Lexical Aspect and the Use of Negation by Mandarin-Speaking Children

Peng Zhou, Stephen Crain, and Rosalind Thornton

1. Introduction

There are two primary negation markers in Mandarin Chinese, *bu* and *mei* (both are translated as English *not*). It is generally agreed that *bu* is used to negate habitual or future/volitional situations, whereas *mei* negates the completion of an event (e.g., Li and Thompson, 1981; Lü, 1980). Consider sentences (1) and (2), for example.

(1) Wo bu   chi xilanhua.
　　I   not eat broccoli
　 'I don't eat broccoli /I will not eat broccoli/I don't want to eat broccoli.'
(2) Wo mei chi xilanhua.
　　I   not   eat broccoli
　 'I didn't eat broccoli.'

Sentence (1) with the negation marker *bu* can have three interpretations: a habitual reading (i.e., I don't eat broccoli), a future reading (i.e., I will not eat broccoli), or a volitional reading (i.e., I don't want to eat broccoli). But if the negation marker *bu* is replaced by *mei*, as in (2), the only available interpretation is one in which *mei* negates the fact that the speaker ate broccoli.

The use of the two negation markers in Mandarin Chinese is closely related to *aspect*, as has long been discussed in the literature (e.g., Ernst, 1995; Hsieh, 2001; Li, 1999; Lin, 2003a; Shen, 1995; Wang, 1965). The present study focuses on the interaction between negation and *lexical aspect*. We present an experimental study investigating the relationship between lexical aspect and the use of the two negation markers by young Mandarin-speaking children. Before reporting the experiment, we will provide a brief review of the relationship between negation and lexical aspect in Mandarin Chinese.

2. Lexical aspect in Mandarin Chinese

Lexical aspect refers to the inherent temporal meanings of verbs or verb phrases. Verbs can be partitioned into four aspectual categories (Vendler, 1967): (a) *states*, as denoted by verbs such as *resemble*, (b) *activities*, verbs that denote events with duration, but with an arbitrary endpoint, such as *play*, (c) *accomplishments*, verbs that denote events with an inherent endpoint, but also with extended duration, i.e., identifiable phases that transpire before the endpoint is reached, such as *draw a picture*, and (d) *achievements*, verbs that denote events with an endpoint that is reached instantaneously, such as *find*. The four categories of states, activities, accomplishments and achievements are often defined using three features: dynamicity (stative vs. dynamic), durativity (durative vs. punctual) and telicity (telic vs. atelic) (cf. Smith, 1991). Dynamicity refers to whether or not there is change in the situation denoted by the verb. Durativity refers to the temporal extension of a situation. Telicity refers to whether or not a situation has an inherent endpoint.

Verbs or verb phrases in Mandarin Chinese can be partitioned into four categories using the three features just described (Li, 1990; Li and Bowerman, 1998). First, verbs can denote states. States are non-dynamic, durative and atelic events. In Mandarin Chinese, states can be basic level predicates containing verbs like *ai* 'love', *xihuan* 'like', *zhidao* 'know', and *xiang* 'resemble'. State predicates in Mandarin Chinese also consist of adjectives such as *gaoxing* 'happy', *gao* 'tall', *gui* 'expensive'. These adjectives can directly be the predicate without a copular verb, as in (3) and (4) (Chao, 1968).

(3) Yuehan hen gaoxing.
　　John　very happy
　　'John is very happy.'
(4) Zhe-ben shu　hen　gui.
　　this-CL　book very expensive
　　'This book is very expensive.'

A second aspectual category is activities. Activity verbs pick out durative and atelic situations, like *wan* 'play', *tiaowu* 'dance' and *chi* 'eat'. These verbs differ in meaning from states in that activity verbs refer to events with (dynamic) successive stages and an arbitrary final point. Next are verbs of accomplishment. These verbs pick out durative and telic events, and include verb phrases such as (5) and (6). In these examples, the events denoted by the verb phrases consist of a process and an outcome (or change of state). Finally, verbs that fall into the category of achievements denote instantaneous events that result in a change of state. Typical achievement verbs are *find, break, see, hear,* etc. Unlike English which uses a single lexical item, most of the Mandarin counterparts to achievement verbs require the presence of resultative verb compounds, i.e., two lexical items are combined to express an end state that is being achieved. More specifically, in Mandarin Chinese activity verbs may combine with state verbs to indicate the end state of an action/event, e.g., *zhao-dao* 'look-find' (=*find*), *da-po* 'hit-break' (=*break*), *kan-jian* 'look-perceive' (=*see*), *ting-jian* 'listen-perceive' (=*hear*). As suggested by the glosses, the attainment of an end point in these achievement verbs is marked by the addition of a second verb (indicating the result) of the resultative verb compound[2].

