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Focus Identification in Child Mandarin

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Abstract
In this study, we investigated how Mandarin-speaking children and adults interpret focus structures like *Zhiyou Yuehan chi-le pingguo* 'Only John ate an apple' and *Shi Yuehan chi-de pingguo* 'It is John who ate an apple'. We found that children tended to associate focus operators *zhiyou* 'only' and *shi* 'be' with the verb phrase (VP), whereas adults uniquely associated them with the subject noun phrase (NP). To account for this difference, we propose that children initially treat focus operators as adverbials, thus ending up associating with the VP. In order to assess our proposal, we examined children's understanding of *zhiyou*-constructions with negation like *Zhiyou Yuehan meiyou chi pingguo* 'Only John didn't eat an apple'. It was found that children, like adults, consistently associated the focus operator with the subject NP in this construction. The findings have an important bearing on language learnability, since negation assists children in reaching the adult interpretation.

Introduction

The study of focus has been an important area of linguistic inquiry in the past 40 years. There is now a considerable literature discussing the properties of focus (e.g., Breul, 2004; Jackendoff, 1972; Krifka, 1991; Rochemont, 1986; Rooth, 1985). It is generally agreed that the interpretation of focus structures involves multiple levels of linguistic knowledge: syntax, semantics, pragmatics, as well as phonology. Therefore, children's emerging knowledge of focus structures could offer insights into the development of these different levels of linguistic knowledge. In this paper, we investigate how Mandarin-speaking children understand contrastive focus. Two main questions were discussed: (i) Whether or not Mandarin-speaking children have adult-like knowledge of focus interpretation; (ii) If they don't have adult-like knowledge, then what are the sources of observed differences?

The paper is structured as follows. First we introduce two contrastive focus constructions in Mandarin Chinese. Then we review previous studies on children's understanding of focus structures. Finally, we present three experiments investigating how Mandarin-speaking children and adults interpret these two focus constructions.

Contrastive focus in Mandarin Chinese

Kiss (1998) distinguished two types of focus, which she termed identificational focus and information focus (cf. Rochemont, 1986). What Kiss called identificational focus is more commonly known as contrastive focus, so we will use this more conventional term. According to Kiss (1998), the focused elements in the *only*-construction and the cleft construction express contrastive focus, which presents an exhaustive identification performed on a set of contextually given entities, whereas the information focus simply conveys new, nonpresupposed information without expressing exhaustive identification. Information focus also receives a pitch accent. Sentences (1), (2) and (3) are used to illustrate.

(1) Only $[\text{John}]_F$ ate an apple.
(2) It is $[\text{John}]_F$ who ate an apple.
(3) $[\text{JOHN}]_F$ ate an apple.

The focused element is indicated by F-brackets and the pitch accent is indicated by capitals. The foci in (1) and (2) express exhaustive identification, which means that of a set of people present in the context, it was John and nobody else who ate an apple. The focus in (3), on the other hand, merely presents JOHN as nonpresupposed information, without suggesting that JOHN was the only person who ate an apple. In the remainder of this section, we discuss the syntactic and semantic properties of the corresponding Chinese *only*-construction and cleft construction, as illustrated in (4) and (5).

(4) Zhiyou Yuehan chi-le pingguo.
only John eat-ASP apple
'Only John ate an apple.'

(5) Shi Yuehan chi-de pingguo.
be John eat-DE apple
'It is John who ate an apple.'

The focus operator *zhiyou* in (4) corresponds to the English *only*. Syntactically, the focus operator *zhiyou* associates with the elements in its c-command domain[1] (e.g., Jackendoff, 1972; Reinhart, 2004, 2006). This means that when *zhiyou* appears in presubject position as in (4), it can only associate with the subject noun phrase (NP) *John*, as illustrated in (6a), since *John* is the only element in its c-command domain. It cannot associate with the entire verb phrase (VP) *ate an apple* or with the object NP inside the VP *an apple*. These prohibitions are indicated in (6b) and (6c) respectively. When the focus operator *zhiyou* occurs in preverbal position, as in (7), it is often reduced to *zhi*[2]. In that position, *zhi* (or *zhiyou*) can associate with the entire VP, as in (7a), or with an element within the VP, i.e., the object NP *an apple* in (7b). But it cannot associate with the subject NP *John*, as indicated in (7c), since *John* is outside the c-command domain of the focus operator *zhiyou*.

(6) a. Only $[\text{John}]_F$ ate an apple.
b. *Only John $[\text{ate an apple}]_F$.
c. *Only John ate $[\text{an apple}]_F$.

(7) Yuehan zhi chi-le pingguo.
John only eat-ASP apple
'John only ate an apple.'
a. John only $[\text{ate an apple}]_F$.
b. John only ate $[\text{an apple}]_F$.
c. *$[\text{John}]_F$ only ate an apple.

Semantically, focus operators partition the semantic structure of the sentences into two meaning components, a presupposition and an assertion (Horn, 1969). The presupposition states that the property denoted by the predicate applies to the focused element, whereas the assertion states that this kind of property doesn't apply to any member of the contextually established alternative sets being contrasted with the focused element. Consider (4), for example, repeated here as (8).

(8) Zhiyou Yuehan chi-le pingguo.
only John eat-ASP apple
'Only John ate an apple.'
a. Presupposition: John ate an apple.
b. Assertion: Everyone other than John didn't eat an apple.

Suppose there are three people in the context, *John, Mary* and *Bill*. For sentence (8) to be true, the property of eating an apple must apply to the focused element *John*, as indicated in (8a), and must not apply to any of the alternatives to the focused element, *Mary* and *Bill*, as in (8b). In other words, the property of eating an apple must be true of *John* and must be false of *Mary* and *Bill*.

In Mandarin Chinese, cleft constructions of the sort illustrated in (5) are another kind of contrastive focus structures. They are usually referred to as *shi…de* constructions. There has always been controversy on the analysis of the properties of *shi* and *de* in this construction. The details will not be our concern here. For an overview, please see Lee (2005a, 2005b). In this paper we will treat *shi* as the focus operator (e.g., Huang, 1982; Lee, 2005a; Teng, 1979) and *de* as an aspect marker[3] (e.g., Huang, 1982; Shi, 1994). To form a Chinese cleft sentence is simply to insert the focus operator *shi* directly in front of the constituent in focus. Unlike their English counterparts, it involves no overt dislocation of the focused element in the syntax, as illustrated in the following sentences.

(9) Shi Yuehan zuotian chi-de pingguo.
be John yesterday eat-DE apple
'It was John who ate an apple yesterday.'
(10) Yuehan shi zuotian chi-de pingguo.
John be yesterday eat-DE apple
'It was yesterday that John ate an apple.'
(11) Yuhan zuotian shi chi-de pingguo.
John yesterday be eat-DE apple
'It was eat an apple that John did yesterday.'

As can be seen in the above sentences, we can simply put the focus operator *shi* immediately preceding the focused element without changing the order of the constituents in the entire sentence (Huang, 1982; Xu, 2004). Once the focus operator is removed, all of them are reduced to a non-cleft, as shown in (12).

(12) Yuehan zuotian chi-de pingguo.
John yesterday eat-DE apple
'John ate an apple yesterday.'

On the other hand, note how different their English counterparts in (9)-(11) are from each other in their surface form. Syntactically, then, Chinese clefts and English clefts differ. Chinese cleft constructions are more like *only*-constructions, in the sense that the focus operator associates with the element in its c-command domain in both structures. However, Chinese and English clefts convey similar semantic function (Lee, 2005a). Sentences (2) and (5), repeated here as (13) and (14), are used to

illustrate.

(13) It is John who ate an apple.
a. Presupposition: x ate an apple.
b. Assertion: x = John; everyone else didn't eat an apple.
(14) Shi Yuehan chi-de pingguo.
be John eat-DE apple
'It is John who ate an apple.'
a. Presupposition: x ate an apple.
b. Assertion: x = John; everyone else didn't eat an apple.

The presuppositions, as in (13a) and (14a), are existential propositions which state that someone (indicated by the variable x) has the property mentioned in the predicate, i.e., eating an apple. In the assertions, (13b) and (14b), the focused element *John* has replaced the variable x in the presupposition, and a negative assertion is made about the alternative possible values of the variable, that is, the individuals in the context being contrasted with *John*. In other words, for sentences (13) and (14) to be true, it must be true that John ate an apple and must be false that anyone other than John ate an apple.

