Chinese children's understanding of false beliefs: the role of language*

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ABSTRACT

The present study investigated the universality of the early development of young children's understanding and representation of false beliefs, and specifically, the effect of language on Chinese-speaking children's performance in false belief tasks under three between-subjects conditions. The three conditions differed only in the belief verb that was used in probe questions regarding one's own or another person's beliefs, namely the Chinese verbs, *xiang*, *yiwei*, and *dang*. While the three words are all appropriate to false beliefs, they have different connotations regarding the likelihood of a belief being false, with *xiang* being more neutral than either *yiwei* or *dang*. Experiment 1 involved thirty-five Chinese-speaking adults who responded to false belief tasks to be used in Experiment 2 in order both to establish an adult comparison and to obtain empirical evidence regarding how Chinese-speaking adults use the three belief verbs to describe different false belief situations. In Experiment 2, 188 three-, four-, and five-year-old Chinese-speaking children participated in three false belief tasks. They were asked to report about an individual's false belief when either *xiang*, *yiwei*, or *dang* was used in the probe question. Results revealed a rapid developmental pattern in Chinese-speaking children's understanding of false belief, which is similar to that found with Western children. In addition, children performed significantly better when *yiwei* and *dang*, which

connote that the belief referred to may be false, were used in belief questions than when *xiang*, the more neutral verb, was used. This finding suggests an important role of language in assessing children's understanding of belief and false belief.

INTRODUCTION

In the past two decades, a great deal of research has focused on preschool children's acquisition of an understanding of intentionality or a 'theory' of mind (Taylor, 1996; Lee & Homer, in press). Central to this understanding is the ability to represent false beliefs, that is, the ability to understand that an individual, self or other, may hold a belief that does not correspond to a true state of affairs. In a typical false belief task for assessing such an understanding (e.g. the Maxi task used by Wimmer & Perner, 1983), children are shown a scenario in which a story character (e.g. Maxi) places a candy in one location. In his absence, Maxi's mother moves the candy to a new location. Children are then asked: 'Where does Maxi think the candy is?' or 'Where will Maxi look for the candy when he returns?' Research has revealed a dramatic shift around four years of age in children's understanding of false beliefs (for a review, see Wellman, 1990; Astington & Gopnik, 1991; Perner, 1991; Taylor, 1996; Lee & Homer, in press). Unlike three-year-olds, four-year-olds develop rapidly in their ability to represent both others' beliefs and changes in their own beliefs (Wimmer & Perner, 1983; Hogrefe, Wimmer & Perner, 1986; Perner, Leekam & Wimmer, 1987; Gopnik & Astington, 1988; Moore, Pure & Furrow, 1990; Sullivan & Winner, 1991; Wimmer & Hartl, 1991). However, several researchers also suggested that under four years of age children may possess a fledgling understanding of theory of mind (Chandler, Fritz & Hala, 1989; Hala, Chandler & Fritz, 1991).

Most of the evidence regarding this rapid developmental pattern was obtained from studies involving children from western cultures who speak Indo-European languages. More recently, however, researchers have begun to extend the same experimental paradigm to children of other cultures (Avis & Harris, 1991; McCormick/Vinden & Olson, 1991; Vinden, 1996). Such research is essential to claims regarding the universality of the developmental pattern. Cross-cultural research also makes it possible to examine cultural variability of theory of mind (D'Andrade, 1987; Vinden, 1996), and certain potential factors that may affect children's false belief understanding, especially those related to the forms of language and other cultural practices. The study of the development of false belief understanding is particularly interesting in languages with lexical items that differentiate between true and false beliefs. One such language is Standard Chinese Language (or Putonhua, a standardized, official version of Mandarin).

In the present study, we examined whether the same developmental pattern of false belief understanding exists with Chinese-speaking preschool children, and more specifically, the effect of Chinese language on children's performance in false belief tasks. The choice of Chinese language as the focus of our study was because the Standard Chinese, unlike English, contains several belief verbs for describing both true and false beliefs (e.g. *xiang*, *yiwei*, *renwei*, *cai*, *juede*, and *xiangxin*). At least two of them, *xiang* and *yiwei* are the words that Chinese preschool children are familiar with and often use in their daily conversations (Zhu, 1986). While both words describe beliefs (Liang, Fu & Chu, 1977; Wu, 1981; Editorial Division, 1995), they differ in the extent to which they characterize beliefs as true or false. In situations similar to the one that children encounter in a false belief task (e.g. the Wimmer & Perner Maxi task), an individual is asked, as a bystander, to report another person's (say, Maxi's) belief. If the individual understands that Maxi holds, held, or has the tendency to hold, a TRUE belief, both *xiang* and *yiwei* can be used to describe Maxi's state of mind. The choice of the words depends on whether the individual intends to emphasize the likelihood of truthfulness of the belief. When the likelihood of the belief's truthfulness is more than neutral, the verb *xiang* is likely to be used (e.g. 'Maxi *xiang* there is a candy in the box'). When the belief's likelihood of being true is somewhat neutral, *yiwei* is used (e.g. 'Maxi *yiwei* there is a candy in the box').

