Focus in Child Language: Evidence from the Acquisition of Chinese

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1. Introduction

A standard view in linguistics maintains that the interpretation of focus structures involves multiple levels of linguistic knowledge: syntax, semantics, pragmatics, and phonology. Therefore, children's emerging linguistic competence with focus structures could offer insights into the development of these different levels of linguistic knowledge. This paper focuses on how Mandarin-speaking children interpret contrastive focus structures, as in (1).

(1) Zhiyou Yuehan chi-le   pingguo.
    only   John   eat-ASP apple
    'Only John ate an apple.'
   a. Only [John]$_F$ ate an apple.
   b. *Only John [ate an apple]$_F$.
   c. *Only John ate [an apple]$_F$.

The focus operator *zhiyou* in (1) corresponds to English *only*. Syntactically, the focus operator *zhiyou* associates with elements in its c-command domain (e.g., Jackendoff, 1972; Reinhart, 2004, 2006). For this reason, when *zhiyou* appears in presubject position as in (1), it can only associate with the subject noun phrase (NP) *John*, as in (1a), since *John* is the only element in the c-command domain of *zhiyou*. It cannot associate with the entire verb phrase (VP) *ate an apple* or with the object NP inside the VP *an apple*, as indicated by the asterisk '*' in (1b) and (1c). The element in focus is indicated by F-brackets throughout. When the corresponding focus operator *zhi*[1] occurs in preverbal position, as in (2), it can associate with the entire VP, as in (2a), or with an element within the VP, i.e., the object NP *an apple,* as in (2b). But it cannot associate with the subject NP *John*, as in (2c), since *John* is outside the c-command domain of *zhi*.

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

Semantically, the focus operator *zhiyou* partitions the semantic structure of sentences that contain it into two meaning components, a presupposition and an assertion (Horn, 1969). The presupposition states that the property denoted by the predicate applies to the element in focus, whereas the assertion states that this same property doesn't apply to any member of a contextually established set of alternatives being contrasted with the focus element. Consider (1), for example, repeated here as (3).

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[1] *Zhiyou* and *zhi* are two variants of the same focus operator, the choice of which depends on the positions of the focused element. *Zhiyou* is used to modify the focused elements in the subject position, whereas *zhi* is used to modify the focused elements in the predicate.

(3) Zhiyou Yuehan chi-le   pingguo.
    only   John   eat-ASP apple
    'Only John ate an apple.'
  a. Presupposition: John ate an apple.
  b. Assertion: $\forall x[(x \neq \text{John}) \rightarrow \neg (x \text{ ate an apple})]$

Suppose there are three people in the domain of discourse, *John*, *Mary* and *Bill*. For sentence (3) to be true, the property of eating an apple must uniquely apply to the focus element *John*, as indicated in (3a), and it must not apply to any of the alternatives to the focus element, *Mary* and *Bill*, as indicated in (3b). In short, the property of eating an apple must be true of *John* and must be false of *Mary* and *Bill*.

In this study, we investigated how Mandarin-speaking children understand focus structures like (1). For a child to understand this structure, he or she first has to identify the correct focus element to be associated with the focus operator. Once the focus element is identified, then the relevant contrast set can be computed, and the properties of the focus element and the contrast set can be determined. In other words, two steps are required to understand this focus structure. The first step is to identify the focus element, and then the second step is to compute the relevant presupposition and assertion. Children may make errors at either of these steps. In the next section, we review previous research on children's understanding of focus structures.

2. *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 (4) and (5) 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.

(4) Only the cat is holding a flag.
(5) The cat is only holding a flag.

The results showed that the majority of the children accepted both (4) and (5) as true descriptions of the picture. Similar results were obtained by Philip & Lynch (1999). In their experiment, both children and adults were asked to judge whether or not sentence (6) was an accurate description of a picture in which a dog was holding an octopus and a starfish, and two cats were holding nothing.

(6) Only the dog is holding an octopus.

It was found that adults judged the sentenc (6) 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 on the grounds that the dog was also holding a starfish. Using a similar task, Yang (2002) investigated how Mandarin-speaking children interpret *zhiyou*-constructions like (7) and (8). She found that four- to six-year-old Mandarin-speaking children interpreted (7) as having the same meaning as (8).

(7) Zhiyou xiaonanhai ti-zhe   shuitong.
    only   boy   carry-ASP bucket
    'Only the boy is carrying a bucket.'
(8) Xiaonanhai zhi ti-zhe   shuitong.
    boy   only carry-ASP bucket
    'The boy is only carrying a bucket.'