(5) Xie-le　　yi-feng　xin
　　write-ASP one-CL letter
　　'Wrote a letter'
(6) Hua-le　　yi-fu　　hua
　　draw-ASP　one-CL picture
　　'Drew a picture'

3. The interaction between lexical aspect and negation

In Mandarin Chinese, lexical aspect interacts with negation. The two negation markers *bu* and *mei* co-occur with verbs that denote different aspectual relations. *Bu* occurs with state and activity verbs, but not with accomplishment or achievement verbs. *Mei* occurs with accomplishment, achievement and activity verbs, but not with state verbs. To illustrate, (7a) is well-formed because *bu* occurs with a state verb *xiang* 'resemble', but (7b) is ill-formed because *mei* cannot be combined with the state verb *xiang*. By contrast, *mei* is acceptable with the achievement verb *zhaodao* 'find', as in (8b), but *bu* cannot occur with this achievement verb, as (8a) indicates.

(7) a. Yuehan bu xiang　　ta　mama.
　　　John　not resemble his mother
　　　'John doesn't resemble his mother.'

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[2] Resultative verb compounds in Mandarin Chinese can also be used to express accomplishment. The distinction between accomplishment resultative verb compounds and achievement verb compounds is not critical for present purposes. Interested readers are referred to Li (1990), Lin (2003b), Wu (2002) and Xiao & McEnery (2004).

   b. *Yuehan mei xiang   ta mama.
      John   not resemble his mother
      'John doesn't resemble his mother.'
(8) a. *Yuehan bu zhaodao Mali.
      John not find   Mary
     'John didn't find Mary.'
   b. Yuehan mei zhaodao Mali.
      John   not find   Mary
      'John didn't find Mary.'

The purpose of the present study is to examine the relationship between lexical aspect and the use of negation by Mandarin-speaking children. Previous research on Mandarin-speaking children's acquisition of negation mainly focused on children's knowledge of the basic semantics of the two negation markers. As discussed in the introduction, *bu* is generally used to negate habitual or future/volitional situations, whereas *mei* negates the completion of events. Previous studies have found that Mandarin-speaking children have mastered the basic semantics of the two negation markers by age four (Fan, 2007; Lee and Fan, 2009; Zhang et al., 2006; Zhou, 2002). However, to the best of our knowledge, no studies have looked at the interaction between lexical aspect and negation in child Mandarin. The present study was designed to determine the age at which young Mandarin-speaking children are sensitive to the interaction between lexical aspect and the two negation markers *bu* and *mei*.

4. Experiment

4.1. Participants

Forty-six monolingual Mandarin-speaking children participated in this experiment. They were divided into three age groups: 14 children were between 3;5-3;11 (8 boys and 6 girls), 16 children were between 4;0-4;5 (10 boys and 6 girls), and 16 children were between 4;7-5;0 (9 boys and 7 girls). All the child participants were recruited from the kindergarten at Beijing Language and Culture University. They had no reported history of speech, hearing or language disorders.

4.2. Procedures

We tested children using a two-choice forced-judgement task. Children were engaged in a game with two puppets (Kermit the Frog and a kitten) played by two experimenters. Children were told that both of the puppets were learning Mandarin Chinese. The child and the two puppets listened to stories acted out by an experimenter. After each story, one of the puppets produced a sentence with *bu*, and one produced a sentence with *mei*. The child's task was to help the puppets to learn Mandarin by letting them know which one had produced a 'correct' sentence of Mandarin. The child participants were introduced to the task individually and then tested individually. They were given 2 practice trials before the actual test session. On one practice trial, Kermit said a grammatical sentence and the kitten said an ungrammatical sentence, and on the other trial Kermit's statement was ungrammatical and the kitten's statement was grammatical. These practice trials were used to familiarise the child with the task, as well as to ensure that children had no difficulty performing the task. Only children who correctly distinguished the grammatical sentences from the ungrammatical sentences on both practice trials were included in the actual test. One 4-year-old child was excluded from the actual test, since he did not respond correctly to one of the practice trials.

4.3. Materials and design

Ten pairs of test sentences were constructed, 5 in which the sentence with *bu* was grammatical and 5 in which the sentence with *mei* was grammatical. The 5 pairs in which the *bu* sentence was grammatical used state verbs, and the 5 pairs in which the *mei* sentence was grammatical used either accomplishment or achievement verbs. The ten verbs used in the test sentences are given in Table 1. We counterbalanced which of the two puppets produced the grammatical statements and which of them spoke first. Two examples are used to illustrate.

