

Acquisition of Mental State Language in Mandarin- and Cantonese-Speaking Children

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Children's theory of mind appears to develop from a focus on desire to a focus on belief. However, it is not clear (a) whether this pattern is universal and (b) whether it could also be explained by linguistic and sociocultural factors. This study examined mental state language in 10 Mandarin-speaking (21–27 months) and 8 Cantonese-speaking (18–44 months) toddlers. The results suggest a pattern of theory-of-mind development similar to that in English, with early use of desire terms followed by other mental state references. However, the Chinese-speaking children used desire terms much earlier, and the use of terms for thinking was very infrequent, even for Mandarin-speaking adults. This finding suggests a consistency in the overall sequence, but variation in the timing of beginning and end points, in children's theory-of-mind development across cultures.

How do we understand ourselves and other human beings? Under the rubric of *theory of mind*, an increasingly large number of scholars have been claiming that a basic aspect of our conceptions of persons is that we construe overt actions in terms of the underlying psychological or mental states that motivate and produce those actions—the actor's beliefs, desires, emotions, and intentions. In other words, our everyday, or “folk,” psychologies are claimed to be fundamentally mentalistic. This claim leads to several subsidiary claims and to questions such as how this everyday mentalism arises developmentally. Is it the basic building block of a folk psychology in all or many cultures, or are there fundamental differences across cultures in the extent to which a theory of mind is important for our conceptions of persons? And, finally, how can an everyday theory of mind and its development best be characterized?

One major claim to emerge from theory-of-mind research is that children's theories of mind develop from a “desire psychology” to a

“belief psychology.” That is, very young children first understand the motivations of other actors in terms of simple wants and needs and then move toward understanding that others' representations of the world may differ from their own and that these differences in information about the world may affect people's actions (Astington & Gopnik, 1991; Flavell, 1988; Wellman, 1990). In order to test this proposal it is necessary to examine the theories of mind held by very young children (e.g., 2-year-olds). However, young children's limited ability to comprehend and respond appropriately to experimental tasks presents a major challenge to this endeavor.

One approach to tackling this challenge is to devise experimental tasks that are more amenable to younger children (e.g., Repacholi & Gopnik, 1997). Alternatively, some researchers have focused on children's everyday conversations as a window onto young children's theory of mind. Even 1½- and 2-year-olds talk about people, and they begin to use mental state verbs such as “want” and “think” to do so. Recent evidence focusing on the use of mental state verbs in the everyday conversations of English-speaking children and their caregivers lends support to a pattern of development from a desire to a belief psychology (Bartsch & Wellman, 1995; Bretherton & Beehly, 1982; Johnson, 1982; Shatz, Wellman, & Silber, 1983). Specifically, each of the 10 English-speaking children analyzed by Bartsch and Wellman (1995) showed a uniform pattern of development from no use of mental state verbs to an exclusive focus on verbs of desire and emotion, followed only later by a focus on thoughts and beliefs.

These data are intriguing in that they suggest that even very young children are well on the way to developing a theory of mind. Moreover, because all of the children in Bartsch and Wellman's (1995) study evidenced the same pattern of talking about desires first and about beliefs only later, Wellman and his colleagues have argued (e.g., Gopnik & Wellman, 1994; Wellman & Woolley, 1990) that this pattern reflects a potentially universal shift in the conception of people and their mental states. Specifically, it reflects an early understanding bereft of a conception of mental representations, such as beliefs, followed only later by an emerging understanding of such representational states.

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However, given that the data are solely from English-speaking children, this developmental pattern might also be explained by a number of linguistic and sociocultural factors. For instance, linguistic phenomena such as the late acquisition of verbs in English-speaking children (Gentner, 1982) and their difficulties with embedded clauses and in distinguishing among different types of verb complement structures (deVilliers, 1995; Gale, deVilliers, deVilliers, & Pyers, 1996; Goodluck, 1997) could contribute to the observed pattern of development. Similarly, sociocultural practices and conventions could be influencing this pattern such that all English-speaking children develop a theory of mind focused first on desires and emotions but not beliefs because English-speaking adults talk about the mind in a particular way (see Bruner, 1990).

To address these explanations for their pattern of results, Bartsch and Wellman (1995) conducted further analyses of the adult-to-child speech in their corpus as well as of the children's syntactic structures for both types of terms. Analyses of parental speech showed that parents talked to these children about both beliefs and desires and that talk about beliefs was not substantially less frequent than talk about desires. Moreover, the sort of complex syntax helpful for talk about beliefs—predicate complementation such as in "He thought that the sky was stormy"—is often evident in children's earlier talk about desires—as in, for example, "She wants to be home for dinner."

However, the ability to produce predicate complements, in general, might be less important than it seems if children's understanding of mind is guided by their emerging ability to understand differences between verb complements. Specifically, Roeper and deVilliers (1994) demonstrated that in an animated story in which Big Bird has a party to which he invites his friend Grover (but later forgets this fact) and forgets to invite Bert, 4- and 5-year-old children were not able to distinguish between the following types of predicate complements:

1. Who did Big Bird forget to invite? (Bert)
2. Who did Big Bird forget that he invited? (Grover)

DeVilliers (1995) argued that 4- and 5-year-old children failed to make this distinction because they develop the syntactic rules for understanding embedded clauses relatively late in the process of language acquisition. Moreover, it appears that they are able to understand infinitive "to" complements, as in Sentence 1 above, earlier than they are able to understand tensed (finite) complements marked with "that," as in Sentence 2. Thus, they answered the second type of question as if they understood it to be the first type of question.

Along similar lines, Perner (1991) argued that young children are unable to make the conceptual distinction between "thinking of" and "thinking that," an ability he claimed is necessary for differentiating between sense and reference. Thus, Perner claimed children must understand the referential meaning of "that" in order to develop the more mature theory of mind necessary for understanding false belief and appearance-reality distinctions.

Naturalistic production data further suggest that there is a clear sequence to children's ability to produce verb complements, which begins with simple object complements, progresses to infinitival (nonfinite) complements, and is followed only later by finite complement clauses (Bloom, 1991). In addition, the use of "that" as a complementizer (Roeper & deVilliers, 1994) and the obligatory marking of tense in finite complement clauses such as in Sentence 2 above are problematic for young English-speaking children (Radford, 1994). Taken together, these data are highly

suggestive of a link between the syntax necessary for understanding verb complements and the propositional distinctions necessary for an understanding of belief. Indeed, they have led to deVilliers's (1995) more radical hypothesis that

the complex syntax that is used for describing mental events *makes possible* [italics added] the representational changes that allow for understanding false beliefs. (p. 1)

To examine these issues more thoroughly and to address broader claims about both the universality of the desire-before-belief pattern of development and the potential effects of linguistic structure and adult-to-child language on the development of a theory of mind requires an examination of relevant mental state terms in other languages. In the absence of being able to examine this development in all the world's languages, it is important to examine the acquisition of mental state terms in a language that is different from English with regard to several key features. Mandarin and Cantonese are particularly useful for this endeavor for several reasons. First, mental state conversation typically depends on verbs such as "want," "think," and "know." Verb learning in general, therefore, could influence the pattern of acquisition of mental state language. English-speaking children tend to acquire few verbs, relative to nouns, in their early stages of language learning (Choi & Gopnik, 1995; Gentner, 1982; Tardif, Shatz, & Naigles, 1997). Children learning Mandarin, however, produce at least as many verbs as nouns in their early conversations (Tardif, 1996; see also Choi & Gopnik, 1995, for Korean) and are more likely to produce a verb as one of their first words than are English-speaking children (Tardif, Gelman, & Xu, 1999).

