. *Zhiyou/Shi* [Sunwukong]_F banzou le xiaofangzi.
Only/SHI Monkey King move ASP house
"Only Monkey King moved a house/ It is Monkey King who moved the small house."

²The comments made by the toy robot are sound files played via a speaker. The sound files were recorded, sliced and edited for intensity by a native speaker of Mandarin.

- b. Zhiyou/Shi [Xiaohuixiang]_F chi le xiangjiao.
 Only/SHI Little Grey eat ASP banana
 “Only Little Grey ate a banana/ It is Little Gray who ate a banana.”

A typical story in the **Exh Condition** associated with (7a) goes as following: Tangseng leads his three disciples with super powers to the west. One day, they pass by a village, and the three disciples are recognized by a poor family. The family begs them to move the two boulders and the little house that block their way out of the mountain. Monkey King and Mr. Piggy agree and make a bet on who can move more things. Monkey King moves a boulder and a house, while Mr. Piggy moves a boulder. Tangseng then judges that Monkey King wins the bet. The final presentation of toys is shown in Figure (8), which is also the key scenario for the judgment of testing sentences.³

In the **Non-Exh Condition**, an example story associated with (7b) looks like the following: Papa Dog offers the elephant twins fruits as reward for helping him move his furniture. He has two bananas and an apple. Little Blue first eats a banana, and Little Gray eats an apple. Little Blue wants another banana, but he is too stuffed, so Little Gray eats the banana. Figure (9) shows the final presentation of toys and key scenario to judge (7b). The crucial condition for exhaustivity is **Non-Exh Condition**: if a participant associates exhaustive inference to a structure, they will reject the testing sentence in this condition.

Besides the 8 testing sentences, each participant is also given eight control items and four practice items; only participants who pass eight of the twelve control/practice items are included in the analysis.

(8) *Final presentation of props in Exh condition*



(9) *Final presentation of props in Non-Exh condition*



The **Participants** are thirty-two Mandarin-speaking children (age: 6;08 and 7;06, mean 6;10) from Beijing were recruited; 16 in *zhiyou* group, 16 in SD cleft group (no age difference between the two groups). As control, twenty-two adults (age: 18-53, mean 32.8) were also tested with a web-based questionnaire on the same material. One child from *zhiyou* group and one adult from SD cleft group were eliminated from the analysis as they gave insufficient correct answers to control items.

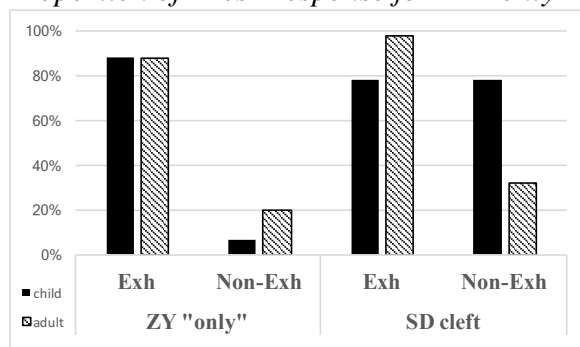
The **Results** are presented in Figure (10). For both children and adults, a statistically significant difference was found between *zhiyou* and SD clefts ($p < 0.001$), as shown by

³The story sets in the context of the well-known story of *Journey to the West*, so the main characters are all known to the participants.

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a logistic regression. A closer examination at the data reveals that children and adults display different patterns of interpretation. Adults accept SD clefts in non-exhaustive conditions more often than ZY (31.82% vs. 20.0%), although the difference is not statistically significant ($Z = -1.449, p = 0.147$). However, ZY and SD clefts are drastically different for children ($Z = -4.91, p < 0.001$): while they are equally likely to accept a SD cleft in both Exh and Non-Exh conditions (78.33% vs. 78%), they merely accept ZY in Non-Exh condition 6.6% of the time. Zooming in on the performance of each individual, we classify a participant as associating exhaustivity with a structure if she/he accepts the structure in “Non-Exh” condition less than 25% of the time. Under such a classification, all adults and children interpret ZY with exhaustivity, but 30% of the adults and 66.7% of the children do not assign exhaustivity to SD clefts.

(10) *Proportion of “Yes” response for ZY “only” sentences and SD clefts*



Turning to the explanations provided by children, both ZY and SD elicit rejection containing additive particles like *ye*, *haiyou*, and *dou*, as in (11). However, in SD group but not ZY group, a child respond with “half right” (12), both of which can be seen as an indirect rejection of the condition.