Findings like these led 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 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 the counterparts of these sentences without *only*; in other words, the claim is that children only mentally represent the meaning component of sentences with *only* corresponding to the presupposition, and not the meaning component corresponding to the

assertion. On this account, the reason children accepted both (4) and (5) 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, there are two proposals about how to account for children's non-adult interpretation, and each one corresponds to one of the steps involved in interpreting sentences with focus operators. On one account, children's non-adult interpretation is attributed to errors in identifying the correct focus element (Crain et al., 1994), whereas the other account attributes children's non-adult responses to a failure to compute the assertion associated with the focus operator (Paterson et al., 2003). To adjudicate between the two proposals and to bring further clarity to our understanding of children's emerging knowledge of focus structures, we conducted two experiments investigating how Mandarin-speaking children and adults interpret contrastive focus structures.

3. Experiment 1

In this experiment, we investigated how Mandarin-speaking children and adults interpret *zhiyou*-constructions with *zhiyou* in presubject position, as in (1), repeated here as (9).

> (9) Zhiyou Yuehan chi-le pingguo.
>   only   John   eat-ASP apple
>   'Only John ate an apple.'

3.1. Subjects

We tested 20 Mandarin-speaking children between the ages of 4;5 and 4;10 (mean age 4;7). In addition, 20 Mandarin-speaking adults were tested as controls.

3.2. Procedures

We tested child subjects using Truth Value Judgement Task (Crain & Thornton, 1998). This 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: "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.

3.3. Materials

Two kinds of scenarios were constructed. In one scenario, test sentences like (9) 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 (9) 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 three trials in each condition, yielding 6 test items. The following 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." After the story was finished, the puppet described what he thought had happened in the story, using the test sentence in (10).

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

On a typical trial in the 'adult-false' condition, the experimenter acted out the following story: "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. " When the story concluded, the puppet presented the test sentence, as in (11).

   (11) 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 which were either obviously true or obviously false. These filler items were included to verify that children 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.

   Before we present the result, 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 are expected to reject the test sentences in both the 'adult-true' condition and in the 'adult-false' condition. This is because, if children are VP-oriented, they should interpret sentences like (10) and (11) with presubject *zhiyou* in the same way as they interpret their counterparts with preverbal *zhiyou*, as in (12) and (13). Both sentences are false in these conditions. On the other hand, if Paterson et al.'s (2003) analysis is on the right track, then children are expected to accept test sentences like (10) and (11) in both conditions, since the supposition is that children can only compute the presuppositions of the focus structures, as indicated in (14) and (15), and both of the presuppositions are true in the two conditions. A third possibility, of course, is that children have adult-like knowledge of focus structures. If so, then children will accept the test sentences in the 'adult-true' condition and reject them in the 'adult-false' condition.

   (12) Zhu xiansheng zhi nadao-le yinse yingbi.
     pig sir only get-ASP silver coin
     'Mr Pig only got a silver coin.'
   (13) Mao xiansheng zhi chi-le huluobo.
     cat sir   only eat-ASP carrot
     'Mr Cat only ate a carrot.'
   (14) Zhu xiansheng nadao-le yinse yingbi.
     pig sir   get-ASP silver coin
     'Mr Pig got a silver coin.'

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

3.4. Results and Discussion

The dependent measure in this 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 the responses by 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); i.e., children rejected them 90% of the time. When asked why the puppet was wrong, children justified their answers by citing the fact that the character in question performed another action besides the one mentioned in the test sentences. Consider (10), for example. Children's stated reason for rejecting (10) in the 'adult-true' condition was that Mr Pig also got a gold coin. Clearly, this response is evidence that children computed the contrast set and, hence, that children were generating the assertion associated with the test sentences. In the 'adult-false' condition, by contrast, there was no significant difference in the acceptance rates of the test sentences by adults (0%) versus children (13.3%). Both children and adults rejected the test sentences to a high degree (adults: 100% vs. children: 86.7%), but they rejected them for different reasons. Sentence (11) is used to illustrate. Adults rejected (11) 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.
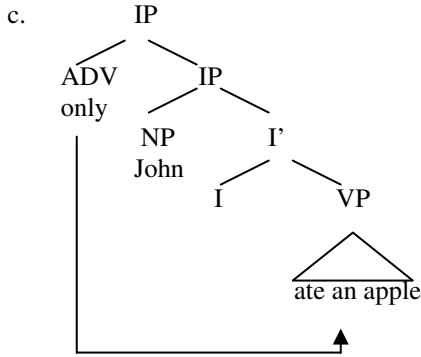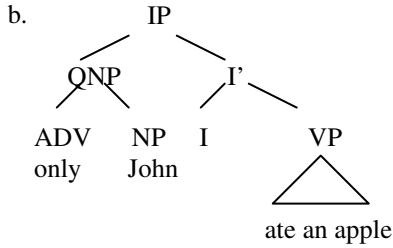
The results from this experiment showed that children rejected presubject *zhiyou*-constructions in both 'adult-true' and 'adult-false' conditions for the same reason, i.e., because the character in question performed another action besides the one mentioned in the test sentences. This is compelling 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 assertions in either case. To illustrate, consider sentence (11), repeated here as (16).