Second, the morphology and surface syntax of predicate complementation in Mandarin and Cantonese is simpler than in English, and there is no obligatory marking of the difference between the two types of complement structures presented in Sentences 1 and 2 above. This is because the more general distinction between finite and nonfinite clauses, which may be implicated in the English-speaking children's difficulties with verb complements, is not grammaticized to the same extent in Chinese as it is in English (Chao, 1968; Li & Thompson, 1981, pp. 594–622; Xu, 1987). Thus, although it is possible to provide distinct sentences that lead to unambiguous translations of Sentences 1 and 2 by adult speakers (see Sentences 3 and 4 below for Mandarin and Sentences 6 and 7 further on for Cantonese), it is also possible to provide a sentence that could lead to *either* interpretation and is indistinguishable on the basis of morphosyntactic cues alone (see Sentence 5 for Mandarin and Sentence 8 for Cantonese).

3. Big Bird *wang4 le qing3 shei2?* (Bert)
Big Bird forget ASP¹ invite who
4. Big Bird *wang4 le qing3 le shei2?* (Grover)
Big Bird forget ASP invite ASP who
5. Big Bird *wang4 le qing3 shei2 le?*
Big Bird forget ASP invite who ASP/SFP? (Bert/Grover)

"Who did Big Bird forget to invite?" or "Who did Big Bird forget that he invited?" or "Big Bird forgot who he invited."

¹ All Mandarin words follow the *Hanyu pinyin* system of romanization, with tones indicated by the numerals 1–4 at the end of each syllable. Words with no numerals indicate that the tone is unstressed and/or variable. Cantonese transcriptions follow the system of romanization used in Lee et

In Sentence 5, it is possible to disambiguate the interpretations by providing intonation cues such as stressing *wang4 le* and a pause between the two clauses, leading to an interpretation consistent with Sentences 2 and 4. Alternatively, relatively equal stress across clauses and no pause between clauses would lead to an interpretation consistent with Sentences 1 and 3.

The same possibility exists for Cantonese, although there appears to be a stronger preference to disambiguate with the perfective aspect marker *zo2* in Cantonese than there is for *le* in Mandarin.² Nonetheless, the following translations into Cantonese demonstrate that it is possible both to disambiguate and to provide an ambiguous sentence that must be disambiguated from pragmatic cues rather than morphosyntactic cues alone.

6. Big Bird *m4-gei3-dak1* (*zo2*) *ceng2* *bin1go3?* (Bert)
Big Bird forget ASP invite who
7. Big Bird *m4-gei3-dak1* *ceng2* *zo2* *bin1go3?* (Grover)
Big Bird forget invite ASP who
8. Big Bird *m4-gei3-dak1* *zo2* *ceng2* *bin1go3* *heoi3* *party?*
Big Bird forget ASP invite who go party
"Who did Big Bird forget to invite to the party?" or "Big Bird forgot who he invited to the party" or "Who did Big Bird forget that he invited?"

Although a thorough examination of adult interpretations of such sentences is beyond the scope of the present study, the basic point is that neither Cantonese nor Mandarin marks finiteness obligatorily.³ In fact, both of the features necessary for marking a finite complement clause in English, tense and the complementizer "that," are missing in both Mandarin and Cantonese (Chao, 1968; Matthews & Yip, 1994). Aspect can appear to be marking finiteness and can certainly help to distinguish among different meanings, but it is not marked obligatorily and is often omitted (Xu, 1987).⁴

The broader implication of these differences across languages is that in English, the distinction between finite and nonfinite (e.g., infinitive) complement clauses (e.g., "He thinks that Bert will come" vs. "He wants Bert to come") maps onto a conceptual distinction (e.g., thinking that vs. wanting to; understanding mental representations of, vs. simpler connections to, situations and events). If English-speaking children have difficulty producing and comprehending finite complement clauses, then indeed that difficulty may result in problems with an understanding of belief. In order to examine the relationship between language and theory of mind more generally, however, comparison with a language in which finite complements are not necessary to express an understanding of belief, as is the case for Chinese, would be informative.

An additional feature of Chinese is that, unlike the English terms "think," "want," and "know," most of the words that are used to code mental states in Mandarin and Cantonese are polysemous and

include meanings that indicate desire as well as meanings that indicate thought or belief. In particular, the Mandarin verb *xiang3* means "to think," but it can also mean "to want to do something" (see Appendix A), "to believe/feel," "to imagine/conceive of," and "to miss somebody." The other verbs are also polysemous, and some also include non-mental-state meanings such as aspect marking, as can be seen from Appendixes A and B, which present a complete list of all meanings for each of the mental state verbs examined in this study. Thus, it is possible to distinguish not only between the appearances of particular mental state verbs but also between the desire and thought/belief senses of the words.

This overlap of word meanings is particularly important and helpful for distinguishing among hypotheses for why children tend to use desire terms before belief terms. In English, these two meanings are encoded by different verbs (i.e., "to want" vs. "to think"), and thus even if we could determine that it is not a syntactic limitation, from the English data alone it is still not possible to tell whether there is something about just learning these two words as lexical tokens that produces these results. In both Mandarin and Cantonese, however, it is possible to distinguish between children's acquisition of the lexical terms and their uses to encode desire versus belief meanings.

These linguistic differences thus can speak to several contrasting developmental possibilities. On the one hand, children may have a universal tendency to develop an understanding of desire before belief because such a tendency reflects an underlying cognitive universal. If so, Mandarin- and Cantonese-speaking children may be similar to English-speaking children and produce verbs indicating desire before

² This judgment was supported by an informal poll of several trilingual speakers of Mandarin, Cantonese, and English who were native speakers of at least one of the three languages. A possible reason there may be a stronger preference to disambiguate in Cantonese is that in Mandarin, the aspect marker *le* can be moved away from the verb to the end of the sentence, and once it appears at the end of the sentence, it is no longer clear whether *le* is functioning as an aspect marker for *qing3* or as a sentence-final particle. In Cantonese, the aspect marker cannot be freely moved, and even if it could, there would be no overlap between sentence-final particles and the perfective aspect marker *zo2*.

³ Even Huang (1982), who is the strongest proponent of a distinction between finite and nonfinite clauses in Mandarin, argued that it is often necessary to insert modals and aspect markers as a test to distinguish the two cases, acknowledging that they cannot be distinguished reliably from the available morphosyntactic markers.

⁴ Moreover, perfective aspect can be added in English to further distinguish when the forgetting and inviting occurred, as in Sentence 9 below:

9. Big Bird forgot (that) he *had* invited Grover.

In Sentences 9 and 2, the time of the inviting is not linked to the time of forgetting, and the perfective aspect marker makes this doubly clear. In the infinitival clause of Sentence 1, the time of inviting (or failure to invite) is dependent on the time of forgetting (the main clause). Similarly, *not* adding an aspect marker to the complement clause in both Mandarin and Cantonese, as in Sentences 3 and 6, could mean that the time of forgetting and the time of inviting are the same (i.e., an infinitival reading). However, because aspect is not marked obligatorily in either Mandarin or Cantonese, not adding an aspect marker does not necessarily mean that the times of the events in the two clauses are the same. Once an aspect marker is added to the complement clause (as in Sentences 4 and 7 and in the English Sentence 9), however, it is clear that the time of the inviting is not the same as the time of the forgetting, which results in a finite reading.

al.'s (1995) corpus and now standardized by the Hong Kong Linguistic Society. Following is a list of linguistic terms, in the order in which they appear in the text, for markers that are not easily translatable into English and that have been abbreviated in the English glosses: ASP = aspect; SFP = sentence-final particle; IPS = first person singular; CL = noun classifier; 2PS = second person singular; DE = the morpheme *de*, which can be used as a nominalizer to mark possession and other relationships between a noun and the phrase that precedes it; ORD = ordinal marker; COP = copular verb ("to be"); 3PS = third person singular; and @rv = resultative verb complement.

they produce verbs indicating belief. Of course, the pattern of acquisition may be similar, but for other reasons: Perhaps other linguistic and sociocultural aspects of learning Mandarin and Cantonese shape such a pattern. But if so, at the least, the same pattern would appear for reasons other than the lexical and syntactic difficulties found with mental state verbs in English. On the other hand, the pattern of understanding desire before belief that has been found in English-speaking children may not appear for Mandarin- and Cantonese-speaking children, further implicating linguistic and cultural factors in children's developing theories of mind. Regardless of the direction of the results, Chinese languages provide a strong test of the universality of children's developing theory of mind and can lead us toward more specific hypotheses for why children's theories of mind develop in the ways that they do.