Table 1 Verbs used in the experiment

	Verb types	
Negation markers	**States**	**Accomplishments/Achievements**
Bu is grammatical	*zhidao* 'know'	
Mei is ungrammatical	*xiang* 'resemble'	
	kaixin 'happy'	
	haokan 'beautiful/nice'	
	hao-chi 'good-eat'= *taste good*	
Bu is ungrammatical		*zhao-dao* 'look-find'= *find*
Mei is grammatical		*kan-jian* 'look-perceive' = *see*
		da-bai 'beat-defeat' = *defeat*
		da-po 'hit-break' = *break*
		tiao-guo 'jump-over' = *jump over*

On a typical trial, the experimenter acted out the following story. In this story, a pirate was hunting for treasure in the underwater world. He came to the fish and asked him if he knew where the treasure was hidden. The fish told the pirate that it might be hidden behind the corals. The pirate went to the corals, but he only found some seaweeds. He then came across a mermaid. He asked the mermaid to tell him where the treasure was hidden in a very impolite way. The mermaid got angry and went away. The pirate then climbed up to the top of a big shell, but he only saw some stones. So, he decided to give up and then left. Following the story, Kermit produced (9a) and the kitten produced (9b). The child was then asked to judge which puppet had said the sentence correctly.

(9) a. Haidao bu zhidao baozang zai nali.
     pirate not know treasure at where
     'The pirate didn't know where the treasure was.'
   b. *Haidao mei zhidao baozang zai nali.
      pirate not know treasure at where
      'The pirate didn't know where the treasure was.'

On another trial, the experimenter acted out a story like this. Again, the story happened in the underwater world. This time a scuba diver was going to explore the underwater world. He had never been to the underwater world before, so he came to a scientist and asked the scientist what it was like in the underwater world. The scientist taught the scuba diver about the underwater world, and then sent him down to the underwater world to see what he could find. The diver's task was to find a shell and then bring it back. The diver first came to a stone. He felt it and left. He then came to a fish. He thought it might be a shell, because it looked very shiny and it had beautiful colours. So he brought it back to the scientist. After the story, Kermit produced (10a) and the kitten produced (10b). Again, the child was asked to judge which puppet had said the sentence correctly.

(10) a. *Qianshuiyuan bu zhaodao beike.
      scuba diver not find shell
      'The scuba diver didn't find shells.'
    b. Qianshuiyuan mei zhaodao beike.
       Scuba diver not find shell
       'The scuba diver didn't find shells.'

There were ten trials, each consisting of a story and a pair of test sentences (one with *bu* and one with *mei*). The first 5 pairs used state verbs and the other five used either accomplishment or achievement verbs. The trials were presented in a pseudo-random order.

4.4. Predictions

As discussed, the negation marker *bu* is compatible with state verbs, but not with accomplishment or achievement verbs, whereas the negation marker *mei* is compatible with accomplishment or achievement verbs, but not with state verbs. So if children were sensitive to the interaction between lexical aspect and the two negation markers, then they would be expected to choose the sentence with *bu* as the correct sentence when presented with sentence pairs containing state verbs. By contrast, children should choose the sentence with *mei* as the correct one when presented with sentence pairs containing accomplishment or achievement verbs. For example, on the first example trial children should judge Kermit's statement in (9a) to be correct, but they should judge the kitten's statement in (10b) to be correct on the second example trial.

4.5. Results and discussion

The dependent measure was the proportion of correct responses. Figure 1 shows the proportion of correct responses to sentence pairs containing state verbs by the three age groups. Figure 2 summarises the proportion of correct responses to sentence pairs containing accomplishment or achievement verbs by the three age groups.
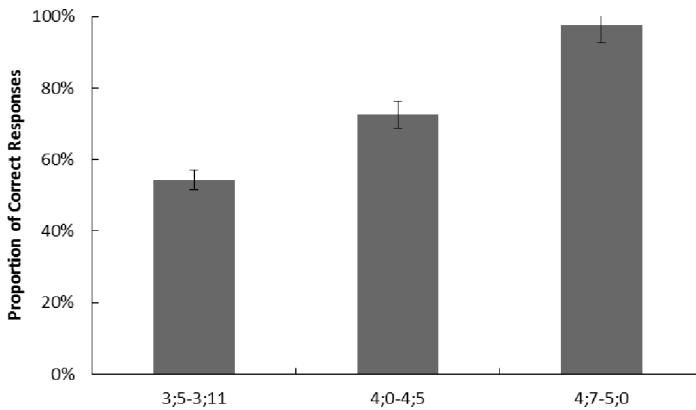