(16) 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: $\forall x[(x \neq carrot) \rightarrow \neg (Mr\ Cat\ ate\ x)]$
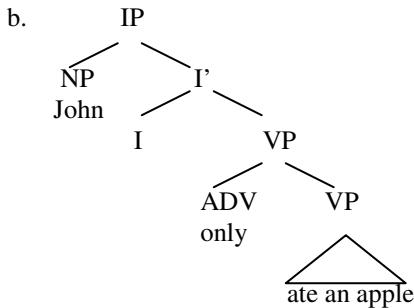   c. Assertion: $\forall x[(x \neq Mr\ Cat) \rightarrow \neg (x\ ate\ a\ carrot)]$

As noted earlier, when children rejected sentence (16), 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 (16a) and (16b). Only the assertion they computed was different from that of the adults, as in (16c), 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. Children have problems in identifying the correct focus. 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, the focus operator *zhiyou* 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, the focus operator *zhiyou* is normally treated as adverbial. Sentences (1) and (2) are used to illustrate, repeated here as (17) and (18).

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

b.
```
              IP
           /      \
        QNP        I'
       /   \      /  \
     ADV   NP   I    VP
     only  John      /\
                    /  \
                 ate an apple
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c.
```
              IP
           /      \
        ADV        IP
        only      /  \
                NP     I'
                John  /  \
                     I    VP
                         /\
                        /  \
                     ate an apple
```

(18) a. Yuehan zhi   chi-le   pingguo.
        John   only eat-ASP   apple
        'John only ate an apple.'

b.
```
           IP
          /  \
        NP    I'
        John /  \
            I    VP
                /  \
              ADV   VP
              only  /\
                   /  \
                ate an apple
```

For adults, when *zhiyou* appears in presubject position, as in (17a), it is used to modify the subject NP, as illustrated in the tree diagram (17b), where *zhiyou* c-commands the subject NP *John*, but not the VP *ate an apple*. In this case, the focus operator *zhiyou* and the subject NP *John* form a constituent, which we have labelled Quantified Noun Phrase (QNP). One source of evidence that they form a constituent comes from the fact that *zhiyou Yuehan* constitutes an acceptable fragment answer to wh-questions like (19) and (20) (see Radford 1997: 108 for discussion of this sentence fragment test of constituency).

      (19) a. Zhiyou shei   chi-le   pingguo?
              only   who eat-ASP   apple
              'Only who ate an apple?'
           b. Zhiyou Yuehan.
              only   John
              'Only John.'
      (20) 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 (18a), it is treated as an adverbial, which c-commands and is adjoined to the VP, as indicated in (18b). In contrast to adults, children initially treat *zhiyou* as an adverbial whenever it occurs in a presubject position or a preverbal position. When it occurs in a presubject position, the focus structure is represented as in (17c), in which *zhiyou* is adjoined to the whole sentence as a sentential adverbial. It tends to be associated with the VP, presumably on par with other sentential adverbs (e.g., *always*, *probably*, *similarly*) which can be associated with the entire sentence or with the VP, but not with the subject NP. This explains why children interpreted (17a) as having the same meaning as (18a).

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.

4. Experiment 2

According to Relativized Minimality, as proposed by Rizzi (1999, 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.

> (21) 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 (22), if Z c-commands Y, Z does not c-command X, and X and Z are of the same structural type.

> (22) *… 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 (23a).

> (23) a. Zhiyou Yuehan meiyou chi pingguo.
> only John not eat apple
> 'Only John didn't eat an apple.'
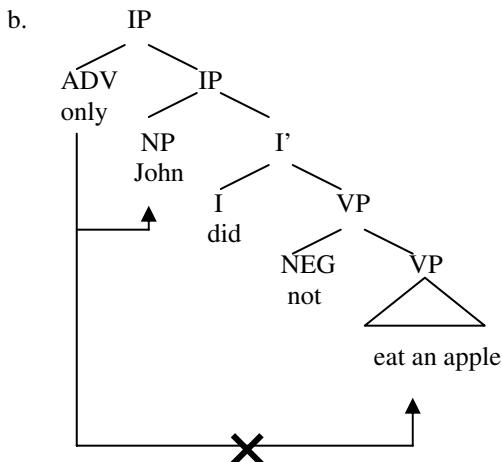
From Experiment 1, we know that Mandarin-speaking children treat the focus operator *zhiyou* in presubject position as sentential adverbial and thus tend to associate it with the VP, as indicated in (17c). The addition of negation *meiyou* 'not' in preverbal position should, therefore, block this association, since 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 encouraged by their grammars to access the adult-like reading, i.e., associating the focus operator with the subject, since the subject NP is the only element that remains in the c-command domain of the focus operator. This expected change in the association of the focus operator is graphically depicted in (23b).

4.1. 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.

4.2. Procedures

Child subjects were tested using Truth Value Judgement Task. They were given 2 practice items prior to the actual test. In one, the puppet's statement was obviously true and in the other it was obviously false, so that children witness the puppet saying something wrong, as well as something right. Adult controls were tested on the same stories but using a questionnaire.