To sum up, in both the *zhiyou*-construction and the *shi…de* construction, the focus operator associates with the element in its c-command domain. When computing the meaning, both constructions can be decomposed into two conjoined propositions, the presupposition and the assertion. In this study, we investigated how Mandarin-speaking children understand these two constructions. For a child to understand these two focus structures, he or she first has to identify the correct focus associated with the focus operator. Once the focus is identified, then the relevant sets can be computed, i.e., the focused element and the contrastive set. In other words, two steps are required in order to understand focus structures. The first step is to identify the focus, and then to compute the relevant presupposition and assertion. So children may make errors at either of the two steps. In the next section, we review previous studies on children's understanding of focus structures.

***Only* and *zhiyou* in child language**

Crain, Ni & Conway (1994) investigated how three- to six-year-old children understand English *only*-constructions. They used a picture verification task, in which children were asked to judge whether or not each test sentence was an accurate description of a picture. For example, children were asked whether or not sentences like (15) and (16) were accurate descriptions of a picture in which a cat was holding a flag, a duck was holding a flag and a balloon, and a frog was holding a balloon.

(15) Only the cat is holding a flag.
(16) The cat is only holding a flag.

The results showed that the majority of the children accepted both (15) and (16) as true descriptions of the picture. Similar results were obtained by Philip & Lynch (2000). In their experiment, both children and adults were asked to judge whether or not sentence (17) was an accurate description of a picture in which a dog was holding an octopus and a starfish, and two cats were holding nothing.

(17) Only the dog is holding an octopus.

It was found that adults judged the sentence to be a true description of the picture, whereas over one third of the children judged it to be false, and they justified their responses by making reference to the fact that the dog was also holding a starfish[4]. Using a similar task, Yang (2002) investigated how Mandarin-speaking children interpret *zhiyou*-constructions like (18) and (19). She found that four- to six-year-old Mandarin-speaking children interpreted (18) as having the same meaning as (19).

(18) Zhiyou xiaonanhai ti-zhe shuitong.
only boy carry-ASP bucket
'Only the boy is carrying a bucket.'

(19) Xiaonanhai zhi ti-zhe shuitong.
boy only carry-ASP bucket
'The boy is only carrying a bucket.'

These findings lead Crain et al. (1994) to formulate, as a descriptive generalization, that children are initially VP-oriented, in the sense that they tend to associate the focus operator (i.e., English *only*, Chinese *zhiyou*) with the VP regardless of its surface position in the sentence. However, an alternative account was advanced by Paterson, Liversedge, Rowland & Filik (2003). According to these researchers, children interpret sentences with *only* as having the same meaning as their counterparts without *only*; in other words, the claim is that children only mentally represent the presupposition meaning component of sentences with *only*, and not the assertion. On this account, the reason why children accepted both (15) and (16) as true descriptions of the picture in Crain et al. (1994), is not because they are VP-oriented, but rather because they compute the sentence with *only* in the same way as they compute the corresponding sentence without *only*, namely, *the cat is holding a flag*. This is a plausible account of some of the data, since *the cat is holding a flag* is a true description of the picture of a cat holding a flag, a duck holding a flag and a balloon, and a frog holding a balloon.

In summary, the two proposals diverge on how to account for children's non-adult interpretation. On one account, children's non-adult interpretation is attributed to errors in identifying the correct focus (Crain et al., 1994), whereas the other account attributes children's non-adult responses to a failure to compute the assertion associated with the contrast sets (Paterson et al., 2003)[5]. To adjudicate between the two proposals and to bring further clarity to our understanding of children's emerging knowledge of focus structures, we conducted three experiments investigating how Mandarin-speaking children and adults interpret contrastive focus structures.

Experiment 1

In this experiment, we investigated how Mandarin-speaking children and adults interpret *zhiyou*-constructions like (4), repeated here as (20), with *zhiyou* in presubject position.

(20) Zhiyou Yuehan chi-le pingguo.
only John eat-ASP apple
'Only John ate an apple.'

Method

Subjects

We tested 20 Mandarin-speaking children between the ages of 4;5 and 4;10 (mean age 4;7). They were recruited from the kindergarten at Beijing Language and Culture University. In addition, 20 Mandarin-speaking adults were tested as controls, all postgraduate students at Beijing Language and Culture University.

Procedures

We tested child subjects using Truth Value Judgement Task. This research technique is designed to investigate which meanings children can and cannot assign to sentences (Crain & Thornton, 1998). The task involves two experimenters – one acting out the stories with toy characters and props, and the other playing the role of a puppet who watches the stories alongside the child subject. At the end of the story, the puppet explains to the child subject what he thinks happened in the story. The child's task is to decide whether the puppet said the right thing or not. If the child informs the puppet that he was wrong, then he is asked to explain: "what really happened?" The child subjects were introduced to the task individually and then tested individually. They were given 2 practice items before the actual test, one in which the puppet's statement was obviously true and one in which it was obviously false, so that children knew that the puppet could say something wrong. These practice items were also used to familiarize children with the task. Only those children who correctly rejected the puppet's statement were included in the actual test.

The 20 adult subjects were tested on the same stories but using a questionnaire. All the stories were written out and they were asked to indicate, for each story, whether the puppet was right or wrong; and if they judged the puppet to be wrong, they were also asked to justify their answers.

Materials

Two kinds of scenarios were constructed. In one scenario, test sentences like (20) were predicted to be true for adults; and in the other scenario, they were predicted to be false for adults. We will refer to these scenarios as the 'adult-true' and 'adult-false' scenarios, respectively. Test sentences like (20) were presented following either of the two scenarios. Thus subjects were tested in two conditions: (i) *zhiyou*-construction in the 'adult-true' scenario, and (ii) *zhiyou*-construction in the 'adult-false' scenario. There were 3 trials in each condition, yielding 6 test items. The following two examples are used to illustrate.

On a typical trial in the 'adult-true' condition, the experimenter acted out the following story: "Mr Horse and Mr Pig are going to have a running race. At the far end of the track, there are three coins – two gold coins and one silver coin. They look very shiny. But only the one who runs faster can get these coins. Mr Pig is not very fast. Mr Horse is a fast runner, but he goes to eat a cake in the middle of the race. After eating a cake, he eats a banana. The food makes him sleepy so he decides to take a nap. When he wakes up, Mr Pig has finished the race. Mr Horse feels so sad that he cannot help crying. But Mr Pig is a nice guy. He takes a gold coin and a silver coin for himself, and leaves the other gold coin to Mr Horse." Figure 1, which corresponds to the scene at the end of the story, illustrates this condition.

FIGURE 1 INSERT HERE

After the story was finished, the puppet described what he thought had happened in the story, using the test sentence in (21).

(21) Zhiyou zhu xiansheng nadao-le yinse yingbi.
only pig sir get-ASP silver coin
'Only Mr Pig got a silver coin.'

Here is a typical trial in the 'adult-false' condition: "Mr Cat and Mr Rabbit are having lunch at Mr Owl's restaurant. Only two kinds of food are served here, fish and carrots. Mr Cat orders a fish and Mr Rabbit orders a carrot. They soon eat them up. But Mr Rabbit feels like having one more carrot, so he orders another one. When he is about to eat it, he smells a fish-flavour from the carrot. He always thinks that fish taste yucky, so he gives the carrot to Mr Cat. Mr Cat likes this fish-flavoured carrot. He soon finishes it." Figure 2, which corresponds to the scene at the end of the story, illustrates this condition.

FIGURE 2 INSERT HERE

When the story concluded, the puppet presented the test sentence, as in (22).

(22) Zhiyou mao xiansheng chi-le huluobo.
only cat sir eat-ASP carrot
'Only Mr Cat ate a carrot.'

Four filler items were also included. On these items, the puppet produced statements like (23) and (24), which were either obviously true or obviously false.

(23) Tiaotiaohu zhaodao-le zhu, danshi meiyou zhaodao tuzi.
Tigger find-ASP pig but not find rabbit
'Tigger found the pig, but he didn't find the rabbit.'
(24) Nanhai he nühai qizhe ma qu mai dongxi le
boy and girl ride horse go buy thing ASP
'The boy and the girl rode a horse to go shopping.'

These filler items were included to verify that the child could answer both 'yes' and 'no' correctly, as well as to obscure the purpose of the experiment. Test and filler items were presented in a pseudo-random order. All the test stimuli are provided in Appendix A.