When one understands that Maxi holds, held, or may hold, a FALSE belief, both words are also acceptable. In this situation, *xiang* only has a neutral connotation. By contrast, *yiwei* has a less than neutral connotation and tends to convey a sense that the belief in question may be false. Thus, while *xiang* is similar to 'think' or 'believe' in English, the meaning of *yiwei* is somewhat similar to the English word 'assume'. When the two words are used in questions, which is the case in a typical false belief task (e.g. where does Maxi think the candy is?), a question with either of the words (e.g. where does Maxi *xiang*/*yiwei* the candy is?) invites a person to report about Maxi's belief. The answer to those questions depends on whether Maxi's belief is correctly represented by the person, regardless of the belief verb used in the question. A similar situation in English is: where does Maxi think/believe/ assume the chocolate is?

In addition to these two words, one can also use another verb, *dang*, to talk about situations involved in common false belief tasks. Unlike *xiang* and *yiwei* that can be used to describe any belief situation, *dang* has a limited usage: first, it is only suitable for describing false belief situations. Second, the word seems to be more commonly used for certain false belief situations than others. For example, the word is most often used to talk about mistaken identities (e.g. 'Maxi *dang* I am a teacher'). The word can also be used for describing erroneous thoughts (e.g. 'Maxi *dang* the basket is empty'), though not as commonly as for the former situation.

TABLE 1. *The connotations of three Chinese belief verbs*
xiang, yiwei, *and* dang

| | Likelihood of truth as implied by the word about the belief in question | | |
	High	Neutral	Low
xiang	+	+	−
yiwei	−	+	+
dang	−	−	+

'+' means 'applicable' and '−' means 'not applicable'.

The different connotations of the three Chinese belief verbs are illustrated in Table 1. It should be noted that to the best of our knowledge there exists no formal linguistic analysis on the three words. Also, the difference between the three verbs is more complicated than is shown in the table. Table 1 simplifies the differences to help non-Chinese-speaking readers understand the differential connotations of the verbs. The other usages of the three words are listed in Appendix I.

The present study, conducted in People's Republic of China, examined whether Chinese preschool children follow the same developmental pattern of false belief understanding as Western children, and the effect of the three belief verbs in Chinese language on Chinese children's performance in false belief tasks. Two experiments were conducted. Experiment 1 used Chinese-speaking adults as informants, while Experiment 2 used Chinese-speaking children. For the child participants, there were three conditions differing only in the belief verb used to assess the understanding of false belief (the *xiang*, *yiwei*, and *dang* conditions). Children were randomly assigned to each of the three conditions. In each condition, the same three tasks were used. The first task (the matchbox task), modelled after Hogrefe *et al.* (1986), involves a matchbox with its conventional content (matches) removed and an unconventional content (a pencil stub) inserted. Children were asked to report their own prior beliefs regarding the content of the matchbox. The second task is a modified version of the Maxi task used in Wimmer & Perner (1983) (the Baobao task) in which a child named Baobao places his candy in a basket and in his absence, his mother transfers the candy to a box. The third task uses a book-reading format. In the task, children were read a richly illustrated story in which a mother cat takes her family on a picnic (the cat task). She mistakes a tortoise for a rock and places food and plates on the back of the tortoise. Children were asked to report the cat's belief regarding the identity of the animal.

If Chinese language has any impact on children's performance in these false belief tasks, children should perform better in these false belief tasks in

which *yiwei* is used in the probe question than the tasks in which *xiang* is used. This is because *yiwei* is more appropriate than *xiang* for describing false beliefs. It highlights to children the fact that it is an individual's false belief, not true belief, that they need to report. The word *xiang* simply does not have such a connotation. Hence, as long as children are able to represent correctly the individual's false belief, they should be more likely to report the false belief in the *yiwei* condition than in the *xiang* condition. In addition, for a similar reason, children should also perform better in the *dang* condition than in the *xiang* condition, particularly in the cat task because the task requires children to report a false belief about one's identity for which the word *dang* is specially appropriate to be used.

Due to the lack of formal linguistic analysis on the three Chinese belief verbs, the false belief paradigm was administered first to Chinese-speaking adults in Experiment 1. The purpose of this experiment was to obtain empirical evidence regarding the similarities and differences between the three verbs in Chinese-speaking adults' descriptions of different false belief situations. Three procedures were used. First, adults were administered the same tasks as those used with children (the standard procedure). This procedure was to ascertain whether Chinese-speaking adults took a belief question using each of the three belief verbs as asking for the same response. Second, another group of adults participated in a sentence completion procedure in which they were asked to provide a belief verb to describe the situations involved in the above false belief tasks. Further, in a subsequent ranking procedure, adults were asked to determine which of the three verbs best described a protagonist's false belief in each of the three false belief tasks. These two procedures were designed to assess, in Chinese-speaking adults' view, the relative degree of appropriateness of the three belief verbs for describing false belief situations.

EXPERIMENT 1

METHOD

Participants

Thirty-five Chinese-speaking adults participated in the experiment. Fifteen of them (Group 1) participated in the three false belief tasks using a standard procedure (see below). A different procedure was used for the rest of the 20 adult participants (Group 2) (see below). Adults were recruited from a residential neighbourhood in Hangzhou, P. R. China. They were from various vocations and had varying levels of education.

Materials and procedures

Materials and procedures for the standard procedure. Group 1 adults were seen individually. They were randomly assigned to one of the three conditions

that only differed in the belief verb used in the belief questions. Each adult participated in three false belief tasks in random order. In order to make adults' performance as comparable as possible to the children in Experiment 2, each task was administered in the same manner as it was done in Experiment 2 with preschool children. The testing was conducted in Standard Chinese.