In the present study we examined, specifically, the patterns of emergence and use of both Mandarin and Cantonese mental state terms. In Study 1, we examined the Mandarin verbs *yao4* (want), *xiang3* (want/think), *hui4* (know how), *neng2* (have the ability to), and *zhidao4* (know that) in the naturalistic conversations of 10 Beijing toddlers studied longitudinally from the age of 22 months to 27 months. In Study 2, we examined the use of these same terms for "want," "think," and "know that" (*jiu3*, *soeng2*, *zi1*) plus the Cantonese words *nam5* (think/consider) and *sik1* (know how/recognize) in the naturalistic conversations of 8 Hong Kong children, who were each studied longitudinally for about 1 year and whose ages ranged from 18 to 32 months at the beginning of the study period. The children's acquisition and use of the terms were compared with those of their caregivers, and we compare both sets of patterns with English data from a sample of children in the United States (as reported in Bartsch & Wellman, 1995).

Our predictions were, first, that because Mandarin and Cantonese verbs tend to be acquired earlier than English verbs (Leung, 1998; Tardif, 1996), Mandarin- and Cantonese-speaking children should also use mental state verbs earlier than their English-speaking counterparts. Second, if a theory of mind is universal in its first conceptual stages, then children should talk about desires (i.e., wanting) before they talk about beliefs (i.e., thinking or knowing), and this should be true in some form for all children learning all languages. Thus, we might expect that the Mandarin- and Cantonese-speaking children would use the verb *yao4/jiu3* (want) before they used the verbs *xiang3/soeng2* (want/think), *hui4/sik1* (know how), *neng2* (have the ability to), or *zhidao4/zi1* (know that), despite the lack of a finite-nonfinite distinction for these verbs. Similarly, given the polysemous lexical item *xiang3/soeng2*, the Mandarin- and Cantonese-speaking children should use the "want" sense of the verb before they use it to mean "think." Finally, if the patterns we find are due to an underlying cognitive universal rather than to sociolinguistic factors, then the children's use of desire terms before belief terms should be unrelated to the relative frequencies of these words in the speech of their caregivers and other adults in their environment.

Study 1: Mandarin-Speaking Children

Method

Participants and procedure. Everyday conversations of 10 monolingual Mandarin-speaking toddlers and their caregivers were recorded over a 6-month period beginning when the children were, on average, 22 months of age (3 children were 21 months of age and 3 children were 23 months

of age, whereas the other 4 children were all 22 months of age at the time of the first transcribed recording). Five of these children (4 boys and 1 girl) had parents who had a university-level education or above and were considered to be *zhishifenzi* (intellectuals), whereas the other 5 children (4 boys and 1 girl) had parents with no more than a high-school-level education, who worked in factories or held other blue-collar jobs and were considered to be *gongren* (workers). All families were recruited from hospital immunization records in Haidian District, Beijing, China.

The data collection procedures that were used in this study are as follows (see Tardif, 1993, 1996). Twila Tardif, a fluent speaker of Mandarin, went to each of the family's homes in Beijing at least once every 2 weeks over a 6-month period. At each of the visits, the families were instructed to "do what [they] normally do" at that time of day and to carry on their activities as if the researcher was not present. Contexts of recording varied widely both within and across families. Thus, the children and their caregivers were recorded performing a wide range of activities that were typical for Beijing toddlers (e.g., eating, indoor and outdoor play, talking to neighbors). To facilitate naturalistic interaction, we told the families that the researcher was interested in understanding how children use language naturally in their everyday environments and that the caregivers should not try to elicit talk from the child but should simply interact with the child in whatever way they normally would, even if that meant sometimes not interacting with the child at all. Familiarization with the researcher, the equipment, and the recording procedure usually meant that the families were able to ignore the researcher's presence for the hour-long recording period, although there was extensive interaction between the researcher and the families throughout the 6 months of the study and especially before and after each visit. This procedure was similar to the types of naturalistic data-collection procedures followed in the collection of the English-language data examined by Bartsch and Wellman (1995).

For the present analyses, 50 hours of transcripts (20,639 child utterances) were used. This meant that there was one transcript per family for each month of the study, except that 1 child is missing the fourth transcribed recording and another child had an extra transcript between the second and third transcribed recordings. All of these transcripts are in *Hanyu pinyin* CHAT format and are available on the CHILDES database (MacWhinney & Snow, 1990).

Coding. Utterances that included the target words were selected automatically with the KWAL program in CLAN (MacWhinney, 1995) and then coded by native Mandarin speakers according to the coding categories listed in Appendix A. Use of one of the target terms was considered to be a reference to a mental state only if the usage was judged, with regard to its context, to refer to the desires, thoughts, knowledge ("know that"), needs, or abilities ("know how") of the speaker, listener, or third party. Examples are *wo3 yao4 qiu2* ("I want [the] ball," referring to the speaker's own desires) and *ni3 zen3me zhidao4 ta1 neng2 chi1 ren2* ("How do you know it can eat people?" referring to the listener's knowledge of a third party's abilities). These judgments were made following procedures essentially identical to those described by Shatz et al. (1983) and Bartsch and Wellman (1995). In particular, any utterances of target words by a child that were complete or partial repetitions of a preceding adult utterance were excluded. To ensure that the children's productions were truly productive, we also excluded simple responses to questions such as *yao4 bu2 yao4* ("[You] want not want"), which are very common in Mandarin. The problem with responses to these utterances is that although both *yao4* and *bu2 yao4* are perfectly acceptable responses, even for adults, the children could be repeating the last word and not using *yao4* (or any other verb, because this is a general Verb-not-Verb [V-not-V] structure in both Mandarin and Cantonese) productively. Thus, all responses to V-not-V questions and any other responses that were simple repetitions (with no elaboration) of the words in the question were excluded from analysis. Similarly, simple utterances of *bu4 zhidao4* ("[I] don't know") and *bu4 hui4* ("[I] don't know how") were excluded from analysis on the grounds that they are arguably conversational strategies akin to the child's saying

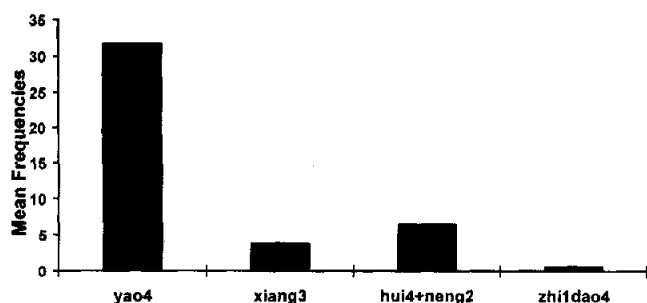


Figure 1. Mean frequencies of mental state verbs for Mandarin-speaking toddlers (21–27 months).