Fig.1. Mean proportion of correct responses to sentence pairs containing state verbs by the three age groups
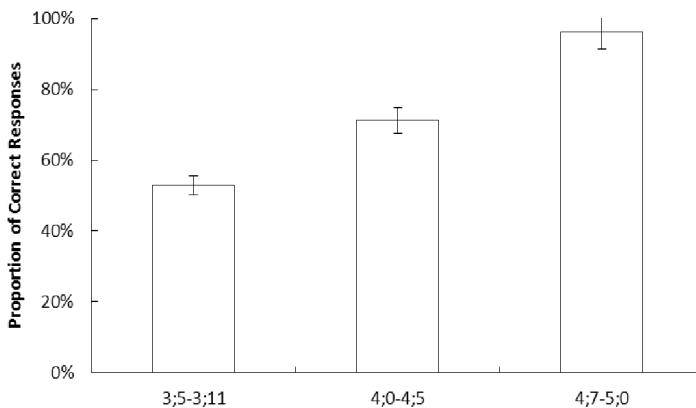

Fig.2. Mean proportion of correct responses to sentence pairs containing accomplishment or achievement verbs by the three age groups

The two figures indicate that children exhibited a developmental pattern of correct responses. In response to sentence pairs containing state verbs, children aged between 3;5-3;11 correctly chose the

sentences with *bu* only 54.29% of the time, children aged between 4;0-4;5 did so 72.50% of the time, and children aged between 4;7-5;0 97.50% of the time. In response to sentence pairs containing accomplishment or achievement verbs, children aged between 3;5-3;11 judged the sentences with *mei* to be correct 52.86% of the time, children aged between 4;0-4;5 did so 71.25% of the time, and children aged 4;7-5;0 96.25% of the time.

To assess the pattern statistically, generalised linear mixed models (GLMMs) were applied using the R software package, version 2.15.0 (R Development Core Team). This analysis corresponds to a logistic regression, taking into account the variability that occurred across participants and across items. We fit the data from the two conditions separately (i.e., a model for sentence pairs containing state verbs and a model for sentence pairs containing accomplishment or achievement verbs). The models treated age (i.e., three age groups) as fixed effects, with random intercepts and slopes for both participants and items (Baayen et al., 2008).

The models revealed that age was a reliable predictor for sentence pairs containing state verbs ($\beta =$ 1.54, $SE = 0.29$, $z = 5.39$, $p < .001$) as well as for sentence pairs containing accomplishment or achievement verbs ($\beta = 1.35$, $SE = 0.38$, $z = 3.57$, $p < .001$). In both conditions, the proportion of correct responses increased with age. The patterns displayed by Figures 1 and 2 were supported by the statistical modelling. Children exhibited a developmental pattern in their proportion of correct responses. Children aged 4;7 and older manifested adult-like knowledge of the interaction of lexical aspect and the two negation markers *bu* and *mei* in Mandarin Chinese. These children knew that the negation marker *bu* can occur with state verbs, but not with accomplishment or achievement verbs, whereas the negation marker *mei* is compatible with accomplishment or achievement verbs, but not with state verbs. Children aged between 4;0 and 4;5 were less sensitive to this interaction between lexical aspect and negation. Finally, children younger than 4;0 responded at chance.

The findings indicate that Mandarin-speaking children know how lexical aspect interacts with negation by age 4;7. One question remains to be answered, however. Why do Mandarin-speaking children younger than 4;7 have problems with the interaction between lexical aspect and negation? We turn to this in the concluding discussion.

5. Conclusion

The present study investigated how lexical aspect interacts with negation in child Mandarin. We found that children aged 4;7 and above manifested adult-like knowledge of the relationship between lexical aspect and negation; children between 4;0 and 4;5 were less sensitive to this property; and children younger than 4;0 responded at chance. Then a natural question to ask is that why children younger than 4;7 do not have adult-like knowledge of how lexical aspect interacts with negation. First, one could hypothesise that children younger than 4;7 do not have adult-like knowledge of negation. Alternatively, one could assume that younger children do not have adult-like knowledge of lexical aspect. However, these two possibilities could be ruled out based on previous research on Mandarin-speaking children's knowledge of negation and lexical aspect. Previous studies have shown that Mandarin-speaking children have adult-like knowledge of lexical aspect and negation around age four (Fan, 2007; Lee and Fan, 2009; Li, 1990; Li and Bowerman, 1998; Zhang et al., 2006; Zhou, 2002). In light of the previous findings, we propose that younger children's non-adult interpretation is due to their non-adult-like knowledge of the relationship between lexical aspect and negation. In other words, although younger children do not have problems with negation and lexical aspect alone, they have problems with how the two interacts with each other.

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