1. *The matchbox task*

Adults were first shown a matchbox and asked the content of the matchbox. All the adults reported the conventional content of a matchbox. The experimenter then revealed the true content of the matchbox, a pencil stub, and asked the following question:

(a) Actual instruction in Standard Chinese: Zai Wo Da Kai Huo Chai He Zhi Qian, Ni *Xiang/Yiwei/Dang* Li Mian Shi Shen Me?

(b) Literal translation in English: Before I open the matchbox, you *xiang/yiwei/dang* in it is what?'

(c) Figurative translation in English: Before I open the matchbox, what did you *xiang/yiwei/dang* was in it?

2. *The Baobao task*

The adult was read a story called the Baobao story (see Appendix II), accompanied by illustrations. The story is a simplified version of the story used in Wimmer & Perner (1983). The story involves a boy named Baobao who leaves a candy in a basket and goes to the washroom. In his absence, his mother moves the candy to a box. The following questions were asked:

(Question 1) Where did Baobao put his candy before he went to the washroom?

(Question 2) Baobao's mother put his candy in where? (Where did Baobao's mother put his candy?)

(Question 3) Baobao know not know his mother put his candy in the box? (Does Baobao know or not know his mother put his candy in the box?)

(Question 4)

(a) Actual instruction in Standard Chinese: Bao Bao *Xiang/Yiwei/Dang* Ta De Tang Zai Na Li?

(b) Literal translation in English: Baobao *xiang/yiwei/dang* his candy in where?

(c) Figurative translation in English: Where does Baobao *xiang/yiwei/dang* his dandy is?

(Question 5) Baobao will first go to where *na* his candy? (Where will Baobao go to for his candy first?).

The first two questions are memory control questions. The third question examines the participant's understanding of Baobao's state of knowledge/

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ignorance; the fourth question requires the participant to report Baobao's belief. The last question asks the participant to predict Baobao's search behaviour. The phrase 'to go to *na* first' instead of 'to look for' was used in the present study. *Na* in Standard Chinese means 'to take' (Wu, 1981).

3. *The cat task*

The adult was read a story called 'A Surprise Picnic' with illustrations (Goodall, 1977). The English version of the story is shown in Appendix III. The story involves a mother cat taking her family to an island for a picnic. She mistakes a sleeping tortoise for a rock and puts food and plates on the back of the tortoise. In the mother cat's absence, the tortoise goes into a cave carrying the food and plates with it. The cat family looks for the food and finds out that the 'rock' is in fact a tortoise.

The adult was read the story twice. The first reading was to inform the adult of the true identity of the rock/tortoise. On the second reading of the story, the experimenter stopped at the scene in which the mother cat is standing by the rock/tortoise and asked:

(Question 1) This is what (pointing at the rock/tortoise)? (What is this?)

(Question 2) Cat mother know not know this is a tortoise? (Does the mother cat know this is a tortoise?)

(Question 3)

(a) Actual instruction in Standard Chinese: Mao Ma Ma *Xiang/Yiwei/Dang* Zhe Shi Shen Me?

(b) Literal translation in English: cat mother *xiang/yiwei/dang* this is what?

(c) Figurative translation in English: What does the mother cat *xiang/yiwei/dang* this is?

Question 1 is a memory control. Again, Question 2 examines the adult's understanding of the mother cat's knowledge/ignorance and Question 3 the mother cat's belief.

Material and procedures for the sentence-completion and ranking procedures. Group 2 adults were also seen individually. They first participated in a sentence completion task in which they received the above three false belief tasks in the same manner as did Group 1 adults but Group 2 adults were not asked the above-mentioned probe questions. Instead, Group 2 adults were shown a ready-made statement that described the false belief situation involved in each of the three false belief tasks. However, the belief verb was left out in the statement. For example, in the matchbox task, the participants were shown the following statement: 'I ____ there were matches in the box'. They were asked to complete the sentence verbally with a verb so that the

The matchbox task

The Baobao task

The cat task
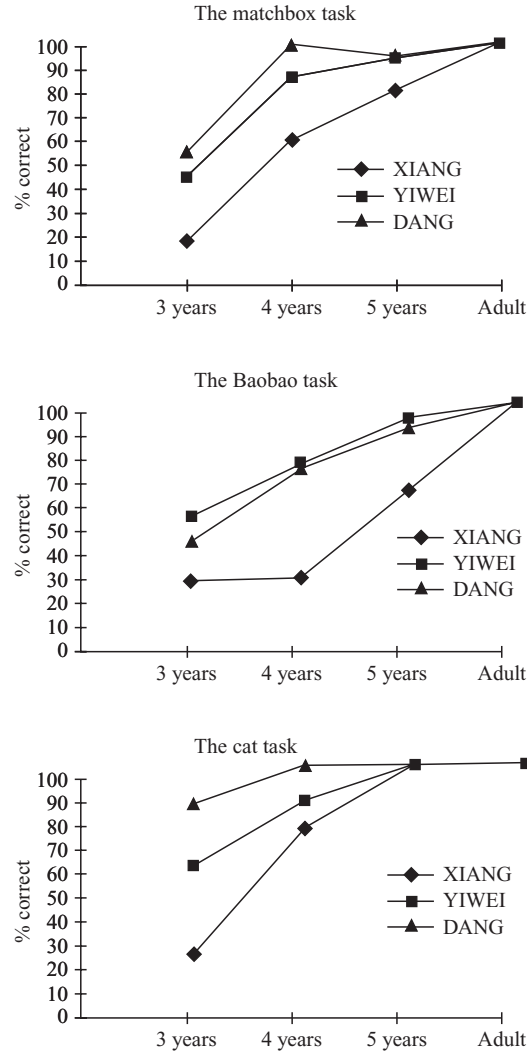
Fig. 1. Percent of three-, four-, and five-year-old children and adults in each condition passing the three false belief tasks.

statement best described the false belief situation in question. The sentence completion procedure was designed to elicit spontaneous use of belief verbs. The participant had to complete one sentence for each false belief task.