“no” when presented with information or a task for which she or he is not prepared to respond. Uses of words in memorized songs, poems, proverbs, and other forms of quoted and formulaic speech were also excluded. Other uses were largely accepted as referencing mental states, as they would have been if spoken by adults. These inclusion and exclusion criteria were identical to those used for the English-speaking children in Bartsch and Wellman’s (1995) study.

Our primary concern was to code the mental state uses of target terms as referring to “desires,” “know how,” “know that,” or “think/believe.” We did so by considering the extended conversations and contexts in which the terms were used. Chinese speakers routinely distinguish these various meanings in their everyday comprehension of these polysemous terms. Thus, we followed those everyday distinctions in judging children’s uses. Examples of the various uses and coding categories are listed in Appendix A. In particular, “desire” meanings included Categories 1 through 4 for *yao4* and Categories 1a and 1b for *xiang3*; “know how” included Category 2 for *hui4* and Category 4 for *neng2*; “know that” included all uses of *zhi1dao4* that were not simple statements of “don’t know”; and “think/believe” included Categories 3 and 4 for *xiang3*. Any categories that were not listed above were not coded as mental state meanings but were calculated into the total uses for a particular verb. Again, this method of coding for meaning followed procedures identical to those of Bartsch and Wellman (1995). Cohen’s kappa for the interrater reliability between a native Mandarin-speaking coder (who was blind to our hypotheses) and Twila Tardif was 1.00 for each of these codings.

Results and Discussion

Even at the earliest recordings, these Mandarin-speaking children showed some use of mental state verbs. At 21 months of age,

roughly 2% of all utterances contained a mental state verb. By the time the children reached 27 months of age, this figure increased to 5% of all utterances. These percentages were higher than those of English-speaking children at the youngest ages. By the end of this period, the Mandarin-speaking children were comparable to the 2½- to 3-year-old English-speaking children in Bartsch and Wellman’s (1995) study, who used similar mental state verbs in about 5% of their utterances.

Our Mandarin data also show a general trend at this early age toward using the verb *yao4* (which, like the English verb “want,” encodes only one mental state meaning, that of desire) much more frequently than other mental state verbs that encode meanings other than desire, as can be seen in Figure 1. *Yao4* (want) was also the earliest mental state verb for these Mandarin-speaking children to acquire. As can be seen from Table 1, 7 of the 10 children in the study had already acquired the verb and were using it during the first transcribed recording. Thus, it is possible that these children acquired the verb even earlier than this. In fact, in Tardif et al.’s (1999) study, 5 out of 24 Mandarin-speaking mothers listed *yao4* as one of their children’s first words, with a mean age of occurrence at 11 months of age (range = 8–14 months).

Finally, if we examine the data from children who used no or only one mental state verb at the beginning of the study, we find even clearer evidence for the emergence of *yao4* (want) before any other mental state verb. Results from these children are especially informative about the sequence of acquisition because they allow us to examine children’s very first uses. The data of children who were producing two or more mental state terms at the start of the study are less informative because it is not clear in what order these terms came into their language use. As shown in Table 1, all children except W.W. and Y.Y. are relevant to this analysis, and all 8 of these children used *yao4* before any other term. Moreover, for W.W. and Y.Y., *yao4* was still among their first recorded terms.

Averaging the uses across all children, one can see from Figure 2 that although *yao4* makes up 100% of all mental state verb uses at 21 months of age, it drops to roughly 70% of all mental state verb uses shortly after this time as the other terms gradually come to be used. However, there is little distinction between the other mental state verbs at this early age. Moreover, given the multiple polysemy of these verbs in Mandarin, it is not clear without further

Table 1
Age (in Years; Months) of First Occurrence of Mandarin Target Word

Child	<i>yao4</i> (want)	<i>xiang3</i> (want/think)	<i>hui4</i> (know how)	<i>neng2</i> (is able)	<i>zhi1dao4</i> (know that)
B.B.	1;10*	—	2;0	2;2	1;11
C.X.X.	1;10	2;0	2;0	—	—
H.Y.	1;9*	1;10	1;10	2;1	—
L.C.	1;11	2;0	2;0	2;1	—
L.L.	1;9*	1;11	1;11	1;11	—
L.X.B.	1;9*	1;11	1;10	1;11	1;10
T.T.	1;10	—	—	2;0	—
W.W.	1;11*	1;11*	2;0	2;3	2;1
W.X.	1;10*	2;1	2;1	2;0	1;11
Y.Y.	1;11*	2;2	1;11*	2;0	1;11*

Note. Asterisks mean that the word was produced in the first available transcript for that child.

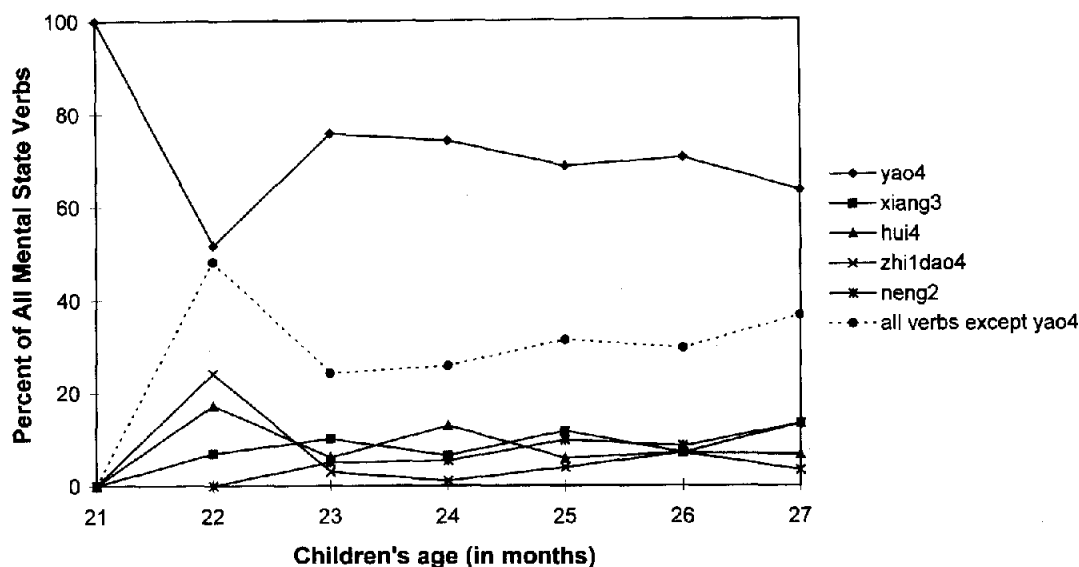


Figure 2. Mandarin-speaking children's use of mental state verbs.

analysis how many of these references, if any, are actually references to distinctive mental states.

Thus, in Table 2, we present only those uses that were clearly coded to involve "desire" (for both *yao4* and *xiang3*), "thought" (for *xiang3*), "belief" (for *xiang3* and *zhi 1 dao4*), and "ability" or "know-how" (for *hui4* and *neng2*). Again, the Mandarin results clearly replicate the English findings: Talk about desire precedes talk about thoughts and belief. Repeating the analysis of children who used no or only one mental state meaning at the beginning of the study, which included all children except Y.Y., we found that all 9 of these children began to use mental state verbs exclusively to refer to desire. Only later did the Mandarin-speaking children start to make use of these verbs for encoding meanings of thought, belief, or ability.