4.3. Materials

Two types of test sentences were created. One used the sentence structure discussed above, as illustrated in (23a) (Type 1). The other was a simple *zhiyou*-construction, as in (1), repeated here as (24) (Type 2).

> (24) 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 (23a) false and (24) 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. 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 they front paws, their back paws slide off the branches. No luck, they didn't climb to the top. They failed.

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 what has been called 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 is under consideration. In Truth Value Judgement Task, children are asked to say whether sentences are true or false. Following Russell's observation, it is appropriate to invite children to make a negative judgment for a sentence only if the corresponding positive judgment is 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 (25) and (26).

> (25) 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.'

(26) 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 child subject also witnessed three control scenarios. Following each scenario, the puppet produced statements which were either obviously true or obviously false.

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 (25), followed by simple *zhiyou*-constructions like (26). 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.

4.4. 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 for Type 1 test sentences. None of the subjects accepted any of the 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 (25) 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), adults 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. These children 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 (26) by pointing out that the black dog also climbed up the small tree.

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 accepted Type 2 test sentences significantly more often than children who heard Type 2 test sentences first (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. 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 proposed analysis according to which Mandarin-speaking children treat contrastive focus operators like *zhiyou* as adverbials. Children learn that presubject *zhiyou* can also sometimes be associated with the subject NP, based the evidence from *zhiyou*-constructions with preverbal negation. From that point on, children 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 step in the concluding discussion.
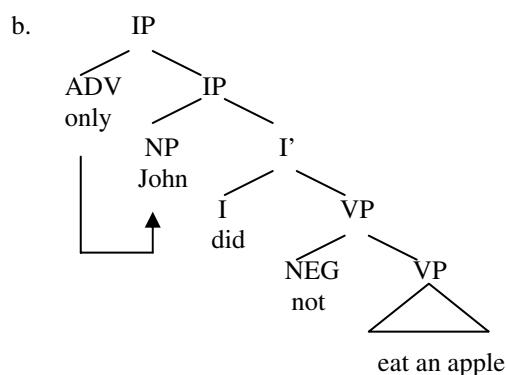
5. Conclusion

We began the present study by investigating how Mandarin-speaking children and adults understand contrastive focus structures like *Zhiyou Yuehan chi-le pingguo* 'Only John ate an apple'. It was found that children tended to associate the focus operator *zhiyou* with the VP, whereas adults uniquely associate it with the subject NP (Experiment 1). 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
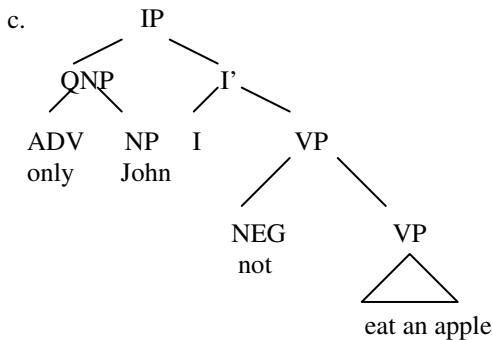
al.'s (1994) proposal about the source of children's non-adult interpretation. However, previous research does not tell us the whole story. One thing that has remained unspecified is a detailed account of why children are VP-oriented. Another missing piece is an account of children's transition to the 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 second 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 2. 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 (23a) is used to illustrate, repeated here as (27a). 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 (27b), which is different from that of adults, as indicated in (27c), where the focus operator *zhiyou* and the subject NP *Yuehan* form a constituent *zhiyou Yuehan* 'only John'.

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

b.

c.

```
                    IP
                  /    \
              QNP       I'
             /   \     /   \
          ADV    NP   I      VP
          only  John        /   \
                          NEG    VP
                          not   /\
                               /  \
                           eat an apple
```

Therefore, to converge on the adult grammar, children require further primary linguistic data revealing that the pre-subject focus operator *zhiyou* forms a constituent with the subject NP, since sentence structures like (27a) do not reveal this constituent relation. We contend that one such kind of primary linguistic data are readily available to children, namely fragment answers to wh-questions, as discussed in (19) and (20) and repeated here as (28) and (29). This, in combination with a 'uniqueness' constraint on form/meaning correspondence, informs children that the presubject focus operator must be 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.

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

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