After the sentence completion task, the adult participated in the ranking task. The adult was presented with three statements that differed only in the

TABLE 2. *Adults' spontaneous use and ranking of the three belief verbs*

	Task		
	Matchbox/Self	Baobao	Cat
Spontaneous use of belief verbs (%)			
xiang	40 (8/20)	25 (5/20)	5 (1/20)
yiwei	10 (2/20)	20 (4/20)	50 (10/20)
dang	0	0	10 (2/20)
renwei	40 (8/20)	45 (9/20)	30 (6/20)
cai (guess)	5 (1/20)	0	0
juede (feel)	5 (1/20)	5 (1/20)	5 (1/20)
xianxin (believe)	0	5 (1/20)	0
Mean ranking			
xiang	2·00 (0·79)	2·10 (0·91)	2·75 (0·55)
yiwei	1·60 (0·68)	1·60 (0·68)	1·50 (0·51)
dang	2·40 (0·82)	2·30 (0·73)	1·75 (0·79)

For the spontaneous data, frequency and sample size are in parentheses; for the ranking data, the smaller the number, the higher the rank. Standard deviation is in parentheses.

belief verbs used (e.g. 'I *xiang/yiwei/dang* there were matches in the box'). The participant was asked to rank the statements in terms of how well they described the situation from 1 to 3, with 1 being the most appropriate. The ranking task was administered for each false belief task.

RESULTS

Figure 1 shows Group 1 adults' performance in the standard procedure. Not surprisingly, all adults in Group 1 gave correct answers to the belief questions in the standard false belief tasks.

Table 2 shows Group 2 adults' spontaneous use of Chinese belief verbs in the three false belief tasks and their ranking of the three belief verbs as 'best describing' the false belief situation in question. In the sentence completion task, adults used *xiang*, *yiwei*, *dang*, and other words, among which were *renwei*, *cai*, *juede*, and *xiangxin*. *Renwei* is an 'adult' word that encompasses the meanings of *xiang*, *yiwei*, and *dang*, and has a neutral connotation regarding beliefs and false beliefs. In this sense, its meaning is very similar to the English word 'think' (Liang *et al.*, 1977; Wu, 1981; Editorial Division, 1995). *Cai* means 'guess', *juede* 'feel', and *xiangxin* 'believe' (Liang, *et al.*, 1977; Wu, 1981; Editorial Division, 1995). Overall, adults tended to use either *xiang* or *renwei* spontaneously. *Dang* was only used in the cat task. A few adults also used *cai* (guess), *juede* (feel), and *xiangxin* (believe).

In the ranking task, adults gave consistent rankings for the three words in the three false belief tasks. Kendal's coefficients of concordance for the

matchbox, Baobao, and cat tasks are ·16 ($\chi^2[N = 20$, d.f. $= 2] = 6\cdot40$, $p <$ 0·05), ·13 ($\chi^2[N = 20$, d.f. $= 2] = 5\cdot20$, $0\cdot06 < p < 0\cdot08$), and 0·44 ($\chi^2[N = 20$, d.f. $= 2] = 17\cdot50$, $p < 0\cdot001$, respectively). *Yiwei* was ranked by adults as the most appropriate belief verb for describing a false belief situation. *Xiang* was ranked the second and *dang* the third in all but the cat task in which *dang* was a close second and *xiang* the third.

DISCUSSION

The results of the standard tasks confirm that a belief question using any of the three belief verbs invites the same answer regarding a protagonist's belief. In all three tasks, the individual in question had a false belief. Hence, the correct response was to report the individual's false belief, which all adult participants did as expected, regardless of which belief verb was used in the belief question.

Adults in the other two tasks, however, showed differential preference for different belief verbs. In the spontaneous task, the preferred belief verb was *renwei* and *xiang* for the Baobao and matchbox tasks, rather than *yiwei*. This is not surprising given the *renwei* and *xiang*, like English word 'think', generally have neutral connotations and encompass a broader range of belief situations. Adults overall seem to prefer to use a more general word than *yiwei* spontaneously. Despite adults' preference for neutral words in the spontaneous procedure, the same adults favoured *yiwei* over *xiang* in all three tasks when the three belief verbs were contrasted with each other. This suggests that *yiwei* is the most appropriate word among the three verbs for describing an individual's false belief, further confirming the linguistic analysis outlined in the introduction regarding the differences in connotation between *yiwei* and *xiang*.

With regard to *dang*, adults seldom used the word spontaneously. They consistently ranked the word as the least appropriate for describing a false belief situation in all but the cat task. In the cat task, *dang* was ranked a close second to *yiwei*. Note that the cat task is a special false belief situation involving a case of mistaken identity, which, as mentioned earlier, is one of the false belief situations for which *dang* is often used. It should be noted that the cat task also seemed special to the adults in the spontaneous procedure. Unlike in the other false belief tasks in which most of the adults spontaneously used neutral belief verbs, *xiang* and *renwei*, 50 % of the adults (10 out of 20) used *yiwei*, and two even used *dang* which was never spontaneously used in the other false belief tasks.