Interestingly, the use of the term *xiang3* for its thought meaning was minimal throughout the entire period of the sample. This is shown more clearly in Figure 3, which contrasts the use of *xiang3* to encode desire versus thought. At the earliest age (21 months),

xiang3 did not appear in any of the transcripts. By the next month, however, it appeared in some transcripts but was used only in its desire sense. It was not until the children were 24 months of age that some of them began to use the word *xiang3* to mean thinking, even though they had started to use some of its other meanings before this time. Moreover, the frequency of using *xiang3* to refer to thinking remained low throughout this entire period.

Self versus other references to mental states. In the last set of analyses on the Mandarin-speaking children's use of mental state verbs we examined whether they used these verbs to refer to themselves or to others. As can be seen from Table 3, the pattern of children's references to desire, knowing that, and thinking is extremely clear and consistent. Children referred first to their own desires, knowledge (that), and thoughts before they referred to other people's desires, knowledge, or thoughts. Specifically, for desires, all 10 children showed a pattern of *self* reference before *other* reference (7 out of 10 children showed a delay of from 1 to 3 months, and 3 out of 10 children produced *self* references but no *other* references by the time the study was completed). For know-

Table 2

Age (in Years; Months) of First Occurrence of Mandarin Target Meaning

Child	"desire"	"know how"	"know that"	"think"
B.B.	1;10*	2;0	1;11	—
C.X.X.	1;10	—	—	—
H.Y.	1;9*	1;10	—	—
L.C.	1;11	2;0	—	—
L.L.	1;9*	1;11	—	—
L.X.B.	1;9*	1;10	1;10	2;0
T.T.	1;10	—	—	—
W.W.	1;11*	2;0	2;1	—
W.X.	1;10*	2;0	1;11	2;1
Y.Y.	1;11*	1;11*	1;11*	2;2

Note. Asterisks mean that the word was produced in the first available transcript for that child.

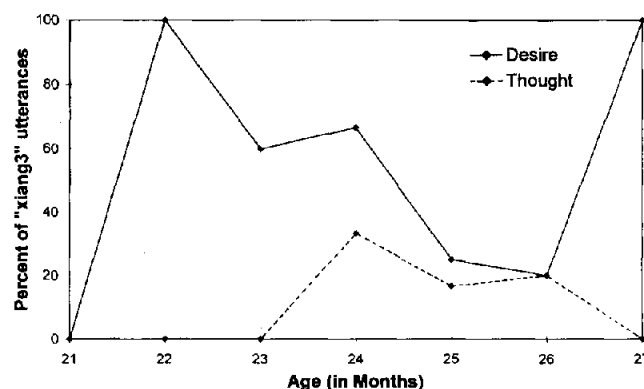


Figure 3. Mandarin-speaking children's meanings for *xiang3*.

Table 3
Age (in Years; Months) of First Self and Other References With Target
Mandarin Mental State Meanings

Child	"desire"		"know how"		"know that"		"think"	
	Self	Other	Self	Other	Self	Other	Self	Other
B.B.	1;10*	2;1	2;2	2;0	1;11	—	—	—
C.X.X.	1;10	2;0	—	—	—	—	—	—
H.Y.	1;9	—	2;1	1;10	—	—	—	—
L.C.	1;11	2;1	2;0	2;0	—	—	—	—
L.L.	1;9*	1;11	1;11	1;11	—	—	—	—
L.X.B.	1;9*	2;1	1;10	1;10	1;10	—	2;0	2;1
T.T.	1;10	—	—	—	—	—	—	—
W.W.	1;11*	2;0	2;0	—	2;1	—	—	—
W.X.	1;10*	—	2;1	2;0	1;11	—	2;1	—
Y.Y.	1;11*	2;1	—	1;11*	1;11*	—	2;2	—

Note. Asterisks mean that the word was produced in the first available transcript for that child.

ing that and thinking, only 1 of the children who produced these words was able to make an *other* reference by the end of the study, whereas all the other children referred exclusively to their own knowledge and thoughts and not to those of other people.

The frequencies of *self* and *other* references in the Mandarin-speaking children parallel those in the English data reported by Bartsch and Wellman (1995) in showing a predominant reference to self in children's early uses of mental state verbs. Specifically, all 10 of the Mandarin-speaking children referred to their own desires with *yao4* and *xiang3* ($M = 29.4$, $SD = 18.8$; $M = 3.5$, $SD = 3.3$) more often than they referred to other people's desires ($M = 2.3$, $SD = 2.7$; $M = 0.4$, $SD = 0.5$), paired $t(9) = 5.03$ and 2.90 , $ps < .001$ and $.05$, respectively. In Bartsch and Wellman's study, 9 out of 10 of the English-speaking children showed such a pattern for reference to desires. The same pattern was also evidenced for references to thinking and knowing that among the Mandarin-speaking children who made such references (for self *zhidao4*, $M = 2.1$, $SD = 3.0$; for other *zhidao4*, $M = 0.0$, $SD = 0$).

The pattern for knowing how, however, is not as clear. Contrary to our expectations, the children appeared to reference other people's abilities to do things at the same time as, or even before, they referred to their own abilities or knowledge of how to do something. Specifically, 4 of the 8 children who made any reference to knowing how spoke about other people's (or things') ability or knowledge of how to do something before their own, whereas only 1 child (W.W.) spoke of his own knowing how first, and the remaining 3 children produced their first utterances that included *self* and *other* references during the same recording visit. Similarly, the frequencies of *self* and *other* references to knowing how were inconsistent and showed no clear trends in either direction (for self *hui4+neng2*, $M = 3.2$, $SD = 2.9$; for other *hui4+neng2*, $M = 3.3$, $SD = 3.6$); ts were insignificant for both pooled and separated *hui4* and *neng2* references to the self versus others. This is an intriguing result that we will examine further in the caregivers' speech as well as in the production data for the Cantonese-speaking children.

Mental state verbs in Mandarin adult-to-child speech. Unlike their children, the Mandarin-speaking adults did not focus exclusively on the verb *yao4* (to want), even at the earliest recordings.

Yao4 was frequent in adult talk, but of the five mental state verbs that we coded for, it was less frequent than the other four verbs combined, as can be seen in Figure 4.

Similarly, unlike their children, the adults did not focus exclusively on the mental state of desire. Except for the earliest transcript, they talked about mental states other than desire at least as often as they talked about desire itself, as can be seen from Figure 5. This is in contrast to the children's speech, in which desires accounted for more mental state talk than all other states, as was shown in Figure 2.

Interestingly, however, the Mandarin-speaking caregivers rarely spoke about thinking with their toddlers. This result is in contrast to the English data, in which thinking was discussed in roughly 21% of the parental mental state references coded by Bartsch and Wellman (1995)—compared with knowing, which was discussed in 25% of these references (Bartsch & Wellman, 1995, and K. Bartsch and H. M. Wellman, personal communication, February 1999). Nonetheless, it is consistent with the Mandarin-speaking children's relatively late development of and minimal reference to thinking.