- (11) a. Bu-dui, Xiaolan ye chi-le.
 Neg-correct Little Blue also eat-ASP.
 “No, Little Blue also ate (a banana).” (TYH, ZY, 7;1)
- b. Bu-dui, Xiaohui he Xiaolan dou chi-le.
 Neg-correct, Little Gray and Little Blue DOU eat-ASP.
 “No, Little Gray and Little Blue both ate (a banana).” (SJM, SD, 6;11)
- c. Bu-dui, haiyou Xiaolan ne.
 Neg-correct, also Little Blue SFP.
 “No, Little Blue also has (one).” (LXY, SD, 6;10)

- (12) Yiban dui, haiyou Xiaolan ne.
 Half correct, also Little Blue SFP
 “Half right, there is also Little Blue.” (LXM, SD, 7;4)

These above results suggest that exhaustivity may be interpreted differently for SD clefts and ZY “only”: adults treat the two construction differently, while for six-year-olds SD clefts are non-exhaustive while ZY “only” are exhaustive. These findings with adult responses are consistent with previous results on SD clefts (Liu & Yang 2016), as well as *it*-cleft type of clefts in other languages (e.g. Destruel et al. 2015, Drenhaus et al. 2011, DeVeugh-Geiss et al. 2015). Meanwhile, children’s responses to correct the testing sentence show their sensitivity to non-at-issue status of cleft exhaustivity: as mentioned above, non-at-issue contents elicit indirect rejections (Xue & Onea 2011, Destruel et al. 2015), which manifest in our results as children’s “half right” responses. The question then is, why do many six-year-olds interpret SD clefts without exhaustivity; will they interpret other non-at-issue exhaustivity constructions without exhaustivity? Experiment 2 is conducted to address this question.

4. Experiment 2

In Experiment 2, we turn to other constructions encoding non-at-issue exhaustivity: pseudo-clefts (13a) and plain focus sentences (PF, (13b)). Pseudo-clefts are the interpretative parallel of *it*-clefts: besides reverse the linear positions of cleft focus and cleft clause, the two structures encode exhaustivity in the same way (e.g. Percus 1997, Hedberg 1990). For PF, exhaustivity is derived as non-at-issue conversational implicature and can be canceled (Onea & Beaver 2009, Horn 2014, Liu & Yang 2016).⁴

- (13) a. Banzou le xiaofangzi de shi [Sunwukong]_F.
 Move ASP small house DE SHI Monkey King.
 “(The one) who moved the small house was [Monkey King]_F.” PC
- b. A: *Who moved the small house?*
 B: [Sunwukong]_F banzou le xiaofangzi.
 Monkey King move ASP small house
 “[Monkey King]_F moved the small house.” PF

This experiment adopts the same experimental setting as Experiment 1, but this time verifying pseudo-clefts and plain focus sentences against (8) and (9). As illustrated in the previous section, exhaustivity in PF is triggered by a *wh*-question. Therefore, for PF sentences, the experimenter asked the robot *Who moved the small house?* before the robot offered a comment instead of the more general question *What happened?*⁵

⁴Since the interaction of prosody and focus is very much debated in a tonal language like Mandarin, we choose to use *wh*-marked plain focus sentences in this study.

⁵Recent discussion on Question Under Discussion (QUD) suggests that offering an explicit *wh*-question may influence children’s interpretation focus position (Sugawara 2016), i.e. children will assign less VP scope

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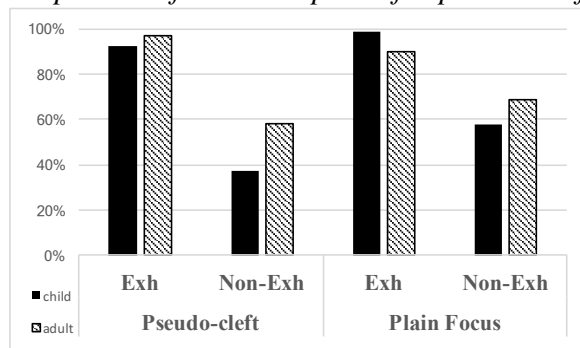
The **Predictions** can be formulated as follows: If children are insensitive to non-at-issue exhaustivity, they would accept the testing sentences in Non-Exh condition more frequently than adults. On the other hand, if children are sensitive to these non-at-issue meanings, they would reject the testing sentences in Non-Exh condition.

The **Participants** are thirty-two Mandarin-speaking children (same age range as Experiment 1: 6;10-7;04; mean: 6;10) from Beijing, giving us 16 children each in the pseudo-cleft group and the plain focus sentence group. None of the children participated in Experiment 1, and no significant age difference was detected between the two experiments. As control, twenty-two adults (age: 18-57, mean 34) were tested with web-based questionnaires.

The **Results** are displayed in Figure (14). Indicated by a logistic regression, no statistically significant difference was detected between pseudo-cleft and PF ($p = 0.010$), nor between children and adults ($p = 0.153$), but there is a significant difference between Exh and Non-Exh conditions ($p < 0.001$). Both children and adults accept pseudo-cleft in non-exhaustive condition about half of the time (children vs. adults 37.5% vs. 58.33%), and plain focus sentences over half of the time (children vs. adults 57.81% vs. 67.85%). A Mann-Whitney test suggests that children respond differently to Exh and Non-Exh conditions given pseudo-cleft sentences ($Z = -6.454, p < 0.001$) or plain focus sentences ($Z = -5.537, p < 0.001$).