Before we present the results, let's turn to the two proposals discussed in the previous section, to see how the present study can be used to adjudicate between the two. As discussed, the two proposals differ in their explanations of children's non-adult interpretation. One suggests that children interpret the presubject *only* and the preverbal *only* in the same way, because children tend to associate the focus operator *only* with the VP (Crain et al., 1994), whereas the other attributes children's non-adult interpretation to their difficulty in computing the assertion associated with the contrast set (Paterson et al., 2003).These two proposals will make different predictions about children's performance in our experiment.

On Crain et al's (1994) account, children should be expected to reject the test sentences in both 'adult-true' and 'adult-false' conditions. Because if children are VP-

oriented, they will interpret sentences like (21) and (22) with presubject *zhiyou* as their counterparts with preverbal *zhiyou*, as in (25) and (26), both of which are false in these two conditions. If, on the other hand, Paterson et al.'s (2003) analysis is on the right track, then we should expect children to accept the test sentences like (21) and (22) in both conditions, since they can only compute the presuppositions of the focus structures, as indicated in (27) and (28), both of which are true in these two conditions. A third possibility, of course, is that children have adult-like knowledge of focus structures. If so, then we should see children accept the test sentences in the 'adult-true' condition and reject them in the 'adult-false' condition.

(25) Zhu xiansheng zhi nadao-le yinse yingbi.
pig sir only get-ASP silver coin
'Mr Pig only got a silver coin.'

(26) Mao xiansheng zhi chi-le huluobo.
cat sir only eat-ASP carrot
'Mr Cat only ate a carrot.'

(27) Zhu xiansheng nadao-le yinse yingbi.
pig sir get-ASP silver coin
'Mr Pig got a silver coin.'

(28) Mao xiansheng chi-le huluobo.
cat sir eat-ASP carrot
'Mr Cat ate a carrot.'

Results and discussion

The dependent measure in the study was the proportion of 'yes' responses to the puppet's statements in each condition. Both children and adults gave correct responses on filler items 100% of the time.

A Mann-Whitney Test was used to compare the patterns of responses by children and adults in each condition. A significant difference was found between children and adults in the 'adult-true' condition. As expected, Mandarin-speaking adults accepted presubject *zhiyou*-constructions 100% of the time; Mandarin-speaking children, by contrast, only accepted them 10% of the time ($Z = 5.65$, $p < .001$). Children rejected the test sentences 90% of the time. When asked why the puppet was wrong, they all justified their answers by citing the fact that the character in question performed another action besides the one mentioned in the test sentences. Consider (21), for illustration. Children's stated reason for rejecting (21) in the 'adult-true' condition was that Mr Pig also got a gold coin. In the 'adult-false' condition, there was no significant difference in the acceptance rates of the test sentences by adults (0%) versus children (13.30%) ($Z = 2.08$, $p = .11$). Both children and adults rejected the test sentences to a high degree (adults: 100% vs. children: 86.70%), but they rejected them for different reasons. Sentence (22) is used to illustrate. Adults rejected (22) by making reference to the fact that Mr Rabbit also ate a carrot, whereas children rejected the sentence by pointing out that Mr Cat also ate a fish.

Within each group, a Wilcoxon Signed Ranks Test was used to compare the response patterns across the two conditions. For children, no significantly different patterns were observed in the 'adult-true' condition versus 'adult-false' condition ($Z = 1.41$, $p = .50$); adults, by contrast, exhibited distinct patterns in these two conditions ($Z = 4.47$, $p < .001$), as illustrated in Figure 3.

FIGURE 3 INSERT HERE

The results from this experiment showed that children rejected presubject *zhiyou*-constructions in both 'adult-true' and 'adult-false' conditions for the same reason, i.e., because the character in question performed another action besides the one mentioned in the test sentences. This is compelling evidence that Mandarin-speaking children are VP-oriented; they tend to associate the presubject *zhiyou* with the VP. And it is evidence that children had no difficulty in computing the assertion in both cases. To illustrate, consider sentence (22), repeated here as (29).

(29) Zhiyou mao xiansheng chi-le huluobo.
only cat sir eat-ASP carrot
'Only Mr Cat ate a carrot.'
a. Presupposition: Mr Cat ate a carrot.
b. Assertion: Mr Cat didn't eat anything expect a carrot.
c. Assertion: Everyone other than Mr Cat didn't eat a carrot.

As noted earlier, when children rejected sentence (29), they justified their rejection by pointing out that Mr Cat ate something else in addition to a carrot, namely, a fish. This justification is a clear indication that children were computing the relevant presupposition and assertion, as in (29a) and (29b). Only the assertion they computed was different from that of adults, as in (29c), due to the different focused elements they identified (VP vs. subject NP). These findings support Crain et al.'s (1994) proposal that children initially associate the focus operator with the VP.

In the next experiment, we examined how Mandarin-speaking children and adults understand *shi…de* constructions. As we have discussed, syntactically *shi…de* constructions are more like *zhiyou*-constructions (i.e., the focus operator *shi* has to c-command the focused element), though semantically they are interpreted as English clefts. Therefore, if children are VP-oriented, they should be expected to associate the focus operator *shi* with the VP.

Experiment 2

In this experiment, we investigated how Mandarin-speaking children and adults interpret focus structures like (5), repeated here as (30).

(30) Shi Yuehan chi-de pingguo.
be John eat-DE apple
'It is John who ate an apple.'

Method

Subjects

20 Mandarin-speaking children (mean age 4;7, range 4;5 to 4;10) and 20 Mandarin-speaking adults participated in this experiment. None of the subjects had participated in Experiment 1 and there was no significant difference in the age of the child subjects in this experiment and those of Experiment 1 ($t(38) = 0$, $p = 1$).

Procedures

As in Experiment 1, we tested child subjects using Truth Value Judgement Task. They were given two practice items before the actual test, one in which the puppet's

statement was obviously true and one in which it was obviously false, so that children knew that the puppet could say something wrong. Adult controls were tested on the same stories but using a questionnaire.

Materials

The test stimuli used in this experiment were the same as those in Experiment 1 except for the test sentences. *Zhiyou*-constructions were replaced by *shi…de* structures following each scenario. Test and filler items were presented in a pseudo-random order (see Appendix B for all the test sentences). Sentences (31) and (32) are used to illustrate.

(31) Shi zhu xiansheng nadao-de yinse yingbi.
be pig sir get-DE silver coin
'It is Mr Pig who got a silver coin.'

(32) Shi mao xiansheng chi-de huluobo.
be cat sir eat-DE carrot
'It is Mr Cat who ate a carrot.'

As in Experiment 1, test sentences like (30) were presented in an 'adult-true' condition, in which Mr Pig got a gold coin and a silver coin, and Mr Horse only got a gold coin. Test sentences like (31) were presented in an 'adult-false' condition, where Mr Cat ate a carrot and a fish, and Mr Rabbit only ate a carrot.

Results and discussion

The dependent measure in this experiment was the proportion of 'yes' responses to the puppet's statements in each condition. The data of one child was eliminated from the final analysis, because she didn't give correct answers to the filler items. The remaining 19 children and 20 adults answered correctly 100% of the time on the filler items.

A Mann-Whitney Test was used to compare the response patterns between children and adults in each condition. In the 'adult-true' condition, adults accepted the test sentences 100% of the time. By contrast, children only accepted it 10.50% of the time. This difference was highly significant ($Z = 5.56$, $p < .001$). Mandarin-speaking children rejected the test sentences 89.50% of the time by citing the fact that the character in question performed another action besides the one mentioned in the test sentences, i.e., they rejected (30) by pointing out that Mr Pig also got a gold coin. In the 'adult-false' condition, no significant difference was found in their acceptance rates (adults: 0% vs. children: 10.50%; $Z = 1.47$, $p = .23$). Both Mandarin-speaking adults and children rejected the test sentences to a high degree (adults: 100% vs. children: 89.50%), but they rejected them for different reasons. Consider (31), for example. Adults rejected it by making reference to the fact that Mr Rabbit also ate a carrot. Children, on the other hand, rejected it for the same reason as in the 'adult-true' condition, i.e., because Mr Cat also ate a fish. Within each group, a Wilcoxon Signed Ranks Test was used to compare the response patterns across the two conditions. For children, no significantly different patterns were observed in the 'adult-true' condition versus the 'adult-false' condition ($Z = 0$, $p = 1$); adults, by contrast, exhibited distinct patterns in these two conditions ($Z = 4.47$, $p < .001$), as displayed in Figure 4.