Self versus other references in Mandarin adult-to-child speech. For *self* versus *other* references, two possible relations exist between the adult input and children's productions of these references. First, children might mimic their caregivers in the exact forms and references they use (i.e., adults talk about self, and children talk about self). Second, children might follow the adults' reference to person (i.e., adults talk about child, and children talk about child). In fact, it appears that children follow their caregivers' reference to person rather than simply mimicking the forms they hear. For each of the mental state verbs, caregivers were more likely to refer to others (and the child in particular) than they were to themselves. Given that this is exactly the opposite of the children's results (*self* references were earlier and more frequent than *other* references), simple repetition cannot account for the children's data. An interesting confirmation of this comes from references to "knowing how." Whereas the children were most likely to vary from their self-first pattern for "knowing how," the adults' proportion of *self* to *other* references appears to be even lower for this mental state than for other mental state references. For adults, the proportion of *self* versus *other* references for *yao4* ($6.5 / 25.4$) yielded a mean

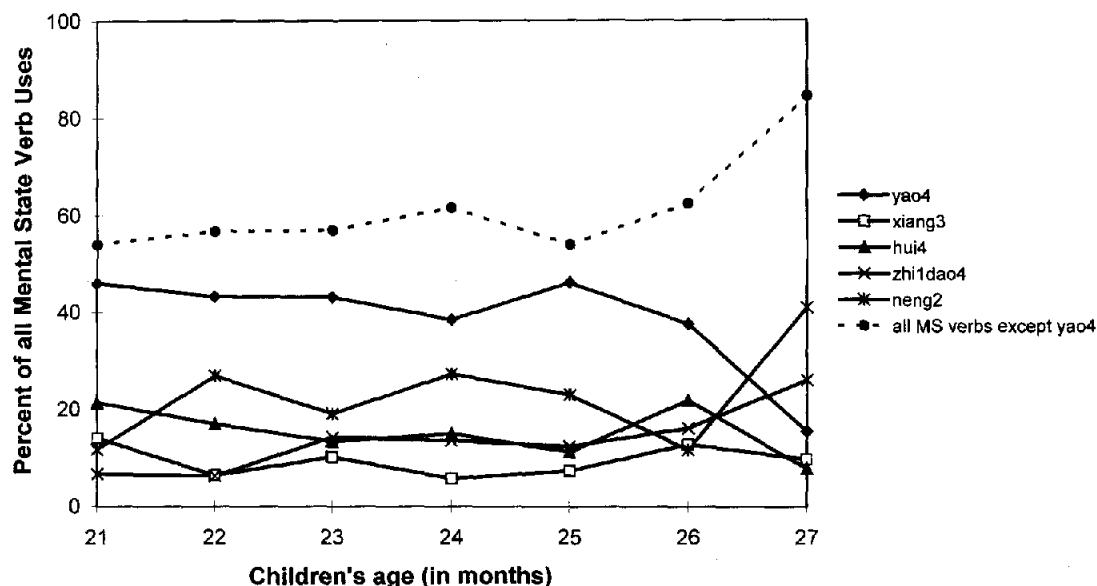


Figure 4. Mandarin-speaking caregivers' use of mental state (MS) verbs.

of 0.26 ($SD = 0.15$), whereas for *hui4* and *neng2* (the words for expressing knowing how), the proportion of *self* versus *other* references ($1.9 / 37.8$) yielded a mean of 0.05 ($SD = 0.07$). A two-tailed paired t test showed these proportions to be significantly different, $t(9) = 2.27$, $p < .05$. Thus, both the adults and the children referred to the child's knowing how, even though this involved, for the children, a reversal of perspective and of pronoun to maintain the proper referent.

Study 2: Cantonese-Speaking Children

There were two primary reasons for extending our study of Mandarin-speaking children to examine the emergence of mental

state verbs with Cantonese-speaking children. First, although we had a relatively large sample of 10 Mandarin-speaking children who were studied longitudinally, these children were studied for only 6 months at a very early age for examining mental state verb use (21–27 months of age). This allowed us to examine the very early emergence of mental state verbs, but it did not allow us to examine some of the later-emerging mental state verbs and meanings. Second, Cantonese allows us to consider more closely several possible reasons for why the thought meaning of *xiang3* is not acquired until a later age. On the one hand, *to think* could be acquired later than *to desire* for reasons consistent with Wellman's (Bartsch & Wellman, 1995; Wellman & Woolley, 1990) argu-

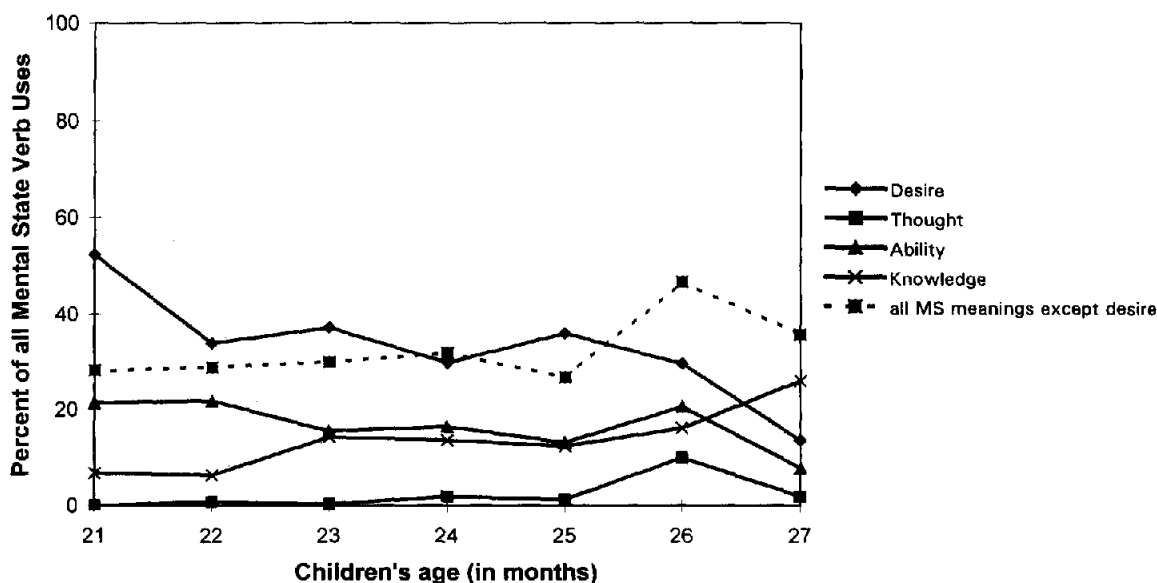


Figure 5. Mandarin-speaking caregivers' mental state meanings.

ments that children's early understandings develop from a desire psychology to a belief psychology. On the other hand, the later emergence of *xiang3* to mean thinking and the later emergence of *xiang3*, relative to *yao4*, could be a result of the polysemy of the verb *xiang3* and of young children's tendency to conform to the one-to-one mapping, or unifunctionality, principle (Slobin, 1985). Alternatively, it could be due to the low frequency of *xiang3* in adult-to-child speech.

Examining Lee's corpus of Cantonese-speaking toddlers (Lee et al., 1995) allows us to address the first two of these issues. First, Lee's corpus includes recordings of children across a larger age range than does the Mandarin corpus. Second, Cantonese, unlike Mandarin, has two verbs for encoding the mental state meaning "to think (about)": *soeng2*, which encodes meanings for desire as well as thought, and *nam5*, which has a unique encoding. Thus, we can examine the emergence of both *soeng2* and *nam5* in Cantonese to see whether the mental state meaning "to think" emerges earlier in Cantonese-speaking children, who have a unique word, *nam5*, to encode this meaning. In addition, we should be able to look at the emergence of "to think" with both words and determine if this meaning emerges earlier with *nam5* (as would be expected if Mandarin-speaking children's delayed acquisition of "thinking" was due to interference with one-to-one mapping) or with *soeng2*.