Three conclusions can be drawn from the results of the present experiment. First, to Chinese-speaking adults, the belief question using any of the three belief verbs invites the same report about an individual's belief. Second, although *yiwei* and *xiang* are both appropriate for describing false beliefs, *yiwei* is overall more appropriate than *xiang* to be used to talk about false

belief situations involved in the tasks of the present study. Third, the cat task involves a special false belief situation for which, in addition to that of *yiwei*, the use of *dang* is especially suitable.

EXPERIMENT 2

Experiment 2 used the same false belief tasks as those in Experiment 1 with Chinese-speaking preschool children. Based on the findings of Experiment 1, the following predictions were made. First, if the use of belief verbs has an impact on children's performance in false belief tasks, it should be expected that Chinese children perform better in the *yiwei* condition than in the *xiang* condition in all three false belief tasks. Second, Chinese children should perform better on the Cat task of the *dang* condition than they do on the same task of the *xiang* condition. In addition, the differential effect between *dang* and the other two words on Chinese-speaking children's performance in other false belief tasks was explored, though no specific directional predictions were made.

METHOD

Participants

One hundred and seventy-seven three-, four-, and five-year-old Chinese children were tested in the experiment. Seventeen three-year-olds, 20 four-year-olds, and 20 five-year-olds participated in the *xiang* condition (8, 10, 8 males and 9, 10, 12 females, mean ages: 3;4, 4;7, 5;4) respectively). Twenty three-year- olds, 21 four-year-olds, and 18 five-year-olds participated in the *yiwei* condition) 14, 8, 9 males and 6, 13, 9 females, mean ages: 3;5, 4;4, 5;4, respectively). Twenty three-year-olds, 21 four-year-olds, and 20 five-year-olds participated in the *dang* condition (14, 9, 7 males and 6, 12, 13 females, mean ages: 3;3, 4;5, 5;5, respectively). Eleven additional children were recruited but excluded from data analyses due to experimenter error (e.g. the experimenter missed at least two probe questions) or equipment failure (the tape recorder battery ran low).

The children were recruited in two medium-sized southern coastal cities (Hangzhou and Wenzhou) in the People's Republic of China (with a population of one million and 700,000, respectively). The children were enrolled in kindergartens that served children between ages of 2 and 6 years. All children spoke both Standard Chinese and a local dialect (Hangzhou dialect or Wenzhou dialect, which are essentially the same language as Standard Chinese except for word pronunciations. There are some differences in the use of expressions but they are irrelevant to the belief words in question). Standard Chinese is the language of radio and television. It is also used in the kindergartens for instruction and for interaction among

children. According to the teachers in the kindergartens, due to the economic boom and population migration, many households mainly use Standard Chinese. No children had any difficulty in understanding and using Standard Chinese, which was used in the interview.

Material and procedure

The same materials and procedures used in the standard procedure of Experiment 1 were employed in the present experiment. Children were seen individually and randomly assigned to one of the three conditions, the XIANG, YIWEI, or DANG conditions. The order of the three false belief tasks was counter-balanced between participants.

RESULTS

Preliminary analyses indicated no gender or order effects, and hence the data for both gender and order were combined for subsequent analyses. No child failed the memory control questions.

Children's response to the belief question

Figure 1 shows the percentage of children at each age who responded correctly to the belief question in the matchbox, Baobao and cat tasks under the three experimental conditions. A (3) language/condition × (3) age categorical analysis of variance using the SAS CATMOD procedure was conducted on children's responses in each false belief task. For the matchbox task, the main effects for age and language were significant, $\chi^2(N = 177$, d.f. $= 2) = 49.74$, $p < 0.001$, and $\chi^2(N = 177$, d.f. $= 2) = 19.35$, $p < 0.001$, respectively, while language by age interaction was not significant, $\chi^2(N = 177$, d.f. $= 4) = 4.05$, n.s. For the Baobao task, significant age and language effects were found, $\chi^2(N = 177$, d.f. $= 2) = 27.59$, $p < 0.001$, and $\chi^2(N = 177$, d.f. $= 2) = 18.60$, $p < 0.001$, respectively. Again, there was no significant language by age interaction, $\chi^2(N = 177$, d.f. $= 4) = 4.05$, n.s. By contrast, for the cat task, the language by age effect was significant, $\chi^2(N = 177$, d.f. $= 4) = 28.72$, $p < 0.001$. So were the age and language main effects, $\chi^2(N = 177$, d.f. $= 2) = 64.73$, $p < 0.001$, and $\chi^2(N = 177$, d.f. $= 2) = 28.36$, $p < 0.001$, respectively.

Although there was no *a priori* prediction regarding the task-related effects, a separate exploratory (3) language × (3) age × (3) task analysis using the SAS CATMOD was conducted with task as repeated measures. Since language and age effects were already examined in the above analyses, the effects of the two factors and their interaction were excluded from the testing model. Only the task main effect and task by age interaction were significant, $\chi^2(N = 177$, d.f. $= 2) = 53.00$, $p < 0.001$, and $\chi^2(N = 177$, d.f. $= 4) = 10.88$, $p < 0.05$, respectively, due to the difference between the cat task and the other two tasks (see Fig. 1).