FIGURE 4 INSERT HERE

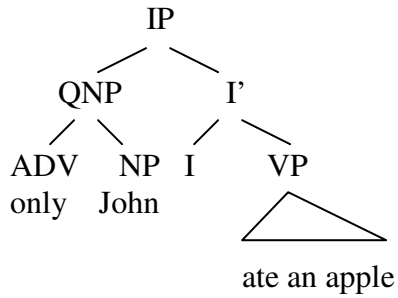
Similar response patterns were obtained in this experiment, as compared to Experiment 1. In both 'adult-true' and 'adult-false' conditions, children rejected presubject *shi…de* constructions by citing the fact the character in question performed another action besides the one mentioned in the test sentences. These results provide further evidence for the proposal by Crain et al.'s (1994) that children are VP-oriented.

To recap, convergent data were obtained in Experiment 1 and Experiment 2. Mandarin-speaking children and adults differ in the interpretation of focus structures. In both constructions, where adults associated the focus operator with the subject NP, children were found to associate the focus operator with the VP. As discussed in section 2, the understanding of focus structures is a two-step procedure. The first step is to identify the focused element, and then to compute the relevant presupposition and assertion. The findings indicate that children's problem lies only in the first step. Children produce non-adult responses because they do not associate the focus operator with the same constituent as adult do. The question to raise now is why children tend to associate the focus operator with the VP, instead of the subject NP. What is the source of this VP-orientation?

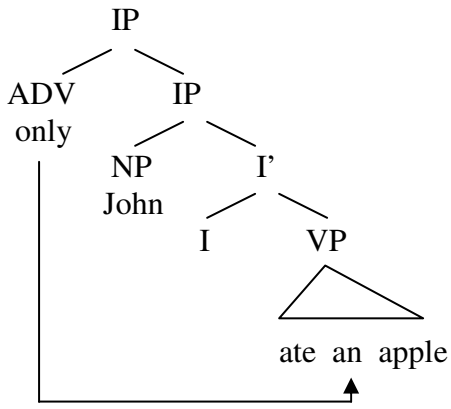
Based on the above findings, we suggest that in adult Mandarin, focus operators *zhiyou* and *shi* can either be used to modify an NP or a VP, depending on the position of the focus operator in the sentence structure. But in child Mandarin, focus operators *zhiyou* and *shi* are normally treated as adverbials. Sentences (4) and (7) are used to illustrate, repeated here as (33) and (34).

(33) a. Zhiyou Yuehan chi-le pingguo.
only John eat-ASP apple
'Only John ate an apple.'

b.



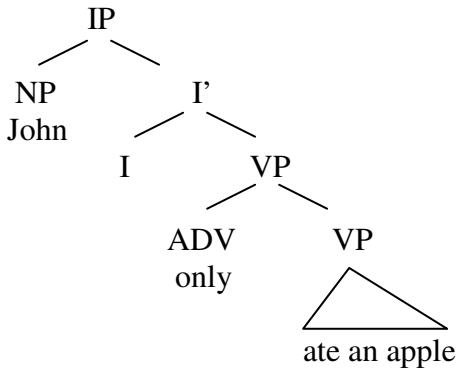
c.



(34) a. Yuehan zhi chi-le pingguo
John only eat-ASP apple

'John only ate an apple.'

b.



For adults, when the focus adverb *zhiyou* appears in presubject position, as in (33a), it is used to modify the subject NP, as illustrated in the tree diagram (33b), where *zhiyou* c-commands the subject NP *John*, but not the VP. In this case, *zhiyou* is treated as a determiner and forms a constituent with the subject NP *John*, which we have labelled Quantified Noun Phrase (QNP). One source of evidence that they form a constituent comes from the fact that *zhiyou Yuehan* 'only John' constitutes a perfectly acceptable fragment answer to wh-questions like (35) and (36)[6] (see Radford (1997: 108) for discussion of this sentence fragment test of constituency).

(35) a. Zhiyou shei chi-le pingguo?
only who eat-ASP apple
'Only who ate an apple?'
b. Zhiyou Yuehan.
only John
'Only John.'

(36) a. Shei chi-le pingguo?
who eat-ASP apple
'Who ate an apple?'
b. Zhiyou Yuehan.
Only John
'Only John.'

When *zhiyou* occurs in preverbal position, as in (34a), it is treated as an adverbial, which c-commands and is adjoined to the VP, as indicated in (34b). In contrast to adults, children initially treat *zhiyou* as an adverbial both when it occurs in a presubject position, and when it appears in a preverbal position. When it occurs in a presubject position, the focus structure is represented as in (33c), in which *zhiyou* is adjoined to the whole sentence as a sentential adverbial, rather than a determiner which forms a constituent with the subject NP as in adult language.

Our motivation for this analysis of the child grammar is based on the observation that many adverbs of quantification, like *sometimes, usually, funnily, interestingly*, and so on, tend to take sentential scope and are not typically associated with the subject NP. If children form the (incorrect) generalization that *zhiyou* is a sentential adverb, then it too will tend to take sentential scope. And the association of sentential

adverbs with the VP is attested across a variety of human languages. So our proposal is that children initially analyse focus adverb *zhiyou* in the same way as these typical sentential adverbs and, therefore, tend to associate it with the VP.

In the next experiment, we attempted to provide empirical support for our analysis of child Mandarin, by using a structure with negation positioned between the focus operator and the VP. We hypothesized that the presence of negation would block the association between the focus operator and the VP, thereby encouraging children to associate the focus operator with the subject NP.

Experiment 3

According to Relativized Minimality, as proposed by Rizzi (1990, 2001), core linguistic relations are local in the sense that they must be satisfied in a minimal configuration in which they can be satisfied; local relations between two elements are blocked if a third element intervenes and this element has the potential of participating in the relevant relation.

(37) Relativized Minimality Condition (RMC) (Rizzi, 2001: 90)
Y is in a Minimal Configuration with X iff there is no Z such that
(i) Z is of the same structural type as X
(ii) Z intervenes between X and Y

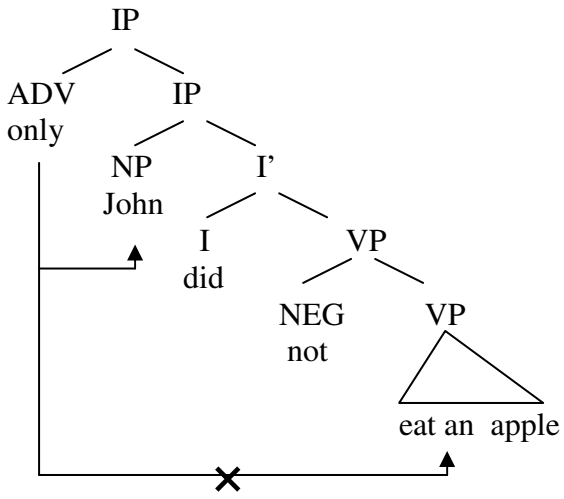
The notation of intervention is defined in terms of c-command: Z intervenes between X and Y iff Z c-commands Y and Z does not c-command X. Thus, The RMC has the effect of ruling out the configuration in (38), if Z c-commands Y, Z does not c-command X, and X and Z are of the same structural type.

(38) *… X … Z … Y …

With the RMC as background, Experiment 3 investigated how Mandarin-speaking children and adults interpret focus structures with negation in preverbal position, as in (39a).

(39) a. Zhiyou Yuehan meiyou chi pingguo.
only John not eat apple
'Only John didn't eat an apple.'

b.



From Experiments 1 and 2, we know that children treat the focus operator *zhiyou* in presubject position as sentential adverbial and thus tend to associate it with the VP, as indicated in (33c). The addition of negation *meiyou* 'not' in preverbal position should, therefore, block this association, since the negation intervenes between the focus operator and the VP, and the negation and the focus operator are of the same structural type, i.e., an adjunct in an A'-position. In this construction, therefore, children may be able to access the adult-like reading, i.e., associating the focus operator with the subject, since the only element that remains in its c-command domain and can be associated with is the subject NP. This expected change in the association of the focus operator is graphically depicted in (39b).

Method

Subjects

The subjects in this experiment were 16 Mandarin-speaking children (mean age 4;7, range 4;6 to 4;9) and 16 Mandarin-speaking adults. The age of the child subjects in this experiment didn't differ significantly from those of Experiment 1 ($t(34) = 1.09$, $p = .28$) or those in Experiment 2 ($t(34) = 1.04$, $p = .31$) and none of them had participated in either Experiment 1or Experiment 2.

Procedures

Child subjects were tested using Truth Value Judgement Task. They were given 2 practice items before the actual test, one in which the puppet's statement was obviously true and one in which it was obviously false, so that children knew that the puppet could say something wrong. Adult controls were tested on the same stories but using a questionnaire.