Finally, although the examination of naturalistic adult-to-child speech is not possible with Lee's Cantonese corpus (Lee et al., 1995), this corpus provides additional data on the acquisition of mental state verbs in Chinese languages. Even though there are some differences in the meanings and use of these mental state verbs across the two dialects, Cantonese and Mandarin share the syntactic features discussed earlier that result in a lack of syntactic differentiation between finite and nonfinite complements for mental state verbs. Thus, examining mental state verbs in this independently collected Cantonese corpus provides an opportunity to observe the use of these verbs with an independent sample of children and in a different Chinese dialect.

Method

Participants and procedure. The Cantonese data used in the present study include recordings from 8 Cantonese-speaking children (4 boys and 4 girls) from a wide range of family backgrounds, as described in the Hong Kong Cantonese corpus available on CHILDES (Lee & Wong, 1998; Lee

et al., 1995). The ages of the children in the Cantonese transcripts ranged from 17 months to 44 months, but because each child was observed for approximately 1 year and ranged in age from 17 to 32 months at the beginning of the study, not all children were observed at all ages. Table 4 shows the distribution of children across these ages.

Even though the Cantonese-speaking children and their caregivers were also recorded in their own homes, there was much more interaction between the researcher and the target child than in the Mandarin transcripts, thus making the Cantonese corpus somewhat less naturalistic than the Mandarin corpus. In particular, the Cantonese researchers (each researcher visited and collected data from 2 families) and the children's own parents engaged in a high proportion of test questions and other types of interchanges that were focused on eliciting the children's grammatical capabilities (Lee & Wong, 1998). One further difference between these two corpora and the families in them is that, reflective of the social and political situations in Hong Kong and Beijing, half of the Hong Kong children had been exposed to English and/or other languages within the home, whereas the Beijing families spoke only Mandarin in the home (with the exception of a few isolated English words). Finally, 4 of the Hong Kong children had one or more siblings, whereas all of the Beijing children were only children.

The Cantonese transcripts are also available in romanized CHAT format on the CHILDES database, and they can also be examined through the use of a Chinese word processor (Eten) with specialized Cantonese characters. The Cantonese corpus was larger than the Mandarin corpus and included 171 transcripts, or 68,830 child utterances.

Coding. Like the Mandarin utterances, the Cantonese utterances that included the target words were selected with a computer program that resembled the KWAL program in CLAN; they were then coded by native Cantonese speakers according to the categories listed in Appendix B. The procedures for excluding repetitions and responses to V-not-V questions and "don't know" responses were identical to those in our coding of the Beijing transcripts. Similarly, the coding for the mental state meanings of "desire," "know how," "know that," and "think/believe" were based on various combinations of the coding categories listed in Appendix B. In particular, "desire" meanings included Categories 1 through 6 and Category 8 for *jiu3* and Categories 1 and 3 for *soeng2*; "know how" included Categories 1 and 3 for *sik1*; "know that" included all uses of *zi1* as well as Categories 2 and 4 for uses of *sik1* that were not simple statements of "don't know"; and "think/believe" included Category 5 for *soeng2* as well as all uses of *nam5*. Any categories that were not listed above were not coded as mental state meanings but were calculated into the total uses for a particular verb. We assessed reliability by asking two native speakers of Cantonese to code, independently, at least 2 children's uses of all verbs. Cohen's kappa for the interrater reliability between these coders was 1.00.

Table 4
Schedule of Cantonese Transcripts

Child	Age (in months)						
	18-21	22-25	26-29	30-33	34-37	38-41	42-44
C.C.C.		x	x	x	x		
C.G.K.		x	x	x	x		
C.K.T.	x	x	x	x			
H.H.C.			x	x	x	x	
L.L.Y.				x	x	x	x
L.T.F.			x	x	x	x	
M.H.Z.	x	x	x	x			
W.B.H.			x	x	x		
Total utterances	1,033	6,680	16,172	21,500	13,051	8,349	2,045

Results

Like the Mandarin-speaking children, the Cantonese-speaking children showed some use of mental state verbs in all but the very earliest transcripts. Similarly, the use of mental state verbs increased with age over this period from roughly 1% of all utterances at 20 months of age to almost 5% of all utterances at 40 months of age. Thus, the Cantonese-speaking children are somewhat more comparable to the English-speaking children in Bartsch and Wellman's (1995) study than they are to the Mandarin-speaking children whose data are reported earlier.

Nonetheless, the Cantonese data, like the Mandarin data, show a general trend toward much more frequent use of the verb *jiu3* (to want) than of other mental state verbs that encode meanings other than desire, as can be seen in Figure 6.

However, because the data for the Cantonese-speaking children begin at an older age than those for the Mandarin-speaking children, we do not have data for the earliest ages, when children might be using just one of these mental state verbs. Note that in Table 1, for 8 out of 10 Mandarin-speaking children there is at least one transcript in which the child is using just one of the target verbs. In contrast, in Table 5 such data are available for only 2 of the 8 children (C.C.C. and M.H.Z.). For 1 of these children (C.C.C.), *jiu3* is the single verb used in those earliest transcripts, whereas the other child (M.H.Z.)⁵ used *zi1* before he used *jiu3*. For all 6 of the remaining children, *jiu3* appears together with other verbs in their earliest transcripts. Thus, although it is not possible to ascertain whether *jiu3* was indeed the earliest verb for the majority of the Cantonese-speaking children, it does appear, from these data, to be used early and consistently from 20 months of age onward, as can be seen in Figure 7.

If we consider only those uses that encode for each of the mental state meanings discussed earlier, we find a pattern similar to the one found for English and Mandarin. Although many of the Cantonese-speaking children were older than the Mandarin-speaking children at the beginning of the study—and thus the pattern of earliest mental state references is not so clear—talk about desires, abilities, and knowledge clearly preceded talk about thinking. Even for these older children, reference to thinking continued to be infrequent and only began to occur around 36 months of age, as can be seen from Table 6 and Figure 8.

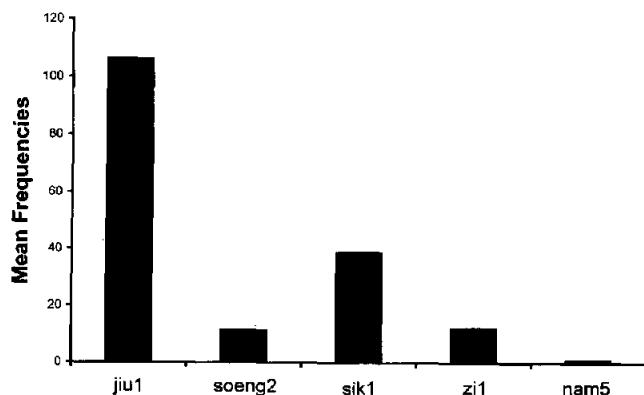


Figure 6. Mean frequencies of mental state verbs for Cantonese-speaking children (18–44 months).

The relatively late use of terms to describe thinking is entirely consistent with the Mandarin and English data. This is true despite the fact that Cantonese-speaking children clearly acquired the term *soeng2*, which could be used to describe thinking, relatively early. Moreover, it is true even though Cantonese-speaking children have the option of using a verb that uniquely encodes a meaning for "think" and thus avoids the problem of polysemy found in Mandarin as well as the additional complications of finite complement syntax found in English.