Overall, three-year-olds in the *yiwei* and *dang* conditions consistently outperformed the three-year-olds in the *xiang* condition in the three tasks. Most three-year-olds in the *xiang* condition gave incorrect responses. They attributed incorrectly a true belief to an individual who should have a false belief. By contrast, three-year-olds' performance in the *dang* and *yiwei* conditions was overall similar in all tasks except for the cat task, in which the correct rate in the *dang* condition (86%) was higher than that in the *yiwei* condition (60%). Table 3 shows the contingency of the same children's

TABLE 3. *Number of children who passed or failed the three false belief tasks*

Age group	3 years			4 years			5 years		
Condition	*xiang*	*yiwei*	*dang*	*xiang*	*yiwei*	*dang*	*xiang*	*yiwei*	*dang*
Pass 0 tasks									
FFF	6	1	1	3	1	0	0	0	0
Pass 1 task									
PFF	2	3	0	1	1	0	0	0	0
FFP	3	2	4	4	0	0	2	0	0
FPF	5	4	1	0	0	0	0	0	0
Pass 2 tasks									
PPF	0	0	1	1	1	0	0	0	0
PFP	1	3	6	6	3	6	5	1	2
FPP	0	4	3	1	2	0	2	1	1
Pass 3 tasks									
PPP	0	3	4	4	13	15	11	16	17
Total	17	20	20	20	21	21	20	18	20

P means 'pass' and F means 'fail'. The three letters (e.g. PFP) refer to either passing or failing the matchbox task, the Baobao task, and the cat task, respectively.

passing or failing at least one, or two, or three tasks. Half of three-year-olds (10/20) in the *yiwei* condition and 70% (14/20) in the *dang* condition passed at least two of the three tasks, that is, correctly reporting another individual's or their own false beliefs. By contrast, only one of the three-year-olds in the *xiang* condition passed more than one task.

The difference in four-year-olds' performance in the *dang* and *yiwei* conditions was small. However, there existed a pronounced difference between these two conditions and the *xiang* condition. Many children in the *dang* and *yiwei* conditions correctly attributed the false belief to the protagonist, while they failed to do so in the *xiang* condition. As shown in Table 3, 19 of the 21 four-year-olds passed more than two tasks in the *yiwei* condition. All four-year-olds in the *dang* condition did the same. Among those children, most passed all three tasks. In the *xiang* condition, 40% of the four-year-olds still failed more than one task. All five-year-olds but two correctly attributed false beliefs to others or themselves in at least two tasks.

TABLE 4. *Percent of children who responded correctly to the knowledge and search questions*

	Condition		
	xiang	*yiwei*	*dang*
THE KNOWLEDGE QUESTION			
The Baobao task			
3 years	53 (9/17)	60 (12/20)	70 (14/20)
4 years	95 (19/20)	100 (21/21)	91 (19/21)
5 years	100 (20/20)	100 (18/18)	100 (20/20)
The cat task			
3 years	53 (9/17)	65 (13/20)	70 (14/20)
4 years	100 (20/20)	100 (21/21)	91 (19/21)
5 years	100 (20/20)	100 (18/18)	100 (20/20)
THE SEARCH QUESTION			
The Baobao task			
3 years	24 (4/17)	30 (6/20)	50 (10/20)
4 years	60 (12/20)	71 (15/21)	76 (16/21)
5 years	90 (18/20)	89 (16/18)	75 (15/20)

Frequency and sample size are shown in parentheses.

Their performance in all three tasks was nearly perfect in the *yiwei* and *dang* conditions, which was consistently higher than that in the *xiang* condition.

Children's response to the knowledge and search questions

Table 4 shows the percent of children who responded correctly to the knowledge (both the cat and Baobao tasks) and search questions (the Baobao task only). A (3) condition × (3) age × (2) task categorical repeated measure analysis of variance with task as repeated measures was conducted to examine the effect of task, condition, and age on children's response to the knowledge questions ('Does X know …?') in both the cat and Baobao tasks. A full model was used. Only the age effect was significant, $\chi^2(N = 177, \text{d.f.} = 2) = 39.35$, $p < 0.001$. In addition, a (3) age × (3) condition categorical analysis of variance was conducted to examine the effect of condition and age on children's response to the search question ('Where will Baobao go to *na* his candy first?'). Again, only the age effect was significant, $\chi^2(N = 177, \text{d.f.} = 2) = 42.02$, $p < 0.001$. These results indicate that children in the three conditions were comparable and the significant language related effects were not due to sampling errors.

DISCUSSION

The results of Experiment 2 indicate that the use of different belief verbs in probe questions significantly affected young Chinese children's response to the belief question in the false belief tasks. Three- and four-year-olds

performed significantly better in the *yiwei* and *dang* conditions than in the *xiang* condition. They tended to report correctly a false belief when *yiwei* and *dang* were used in the belief question. By contrast, they reported true beliefs when *xiang* was used in the belief question. Five-year-olds' performance was also affected by the use of the verb in the belief question. The five-year-olds in the *yiwei* and *dang* conditions consistently outperformed the five-year-olds in the *xiang* condition. The language effect was clearly not due to a sampling error as the children's responses to the same search and knowledge questions across the three conditions were similar.

Given the fact that the three conditions only differed in the belief verbs used in the belief question and that the children in the three conditions performed comparably on the search and knowledge questions, it is clear that the significant language effect was due to the differential connotations of the three belief verbs. As mentioned earlier, although *yiwei* and *xiang* can be used for reporting a false belief, *yiwei* tends to express a sense that the belief in question may be false while *xiang* does not. This semantic difference between the two words is obvious to adults as shown in the ranking tasks of Experiment 1. They tended to consider *yiwei* to be more appropriate than *xiang* to describe the false belief situations in the present study. Three- and four-year-old Chinese children seemed to share a similar understanding of the connotation of *yiwei*. Many three- and four-year-olds reported a false belief in at least two out of the three tasks when *yiwei* was used in the belief question.