Materials

Two types of test sentences were created[7]. One was the sentence structure we discussed above, as illustrated in (39a) (Type 1). The other was the simple *zhiyou*-construction, as in (4), repeated here as (40) (Type 2).

(40) Zhiyou Yuehan chi-le pingguo
only John eat-ASP apple
'Only John ate an apple.'

Type 2 sentences were used as a control to see how children understand them in the same scenarios as were used for Type 1 sentences with negation. These two types of sentences were presented following a scenario, which made (39a) false and (40) true. An example is given as follows.

Three dogs (a white dog, a black dog and a brown dog) are going to have a tree climbing contest. They are all very good at tree climbing. This time, they need to climb a big tree and a small tree. They start with the small tree. They all made it to the top easily, as illustrated in Figure 5. Then they come to the big tree. It is much taller than the small tree. The black dog is really a good climber. He touches the top of tree easily. But the white dog and the brown dog have troubles getting into the branches. Each time they lift their front paws, their back paws slide off the branches. No luck, they didn't climb to the top. They failed. Figure 6 illustrates the last scene at the story.

FIGURE 5 INSERT HERE

FIGURE 6 INSERT HERE

Since the test sentences involve negation, it is important that our test scenarios satisfy the felicity conditions associated with the use of negation. Crain, Thornton, Boster, Conway, Lillo-Martin & Woodams (1996) proposed the Condition of Plausible Dissent. This condition is based on Russell's (1948) observation that a negative judgment is appropriate only when the correlative positive judgment has already been made or considered. In Truth Value Judgement Task, children are asked to say whether sentences are true or false. Following Russell's observation, it is appropriate to ask children for a negative judgment of a sentence only if the corresponding positive judgment has been under consideration at some point of the story. In order to satisfy this condition, the puppet produced a positive lead-in before the test sentences, which corresponded to the first half of the story. In this scenario, the positive lead-in was *San-zhi gou dou pa-shang-le xiaoshu* 'All the three dogs climbed up the small tree'. After the positive lead-in, the puppet explained to the child subject how each individual dog performed, using the test sentences in (41) and (42)[8].

(41) Zhiyou bai gou meiyou pa-shang da shu.
only white dog not climb-up big tree
'Only the white dog didn't climb up the big tree.'

(42) Zhiyou hei gou pa-shang-le da shu.
only black dog climb-up-ASP big tree
'Only the black dog climbed up the big tree.'

Following each test sentence, the child subject was asked to judge whether the puppet said the right thing about the relevant dog. There were altogether 4 test scenarios with 8 test sentences.

In addition to the test scenarios, each subject also witnessed three control scenarios. Following each scenario, the puppet produced statements like (43) and (44), which were either obviously true or obviously false. These items were included to verify that children had no difficulty understanding simple negation, as well as to obscure the purpose of the experiment. The experimenter playing the role of the puppet had a choice between two different statements for each of the control scenarios. One statement was true in the scenario and the other was false. If the child subject had answered 'yes' to a given test sentence, the experimenter was instructed to pick the statement for the following control scenario corresponding to a 'no' answer, and vice versa. This ensured that the number of 'yes' and 'no' answers was balanced. All the test stimuli can be found in Appendix C.

(43) Hei mao meiyou mai yu.
black cat not buy fish
'The black cat didn't buy fish.'

(44) Bai mao meiyou mai yu.
white cat not buy fish
'The white cat didn't buy fish.'

The 16 child subjects were then divided into two groups with 8 for each group. One group was presented *zhiyou*-constructions with preverbal negation, as in (41), followed by simple *zhiyou*-constructions like (42). And the other group was presented the same test sentences in a reverse order. Similarly, for the 16 adult controls, two versions of questionnaires were used, one in which the *zhiyou*- constructions with preverbal negation preceded the simple *zhiyou*-constructions, and the other version presenting them in a reverse order. The 16 adult subjects were then randomly assigned to each version.

Before we report the results of Experiment 3, we wish to comment further on the properties of the test sentences in this experiment, as compared to those of Experiment 1. Because the test sentences in Experiment 3 involved negation, it is important to ask whether or not these sentences differed appreciably in length from the affirmative sentences in Experiment 1. The concern is that if the negative sentences are longer (due to the additional negative particle), this may have altered the intonation units of the test sentences. That is, both the focus operator *zhiyou* and the subject NP might have been in the same intonation unit in the test sentences in Experiment 3, in contrast to the affirmative sentences in Experiment 1, where the focus operator and the subject NP may have been in different intonation units. If so, children may have been unknowingly led, by prosodic information, to interpret the scope of *zhiyou* differently in the two experiments. Critically, having *zhiyou* and the subject NP in the same intonation unit might have encouraged children to associate them semantically in Experiment 3, in contrast to Experiment 1.

We wish to note, first, that there was only a slight difference in length between the positive and negative sentences in these experiments. Sentences (39a) and (40) are used to illustrate. The positive sentence (40) is *Zhiyou Yuehan chi-le pingguo* 'Only John ate an apple' and the negative one (39a) is *Zhiyou Yuehan meiyou chi pingguo* 'Only John didn't eat an apple'. The positive sentence lacks the negative marker *meiyou*, but it includes an aspect marker *le*, which is absent in the negative sentence. So the difference in length is a single morpheme. It seems unlikely that such a small difference in length could have consistently resulted in different intonation units. Two further points about prosodic cues are worth making. One is that Mandarin relies more heavily on syntactic structure than on prosodic information to mark the element in focus in sentences with focus operators. For example, consider the sentences *Zhiyou Yuehan chi-le pingguo* 'Only John ate an apple' and *Zhiyou Yuehan meiyou chi pingguo* 'Only John didn't eat an apple'. English normally marks focus by phonological prominence, so the subject NP *John* would be stressed in the English counterparts of these sentences. However, phonological prominence is not a strongly favoured strategy in Mandarin, so the focused element *Yuehan* would not typically be prosodically marked in either of these sentences. The second observation regards children's sensitivity to prosodic cues in associating the focus operator *zhiyou* with different expressions. It has been found that English-speaking children younger than about six-years-old are not sensitive to prosodic cues in resolving ambiguities involving sentences with the focus operator *only*. This finding was documented in several studies investigating children's interpretation of dative constructions with the focus operator *only* (e.g., Gualmini, Maciukaite & Crain, 2002; Halbert, Crain, Shankweiler & Woodams, 1995). Both observations would appear to reduce the risk that prosodic cues were responsible for children's different patterns of responses in Experiment 1, as compared to Experiment 3. A related concern is whether or not the experimenter who produced the test sentences might have inadvertently encouraged

an association between *zhiyou* and the subject NP, again by providing prosodic cues that this association was intended. In our experiment, the experimenter who produced the test sentences was blind to the experimental hypothesis. He was trained to produce the test sentences using normal intonation, but was not informed about the experimental hypothesis under investigation.

Results and discussion

The dependent measure in this experiment was the proportion of 'yes' responses to each sentence type produced by the puppet. All the subjects responded correctly to the control sentences 100% of the time.

A Mann-Whitney Test showed that children and adults differed significantly in their acceptance rates of Type 2 test sentences, whereas no significant difference was found in their acceptance rates of Type 1 test sentences. None of the subjects accepted Type 1 test sentences. Both children and adults rejected them (the *zhiyou*-construction with preverbal negation) 100% of the time. And, this time, children and adults rejected them for the same reason, namely that in addition to the character mentioned in the test sentences, another character didn't perform the relevant action either. In the example scenario, both adults and children rejected (41) by citing the fact that the brown dog didn't climb up the big tree either. In response to Type 2 test sentences (the simple *zhiyou*-construction), adult accepted them 100% of the time. However, children accepted them only 50% of the time. This difference reached significance ($Z = 3.22$, $p < .01$). As before, those children who rejected these test sentences were asked why the puppet was wrong, they justified their answers by referring to the fact that the character in question performed another action besides the one mentioned in the test sentences. In the example scenario, they rejected (42) by pointing out that the black dog also climbed up the small tree. Figure 7 illustrates the proportion of 'yes' responses to the two types of test sentences by children and adults.

FIGURE 7 INSERT HERE

When the child data were examined further by group, a significant effect of the order of presentation was observed. The group of children who were presented Type 1 test sentences first (Group 1) accepted Type 2 test sentences significantly more often than the group who heard Type 2 test sentences first (Group 2)(87.50% vs. 12.50%, $Z = 2.77$, $p = .01$), though both of the two groups rejected Type 1 test sentences 100% of the time. Figure 8 displays the proportion of 'yes' responses to the two types of test sentences by the two groups of children.