Adopting the same classification as Experiment 1, we find that 31.3% of the children and 60% of the adults do not assign exhaustive reading to pseudo-clefts, and half of the children and 67% of adults tend not to associate exhaustivity with plain focus sentences. Two children in pseudo-cleft group and plain focus group respectively respond with indirect rejection *dui, danshi* “yes, but” in Non-Exh condition.

(14) *Proportion of “Yes” response for pseudo-clefts and plain focus sentences*



From the above results, we can see that children and adults reject the two constructions encoding non-at-issue exhaustivity in Non-Exh condition, which indicates that children are sensitive to non-at-issue exhaustivity in pseudo-clefts and plain focus sentences.

reading to testing structures. Since this study mainly concerns itself with exhaustivity, keeping children away from VP scope reading might seem desirable. However, this explicit question is not congruent with other constructions, and thus was not introduced in other groups.

5. Discussion

In this study, we presented two experiments trying to disentangle the at-issueness factor from the acquisition of exhaustivity-encoding constructions. To this end, we first compared at-issue exhaustivity structure “only” and non-at-issue exhaustivity structure SD clefts, and then two other non-at-issue structures: pseudo-clefts and plain focus sentences.

Overall we find that six-year-olds are sensitive to non-at-issue exhaustivity: (1) they reject non-exhaustive interpretation of pseudo-cleft and plain focus sentence, as demonstrated by Experiment 2; (2) children use indirect rejections such as “half right” and “yes, but ...” responses only with non-at-issue exhaustivity constructions (Experiment 1 & 2). Additionally, children are sensitive to the distinction between at-issue and non-at-issue exhaustivity at this age: (1) they associate exhaustivity more frequently with at-issue exhaustivity (*zhiyou* “only” sentences) than that of non-at-issue exhaustivity constructions, which is shown by their high rejection to non-exhaustive interpretation with *zhiyou* “only” in Experiment 1; and (2) ZY “only” sentences do not elicit “yes, but ...” response, as found in Experiment 1.

With results from *zhiyou* and SD clefts, we also extend the developmental trajectory reported in Zhou and Crain (2010) to children beyond the age of 5. Our results suggest that at-issue and non-at-issue exhaustivity part ways at this age range: while children might lump the two types of exhaustivity together before five, they recognize the differences at this stage. They assign exhaustive inference to *zhiyou* more frequently than structures encoding non-at-issue exhaustivity, namely, SD cleft, pseudo-cleft and plain focus sentences.

Besides delineating the course of acquisition, the experiments are also relevant to the theoretical debate on clefts’ encoding of exhaustivity. In line with previous acceptability judgment evidence (Liu & Yang 2016, Li to appear), results from Experiment 1 confirm that Mandarin speakers do not treat SD cleft as another *zhiyou* “only” sentence. We can thus infer that these two structures may code exhaustivity in different layers of meaning.

Meanwhile, results of the two experiments also open up new questions, especially with regard to SD clefts. As Experiment 1 shows, SD clefts are interpreted non-exhaustively by six-year-olds. Combining findings of this study with that from Zhou & Crain (2010), we can see that the level of exhaustivity assigned to SD cleft decreases from 4 years old to 6 years old, and then rises again for adults. Such a pattern is unexpected, since with other constructions or cleft in other languages, the level of exhaustivity increases with age (Heizmann 2012, Notley et al. 2009, Roeper et al. 2007). Why do six-year-olds stop associating exhaustivity with SD clefts, and how do they rebuild the association to achieve the adult-like interpretation? One possible explanation is that the information focus and the cleft focus in SD cleft is misaligned: while the former falls on sentence final position, i.e. object NP in this case (Xu 2004), the latter resides in the subject NP. Though such a misalignment may not cause confusion when interacts with at-issue exhaustivity like *only*, it drives children to a non-exhaustive interpretation of SD clefts.

One can also argue that the abnormality of SD cleft is due to children’s negligence of the sentence-initial *shi* particle in *shi ... de* construction, and only interpreted its preajacent. However, as children have no problem interpreting *zhiyou*, which is also a sentence-initial

particle, and four-year-olds do assign exhaustive interpretation to *shi* ... (*de*) construction (Zhou & Crain 2010), it is less likely that six-year-olds ignore the *shi* particle in SD cleft.

Finally, this study provides some evidence that Truth-Value Judgment Task (TVJ) does show some sensitivity to non-at-issue meaning components, as participants in pseudo-cleft and plain focus groups deny a non-exhaustive interpretation of the testing constructions. However, as pointed out by Tieu et al. (to appear), TVJ is generally not ideal for testing speakers' interpretation of structures with truth-value gaps. Thus, more evidence from other experimental methods are needed to further interpret such sensitivity.

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