The difference between three- and four-year-olds' performance in the *yiwei* condition and that in the *xiang* condition was probably due to a combination of two reasons. First, three- and four-year-olds may differ from five-year-olds and adults in their understanding of the word *xiang*. While five-year-olds and adults understood that *xiang* can be used to describe both true and false belief situations, some three- and four-year-olds might take the belief question using the word *xiang* as inquiring about a true belief, rather than the protagonist's false belief. In other words, they seemed to restrict the use of *xiang* to report only true beliefs and hence gave incorrect responses. This is apparently a case of semantic underextension (Clark, 1979). This semantic underextension likely stems from the unique connotation of the word *xiang*. Recall that *xiang* is often used to describe an individual's TRUE belief when the speaker intends to stress the likelihood of truth of the belief, and FALSE belief with a neutral connotation. Therefore, *xiang* might appear to some three- and four-year-olds to be a word more likely associated with a true belief situation than a false belief one.

The second reason for the differential results in the *xiang* and *yiwei* conditions is that *yiwei* in and of itself is evidently a more appropriate word for describing the false belief situations than *xiang*, as indicated by adults in Experiment 1. When the belief question uses this particular verb, the

question alerts children to the fact that it is an individual's false belief that is in question. Therefore, if children hold representations of both the true and false beliefs, the specific probe question likely makes it easier for them to report the false belief. By contrast, the word *xiang* may be too neutral to have such a facilitating effect on children's performance in the false belief tasks. Moreover, when there is semantic underextension for the word *xiang*, the use of the word in the belief question may even have a negative effect as it may lead the child to believe that the question asks for a report about a true belief.

It should be noted, however, that on the one hand, some young children in the present experiment might truly have difficulty in holding a representation of false belief. In this case, they would only hold a representation of the true state of affairs. Hence, when asked to report about another's and their own false beliefs, they failed to do so. Instead, they incorrectly attributed a true belief to another individual (in the Baobao and cat tasks) or themselves (in the matchbox task). For example, about 50 % of three-year-olds in the YIWEI condition seemed to fall into this category. They passed only one of the three tasks. For those children, the use of different belief verbs in the probe question did not have any impact on their response. On the other hand, when children overcame semantic underextension for *xiang* and at the same time understood false beliefs, a belief question using either *xiang* or *yiwei* resulted in a correct response. This seemed to be the case for some four-year-olds and many five-year-olds in the present experiment. For those children, the use of different belief verbs in the probe question also had no impact.

With regard to *dang*, children in the *dang* condition performed similarly to those in the *yiwei* condition on two of the three tasks, suggesting that the two words may have similar connotations to children. The exception was the cat task. On the cat task, as predicted, three- and four-year-olds in the DANG condition outperformed those in the *xiang* condition, and even those in the *yiwei* condition. Most of the three-year-olds and nearly all of the four-year-olds in the *dang* condition gave correct answers to the belief question, while about 60 % of the three-year-olds in the *yiwei* condition and only 24 % in the *xiang* condition gave the correct response. This result is not particularly surprising given that the adults in Experiment 1 treated the task in a special way. Recall that in Experiment 1 adults ranked *dang* as more appropriate for describing the situation in the cat task than *xiang*, while *xiang* was preferred in the other two tasks. Three-year-olds' superior performance in the *dang* condition of the cat task was likely due to the fact that the verb *dang* used in the belief question was considered by the children to be most appropriate for the mistaken identity situation involved in the cat task.

The findings of the present experiment suggest that, on the one hand, some young children may have some difficulty with representing an individual's false beliefs (see below for discussion). On the other hand, other young

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children may demonstrate an understanding of false belief when a belief question is appropriately phrased both for the children's language development level and for the false belief situation in question. By contrast, when a belief question uses a belief verb that is yet to be fully understood by the child, the child's ability to represent false beliefs may be underestimated. It should be noted that three-year-olds' performance in the YIWEI and DANG conditions might further improve if the verbs were used in conjunction with certain linguistic markers to further stress the likelihood of truth or falsity of a belief. For example, in Standard Chinese, when talking about a past or present false belief, one may use *hai yiwei* or *hai dang* (*hai* is a marker to stress the falsity of an idea as opposed to the truth; its literal English translation is 'still'). When talking about a future false belief, one may use *hai hui yiwei* or *hai hui dang* (*hui* is a future tense marker; its literal English translation is 'will'). Since the focus of the present study was on the effect of the three belief verbs *per se*, this possibility was not tested here, and needs to be explored in future research.

GENERAL DISCUSSION

The present study investigated the universality of the early development of young children's understanding and representation of false beliefs, and specifically, the effect of language on Chinese-speaking children's performance in false belief tasks. Results show that the use of different belief verbs in probe questions significantly affected young Chinese-speaking children's false belief attribution. Since the language effect has been discussed in Experiment 2, the discussion here focuses on several similarities found between the performance of Chinese-speaking children in the present study and Western children in previous studies using similar tasks.