FIGURE 8 INSERT HERE

The results indicate that the addition of negation does block the association between the focus operator and the VP. The presence of negation assists children in accessing an adult-like interpretation, i.e., associating the focus operator with the subject NP. The findings support our analysis that Mandarin-speaking children treat contrastive focus operators like *zhiyou* as adverbials. And once children learn that presubject *zhiyou* can associate with the subject NP, based on the evidence from *zhiyou*-constructions with preverbal negation, they more freely associate it with the subject NP in simple *zhiyou*-constructions. This is shown by the effect of the order of presentation. However, there is one more step children must make to reach the adult grammar. We turn to this in the concluding discussion.

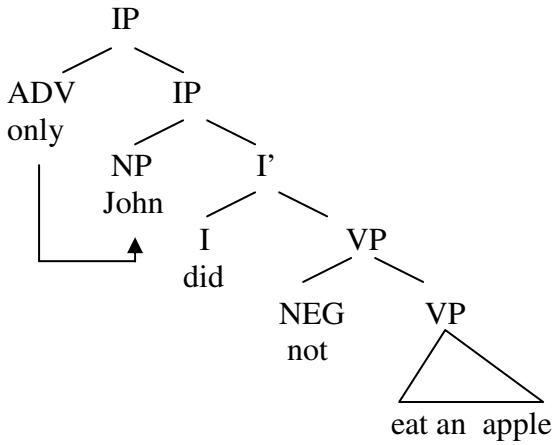
General discussion and conclusion

We began the present study by investigating how Mandarin-speaking children and adults understand contrastive focus constructions like *Zhiyou Yuehan chi-le pingguo* 'Only John ate an apple' and *Shi Yuehan chi-de pingguo* 'It is John who ate an apple'. It was found that children tended to associate the focus operators *zhiyou* and *shi* with the VP, whereas adults uniquely associate them with the subject NP (Experiment 1 and Experiment 2). The findings indicate that children have no difficulty computing the meaning components of focus operators, i.e., the presupposition and the assertion. Children and adults differ only in identifying the element in focus. This supports Crain et al.'s (1994) proposal about the source of children's non-adult interpretation. However, previous research does not tell us the whole story. One thing that has remained unspecified is a detailed account of why children are VP-oriented. Another missing piece is an account of children's transition to the adult grammar.

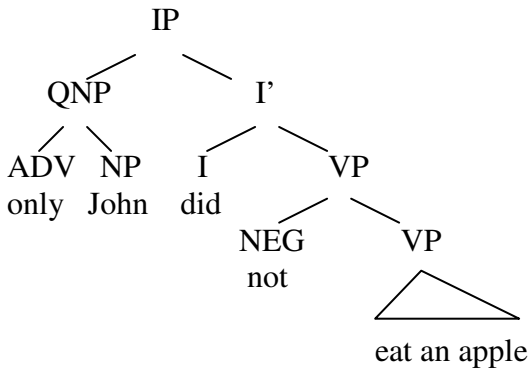
As for the source of children's VP-orientation, we propose that children initially treat focus operators as adverbials. When a focus operator appears in a presubject position, it is treated as a sentential adverbial, thus ending up associating with the VP. In order to assess our proposal, a third experiment was conducted in which we examined children's understanding of *zhiyou*-constructions with negation in preverbal position like *Zhiyou Yuehan meiyou chi pingguo* 'Only John didn't eat an apple.' The basic idea is that if children analyse the focus operator as a sentential adverbial in this situation, the negation should block its association with the VP, according to the Relativized Minimality Condition proposed by Rizzi (1990, 2001). We hypothesized, therefore, that the presence of negation could guide children to an adult-like interpretation, i.e., associating the focus operator with the subject NP, since the only element left in its c-command domain and can be associated with is the subject NP. This is exactly what we found in Experiment 3. Just like adults, children consistently associated the focus operator *zhiyou* with the subject NP. Perhaps the most interesting finding in this experiment was the effect of the order of presentation on children's interpretation. The group of children, who were presented *zhiyou*-constructions with negation in preverbal position like *Zhiyou Yuehan meiyou chi pingguo* 'Only John didn't eat an apple' followed by simple *zhiyou*-constructions like *Zhiyou Yuehan chi-le pingguo* 'Only John ate an apple', interpreted simple *zhiyou*-constructions in the same way as adults did, consistently associating the focus operator *zhiyou* with the subject NP. By contrast, the other group of children who were presented the test sentences in a reverse order still associated the focus operator with the VP in simple *zhiyou*-constructions. These findings indicate that the presence of an intervening negation could guide children to associate the presubject focus operator with the subject NP and, once this kind of association was established, children continued to associate the focus operator with the subject NP, even in simple positive sentences. In other words, the presence of negation could assist children in reaching the adult grammar, by revealing that there is an alternative to the VP which can be associated with the focus operator like *zhiyou*. Nevertheless, children's grammar cannot become equivalent to that of the adults based on this observation alone. Sentence (39a) is used to illustrate, repeated here as (45a). Though the presence of negation assists children in accessing an adult-like interpretation, i.e., associating the focus operator with the subject NP, the focus operator could still remain in the position of a sentential adverb, as represented in (45b), which is different from that of adults, as indicated in (45c), where the focus operator *zhiyou* and the subject NP *Yuehan* form a constituent *zhiyou Yuehan* 'only John'.

(45) a. Zhiyou Yuehan mei chi pingguo.
only John not eat apple
'Only John didn't eat an apple.'

b.



c.



Therefore, to converge on the adult grammar, children require further primary linguistic data revealing that a presubject focus operator *zhiyou* forms a constituent with the subject NP, since sentence structures like (45a) do not reveal this constituent relation between them. We contend that one such kind of primary linguistic data are readily available to children in the form of fragment answers to wh-questions, as discussed in (35) and (36), repeated here as (46) and (47). This, in combination with a 'uniqueness' constraint on form/meaning correspondence[9], informs children that the presubject focus operator is uniquely associated with the subject NP. This completes our account of children's convergence on a grammar that is equivalent to that of the adults in the same linguistic community.

(46) a. Zhiyou shei chi-le pingguo?
only who eat-ASP apple
'Only who ate an apple?'
b. Zhiyou Yuehan.
only John
'Only John.'

(47) a. Shei chi-le pingguo?
who eat-ASP apple
'Who ate an apple?'

b. Zhiyou Yuehan.
Only John
'Only John.'

One question remains to be answered, however. If fragment answers to wh-questions inform children that the presubject focus operator can be associated with the subject NP, then children apparently have ample evidence to converge on the adult grammar. Why, then, does it take so long for children to attain the target grammar?

We have two responses to this question. First, fragment answers should suffice to inform Mandarin-speaking children that presubject *zhiyou* can associate with the subject NP, but they do not suffice to eliminate the alternative VP-association from children's grammars. To jettison the non-adult association, children could conceivably appeal to a 'uniqueness' constraint on form/meaning correspondence, as we have just discussed. In the present case, however, the 'uniqueness' constraint does not clearly apply, since sometimes the preverbal focus operator is homophonous with the presubject one, i.e., both in the phonological form of *zhiyou*. Conflicting cues like this may prolong children's convergence on the target grammar. We wish to note also that similar delays are widely attested. Children take months, even years, to recover from other mistaken generalizations. For example, young English-speaking children initially hypothesize that reflexive pronouns (e.g., *herself, myself, yourself*) are formed by combining the bound morpheme *-self* with a possessive pronoun (e.g., *her, my, your*). This generalization is incorrect, as attested by the counter-examples *himself* and *themselves*. Despite never encountering the incorrect forms, children produce the non-adult forms *hisself* and *theirself* until they are 4- or 5-years old. Similarly, children continue to produce erroneous past participles, such as *flied* (instead of *flown*) and *rided* (instead of *ridden*) for an extended period, lasting years, despite the absence of these forms in the parental input. Apparently, once a generalization is formed, children are loath to abandon it despite the absence of supporting evidence. Perhaps, the same reluctance to abandon a generalization is at work in the case of *zhiyou*.

References:

Aoun, J. & Sportiche, D. (1983). On the formal theory of Government. *The Linguistic Review 2*, 211-236.

Breul, C. (2004). *Focus structure in generative grammar: An integrated syntactic, semantic and intonational approach*. Amsterdam: John Benjamins.