Similar to what has been found with a large body of studies involving Western children, Chinese-speaking children undergo a rapid development in their understanding and representation of false belief between the ages of 3 and 5 years. Some three-year-old Chinese children apparently had difficulty with attributing false beliefs to others and themselves, even when an appropriate belief verb was used in a false belief question. The majority of four-year-old Chinese children correctly represented their own and others' false beliefs. By 5 years of age, most Chinese-speaking children, like their Western counterparts (Wimmer & Perner, 1983; Hogrefe *et al.*, 1986; Gopnik & Astington, 1988; Wimmer & Hartl, 1991), clearly understand that another person's belief differs from their own and can be false. They are also aware that they may have a false belief that differs from the true state of affairs, and are able to distinguish between their present representation of the world and a past false belief. Further, Chinese-speaking five-year-olds' understanding of false belief is rather well consolidated. Despite task

variations and changes in probe questions, their performance remains consistently high.

Similarities between Chinese-speaking children and Western children were also found in several other areas. First, children of both cultures responded similarly to the knowledge question (e.g. Wimmer & Perner, 1983; Hogrefe *et al.*, 1986; Sullivan & Winner, 1991). On average, three-year-old Chinese children's correct response rate to the knowledge question was 61%, and four-year-olds' was well above 90%. No five-year-old responded to the knowledge question incorrectly. These rates are in general comparable to the rates with Hogrefe *et al.*'s (1986) children in standard false belief tasks and Sullivan & Winner's (1991) children in a modified version of the tasks. Second, the developmental pattern of Chinese children's responses to the search question was similar to that of Western children (Wimmer & Perner, 1983; Perner *et al.*, 1987; Sullivan & Winner, 1991; Wimmer & Hartl, 1991). In the present study, when the results of the three conditions were combined, 35% of three-year-olds, 69% of four-year-olds, and 85% of five-year-olds correctly predicted that another individual would search in a wrong place due to a false belief. These rates generally fall within the ranges of correct rates reported in studies with Western children (Wimmer & Perner, 1983; Hogrefe *et al.*, 1986; Perner *et al.*, 1987; Sullivan & Winner, 1991; Wimmer & Hartl, 1991). According to Dennett (1978) and Perner (1991), the search question addresses an important aspect of false belief understanding, and is a critical test of children's understanding of the propositional attitude of a belief representation. The search question, unlike a think question that inquires about a false belief itself, requires one to make predictions based on a false belief representation (also see D'Andrade, 1987; Moses & Flavell, 1990). In order to succeed in such a task, one must first be able to understand the causal relationship between people's beliefs and their actions. As far as this particular aspect of false belief understanding is concerned, the present findings suggest that Chinese children develop at a similar pace to Western children.

Based on the findings of the present study, two major conclusions can be drawn. First, the understanding of mind, in particular false belief, appears to be a universal achievement in children in the 3 to 5 year range (Avis & Harris, 1991; Vinden, 1996). Second, the language used by a culture for talking about beliefs and false beliefs may affect children's false belief attribution. Although it is still an open question as to whether Chinese children's learning of belief verbs in their daily conversation has direct cognitive consequences in the acquisition of theory of mind, it is clear, at least at the methodological level, that young children's performance in a false belief task may be facilitated or impeded by the formulation of the belief question. When a question uses a belief verb, the usage of which young children may not fully understand, the children's response to the question may not reflect their

genuine understanding of false belief. By contrast, a belief question using a Chinese verb for thinking that is appropriate for a false belief situation may provide a more accurate assessment of Chinese children's false belief representation.

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APPENDIX I

THE USAGES OF *XIANG*, *YIWEI*, AND *DANG*

xiang

(1) to think (for describing a thought process)
(2) to think, to consider (for describing a belief or opinion)
(3) to reminisce

yiwei

to think, to consider (for describing a belief or opinion)

dang

(1) verb: to think, to consider (for describing a belief or opinion)
(2) verb: to equate (e.g. One person *dang* two people, meaning that one person works as good as two people)
(3) verb: to pawn something in a pawn shop
(4) adjective: adequate

APPENDIX II

THE BAOBAO TASK

This story is called the Baobao Story. This boy's name is Baobao. He has a candy. He wants to eat the candy but he says he has to go to the washroom first. He says he will eat the candy after he comes back from the washroom. So he puts the candy in the basket and goes to the washroom. While Baobao is still in the washroom, his mother comes from outside. She looks inside the basket and says: 'Hey, how come there is a candy in the basket? Let me put it in the box.' So she puts the candy in the box and leaves. Now, Baobao comes back from the washroom.

APPENDIX III

THE CAT TASK

The mother cat and baby kittens are looking out the window. They would like to go out and play but it is raining. Then the sun comes out and they are so happy because now they can go outside. They decide to go on a picnic so

they take some jam tarts and some apples and some tea and they put them into the basket. They take their picnic and go down to the seashore and get in a boat. They row the boat across the water to an island where they decide to have their picnic.

They see this thing. They decide to put their picnic on the big rock. The mother cat puts the cloth on the rock. She sets out the cups for tea and jam tarts. One kitty plays on the rocks and the other one makes a fire for the tea.

The cats are all looking at the fire and making tea. But look! That big rock is not a rock. It's a tortoise/turtle! And it is walking away with their picnic.

The cats turn around and their picnic is gone. They are very surprised! So they go looking into the cave to see what happened. Oh, there is a jam tart. Their picnic must be in here somewhere. They peek into the tunnel. Boo! Out comes the tortoise/turtle. They are so surprised that they run away. The tortoise/turtle doesn't want to hurt them. He just wants to eat the jam tarts. Without having a picnic, the cats go home.