Crain, S., Ni, W. J. & Conway, L. (1994). Learning, parsing and modularity. In C. Clifton, L. Frazier, & K. Rayner (eds.), *Perspectives on sentence processing*, 443-467. Hillsdale, NJ: Lawrence Erlbaum Inc.

Crain, S. & Thornton, R. (1998). *Investigations in Universal Grammar: A guide to experiments on the acquisition of syntax and semantics*. Cambridge, MA: MIT Press.

Crain, S., Thornton, R., Boster, C., Conway, L., Lillo-Martin, D. & Woodams, E. (1996). Quantification without qualification. *Language Acquisition 5*, 83-153.

Gualmini, A., Maciukaite, S. & Crain, S. (2002). Children's insensitivity to contrastive stress in sentences with *only*. In S. Arunachalam, E. Kaiser, & A, Williams (eds.), *Proceedings of the 25th Penn Linguistics Colloquium*, 87-110. Philadelphia, PA: University of Pennsylvania.

Halbert, A., Crain, S., Shankweiler, D. & Woodams, E. (1995). *Children's interpretive use of emphatic stress*. Poster presented at the 8th Annual CUNY Conference on Human Sentence Processing. Tucson, AZ.

Horn, L.R. (1969). A presuppositional approach to *only* and *even*. *Proceedings of the Chicago Linguistic Society 5*, 98-107.
Huang, C.-T. J. (1982). *Logical relations in Chinese and the theory of grammar*. Doctoral Dissertation, MIT.
Jackendoff, R. (1972). *Semantic interpretation in generative grammar*. Cambridge, MA: MIT Press.
Kiss, K.É. (1998). Identificational focus versus informational focus. *Language 74*(2), 245-273.
Krifka, M. (1991). A compositional semantics for multiple focus constructions. *Cornell Working Papers in Linguistics 10*, 127-158.
Lee, H.-C. (2005a). *On Chinese focus and cleft constructions*. Unpublished doctoral dissertation, National Tsing Hua University, Taiwan.
Lee, H.-C. (2005b). On *de* in *shi…de* construction. *UST working papers in Linguistics*, 131-160. National Tsing Hua University: Taiwan.
Paterson, K.B., Liversedge, S.P., Rowland, C. & Filik, R. (2003). Children's comprehension of sentences with focus particles. *Cognition 89*, 263-294.
Paterson, K.B., Liversedge, S.P., White, D., Filik, R. & Jaz, K. (2005/2006). Children's interpretation of ambiguous focus in sentences with *only*. *Language Acquisition 13*(3), 253-284.
Philip, W. & Lynch, E. (2000). Felicity, relevance, and acquisition of the grammar of *every* and *only*. In S. C. Howell, S. A. Fish, & T. Keith-Lucas (eds.), *Proceedings of the 24th annual Boston University conference on language development*, 583-596. Somerville, MA: Cascadilla Press.
Pinker, S. (1984). *Language learnability and language development*. Cambridge, MA: Harvard University Press.
Radford, A. (1997). *Syntactic theory and the structure of English: A minimalist approach*. Cambridge: Cambridge University Press.
Reinhart, T. (1976). *The syntactic domain of anaphora*. Doctoral dissertation, MIT.
Reinhart, T. (2004). The processing cost of reference set computation: Acquisition of stress shift and focus. *Language Acquisition 12*(2), 109-155.
Reinhart, T. (2006). *Interface strategies: Optimal and costly computations*. Cambridge, MA: MIT Press.
Rizzi, L. (1990). *Relativized Minimality*. Cambridge, MA: MIT Press.
Rizzi, L. (2001). Relativized Minimality effects. In M. Baltin, & C. Collins (eds.), *The Handbook of Contemporary Syntactic Theory*, 89-110. Oxford: Blackwell.
Rochemont, M. (1986). *Focus in generative grammar*. Amsterdam: John Benjamins.
Rooth, M. (1985). *Association with focus*. Unpublished doctoral dissertation, University of Massachusetts at Amherst.
Russell, B. (1948). *Human knowledge: Its scope and limits*. London: Allen and Unwin.
Shi, D.X. (1994). The nature of Chinese emphatic sentences. *Journal of East Asian Linguistics 3*, 81-100.
Teng, S.-H. (1979). Remarks on cleft sentences in Chinese. *Journal of Chinese Linguistics 7*, 101-112.
Wexler, K. (1979). Untitled paper presented at the Workshop on Learnability, Laguna Beach, California.
Xu, L. J. (2004). Manifestation of informational focus. *Lingua 114*, 277-299.
Yang, X. L. (2002). Restrictive focus in child Mandarin. *Contemporary Linguistics 3*, 225-237 (in Chinese).

Footnotes

1. Two definitions of c-command relation are generally accepted. One is Reinhart's (1976), that is, node A c-commands node B if neither A nor B dominates the other and the first branching node which dominates A dominates B; and the other is Aoun and Sportiche's (1983), namely, A c-commands B, iff every maximal projection dominating A dominates B, and A does not dominate B.

2. *Zhiyou* and *zhi* are variants of the same focus operator. *Zhiyou* can be used to modify focused elements in subject position as well in the predicate phrase. For example, Mandarin speakers can say *Zhiyou yuehan chi-le pingguo* 'Only John ate an apple' and *Yuehan zhiyou chi-le pingguo* 'John only ate an apple'. Mandarin speakers tend to omit the second morpheme of *zhiyou*, i.e., *you*, when the focus operator occurs in preverbal position. So Mandarin speakers can express the meaning 'the only thing John ate is an apple', either by saying *Yuehan zhiyou chi-le pingguo* 'John only ate an apple' or by saying *Yuehan zhi chi-le pingguo* 'John only ate an apple'." There are, however, no differences in interpretation between *zhi* or *zhiyou* in this position'.

3. *De* in the *shi…de* construction can be treated equally as the aspect marker *le*, which means in all the *shi…de* constructions used in this paper *de* can be replaced by *le*. We use *de* simply because the Chinese cleft is often referred to as the *shi…de* construction in the literature. So we are just following the common practice of using *de* instead of *le*.

4. The data from this study can also be used as evidence for Crain et al.'s (1994) proposal, as pointed out by the reviewer. That is, if children interpret sentences with *only* as having the same meaning as their counterparts without *only*, as Paterson el al. (2003) proposed, then children should be expected to accept (17) as a true description of the picture in which a dog was holding an octopus and a starfish, and two cats were holding nothing, because children interpret (17) as *The dog is holding an octopus*, which is true in the picture. However, over one third of the children judged it to be false by pointing out that the dog was also holding a starfish.

5. In subsequent work, Paterson, Liversedge, White, Filik & Jaz (2005/2006) reached a different conclusion about children's non-adult responses, and one that is more in line with the descriptive generalization advanced by Crain et al. (1994). However, the test materials in Paterson et al.'s (2005/2006) evoked disproportionate number of erroneous responses from adult controls. This renders the interpretation of the child data problematic, since children's responses too could have been due to some methodological feature of the task.

6. A survey of fifteen Mandarin-speaking adults was conducted to evaluate this constituency test, and they all indicated that *zhiyou Yuehan* 'only John', as in (35b) and (36b), is perfectly natural as a fragment answer to both (35a) and (36a).

7. In the actual experiment, there were three types of test sentences, but the third type of test sentences is not relevant to this paper, so we will not discuss it here.

8. As we mentioned earlier, there were three types of test sentences in the actual experiment, which were used to describe the performance of the three characters in each test scenario. Since the third type of test sentences is not our concern in this study, the corresponding performance of this third character (i.e., the brown dog in the scenario under consideration) will not be discussed here.

9. The remainder of this section responds to the concerns raised by one of the reviewers about the test materials and procedures used in Experiment 3. We appreciate the opportunity to clarify these points which are relevant for much of the research that investigates children's interpretation of sentences with focus operators.

10. This uniqueness constraint is known as the Uniqueness Principle (Pinker, 1984; Wexler, 1979), which is considered to be part of the Language Acquisition Device (LAD). Pinker (1984:113) characterized its function in the following way: "The child knows that when he or she is faced with a set of alternative structures fulfilling the same function, only one of the structures is correct unless there is direct evidence that more than one is necessary".

Figure Captions

Fig.1. *Zhiyou*-construction, 'adult-true' condition

Fig.2. *Zhiyou*-construction, 'adult-false' condition

Fig.3. Proportions of 'yes' responses to the puppet's statements in the 'adult-true' and 'adult-false' conditions by children and adults, Experiment 1

Fig.4. Proportions of 'yes' responses to the puppet's statements in the 'adult-true' and 'adult-false' conditions by children and adults, Experiment 2

Fig.5. The addition of negation, Experiment 3

Fig.6. The addition of negation, Experiment 3

Fig.7. Proportion of 'yes' responses to the two types of test sentences by children and adults, Experiment 3

Fig.8. Proportion of 'yes' responses to the two types of test sentences by group 1 and group 2, Experiment 3

Figure 1

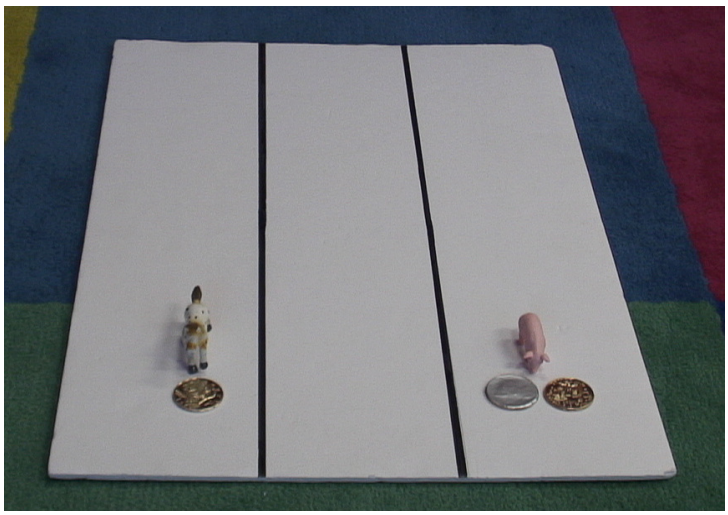
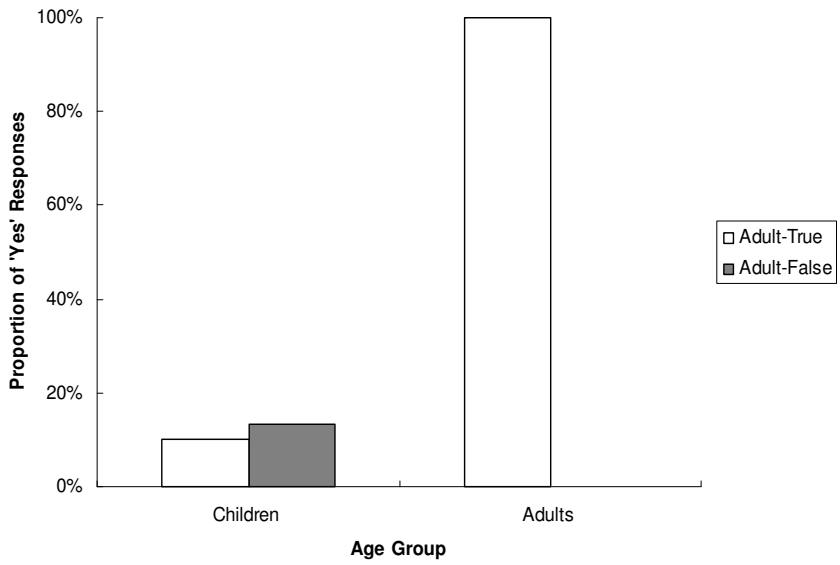


Figure 2

Figure 3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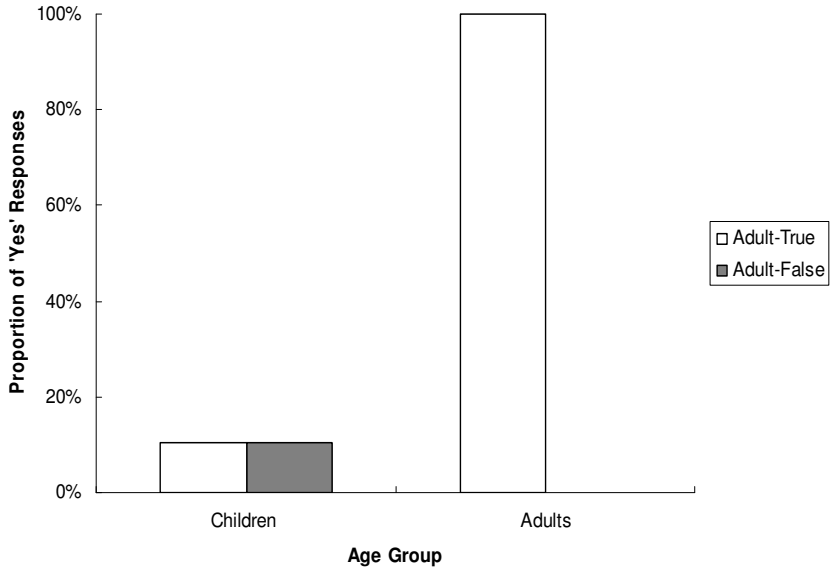
Proportion of 'Yes' Responses
Children
Adults
Age Group
Adult-True
Adult-False

Figure 4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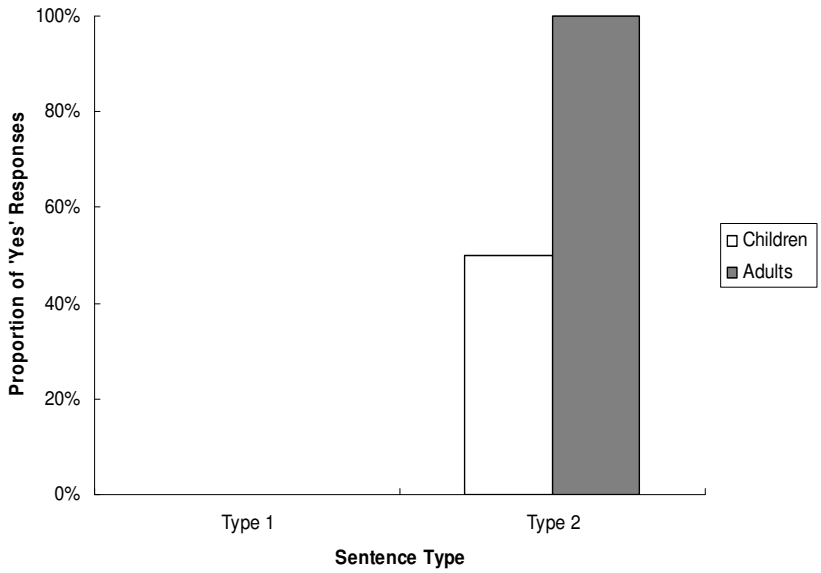
Proportion of 'Yes' Responses
Children
Adults
Age Group
Adult-True
Adult-False

Figure 5

Figure 6

Figure 7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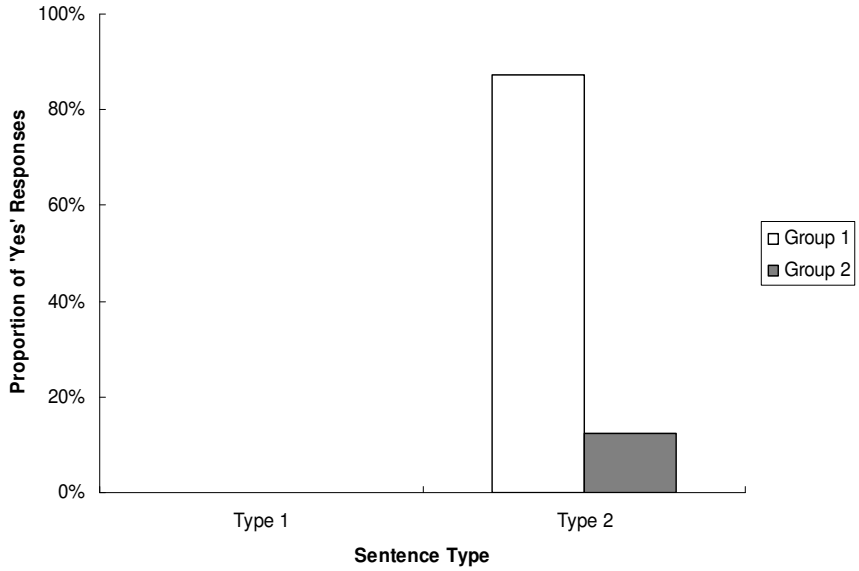
Proportion of 'Yes' Responses
Type 1
Type 2
Sentence Type
Children
Adults

Figure 8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Proportion of 'Yes' Responses
Type 1
Type 2
Sentence Type
Group 1
Group 2