Self versus other references to mental states in Cantonese. The Cantonese-speaking children showed the same pattern of *self* references before *other* references to mental states that was shown by the Mandarin-speaking children. As can be seen in Table 7, all 8 children produced *self* references before (7 out of 8 children) or at the same time as (1 out of 8 children) *other* references for desire, knowing that, and thinking. Moreover, the Cantonese-speaking children's data for *sik1* (knowing how) shows the same pattern of *self* references before *other* references as the other mental state verbs, with all but 2 children producing *self* references earlier and the remaining 2 children producing them in the same recording visit. Frequency data further corroborate this pattern, with all 8 children producing more *self* than *other* references for each of the mental state verbs that they produced, including *sik1* (*self*, $M = 36.1$, $SD = 18.8$; *other*, $M = 7.4$, $SD = 8.4$), paired $t(7) = 5.33$, $p < .005$.

In this sense, the data replicate both the English- and the Mandarin-speaking children's predominant reference to their own mental states. The only deviation from this self-first pattern was with the Mandarin, but not the Cantonese, children's references to "knowing how." Because it was not possible to examine naturalistic adult-to-child speech for the Cantonese-speaking children, it is not clear whether the differences between Mandarin- and Cantonese-speaking children's productions of "knowing how" differed in their referents because of frequency factors in input, differences between the verbs (and modals) used to express this concept in the two dialects, or other potential cultural and contextual differences between the two samples.

General Discussion

The basic finding from these studies is clear. Both Mandarin- and Cantonese-speaking children acquire terms for, and talk about, people's desires well in advance of acquiring terms for and talking

⁵ It is important to note that the 1 child who was an exception to this pattern, M.H.Z., produced only one instance of *zi1* (to know that) before *jiu3* and did not produce further instances of *zi1* until 4 months later, well after he was consistently using *jiu3* to express desire. Furthermore, although this early use of *zi1* was coded as productive by our criteria in that it was neither a repetition of another speaker's immediately preceding utterance nor a simple "don't know" response to an adult request for information, it did not appear to be an entirely productive utterance. In fact, it occurred several utterances after another production that was coded as a repetition, and it was more of a turn-taking device than a mental state use in that the child responded to the investigator's request that the child take his brother to play on the teeter-totter with *zi1* ("[I] know"). Later uses of *zi1*, in contrast, were clearly focused on knowing a particular fact or situation. Finally, M.H.Z. was using *jiu3* in his earliest recorded transcript, but because all of his uses were responses to *jiu3 m5 jiu3* questions, they were coded as repetitions and excluded from analysis.

Table 5
Age (in Years; Months) of First Occurrence of Cantonese Target Word

Child	jiu3 (want)	soeng2 (want/think)	sik1 (know how)	zi1 (know that)	nam5 (think)
C.C.C.	2;3	2;9	2;4	2;4	(2;10)
C.G.K.	1;11*	1;11*	1;11*	1;11*	(2;9)
C.K.T.	1;8	2;5	1;11	1;8	(2;7)
H.H.C.	2;5	2;8	2;10	2;5	3;0
L.L.Y.	2;9*	3;1	2;9	2;9	3;4
L.T.F.	2;2*	2;5	2;2*	2;3	2;11
M.H.Z.	1;11	2;4	2;2	1;8*	(2;8)
W.B.H.	2;4*	2;4*	2;4	2;9	3;4

Note. Asterisks mean that the target word was produced in the first available transcript. Note that in some cases (e.g., L.L.Y. at 2;9) there was more than one transcript at a particular age for the Cantonese sample. Entries in parentheses are the child's age for the last available transcript, at which time the target word still had not been produced.

about people's thoughts. In evidencing this pattern, these data are quite similar to those of English-speaking children. This developmental pattern is consistent not only across languages but also across individuals. Ten of 10 English-speaking children in the study by Bartsch and Wellman (1995) provided data consistent with this pattern; the data of 18 of the 18 Chinese-speaking children in the present study were also consistent with it. Our data for whether the Mandarin- and Cantonese-speaking children also refer to desires before they refer to knowledge are a little more equivocal but still quite strong. Specifically, 9 of the 10 Mandarin-speaking children produced words for desire before words for knowing how or knowing that, and the remaining child produced words for desire and words for knowing during the first recorded visit, so it is not clear in which order he acquired them. For the Cantonese-speaking children, the data are less clear, in part because we were unable to examine the earliest uses of mental state terms for most of the children in that sample.

Wierzbicka (1992) suggested that human languages worldwide all contain terms that refer roughly to wanting, thinking, and knowing. Our data suggest that children worldwide acquire these

terms and meanings in a clear order—references to thoughts appear only considerably after an earlier period of references to desires (and also to emotions; see Wellman, Harris, Banerjee, & Sinclair, 1995), with knowledge perhaps coming in at an intermediate state (see also Hogrefe, Wimmer, & Perner, 1986, and Moore, Bryant, & Furrow, 1989, who found an understanding of knowledge before belief in experimental comprehension paradigms). Of course, data from only a few languages cannot confirm such a broad hypothesis. But the consistency across English and Chinese languages is especially intriguing. As noted earlier, Chinese languages contrast with English on a great many properties that might have directly influenced our results. Specifically, verb learning proceeds notably earlier in Mandarin and Cantonese compared with English (Leung, 1998; Tardif, 1996); the surface structure of predicate complement utterances in Mandarin and Cantonese does not include the finite markers (tense and the complementizer "that") that are problematic for talking about thinking in English; and, in Mandarin and Cantonese, the same terms can be used to refer to desires or to thoughts. In these ways, children acquiring Mandarin and Cantonese provide an especially

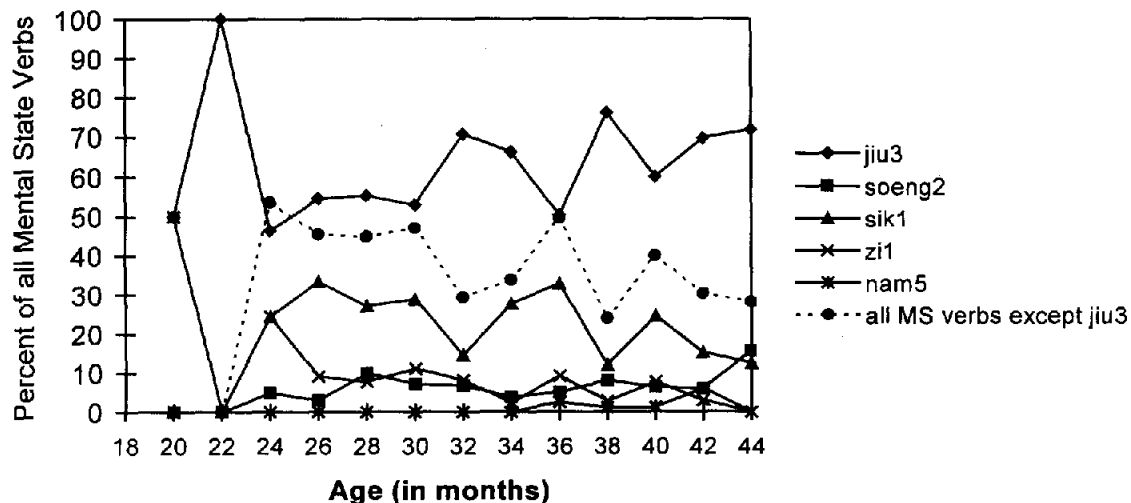


Figure 7. Cantonese-speaking children's use of mental state verbs.

Table 6
Age (in Years; Months) of First Occurrence of
Cantonese Target Meaning

Child	"desire"	"know how"	"know that"	"think"
C.C.C.	2;3	2;4	2;4	(2;10)
C.G.K.	1;11*	1;11*	1;11*	(2;9)
C.K.T.	1;8	1;11	1;8	(2;7)
H.H.C.	2;5	2;10	2;5	3;0
L.L.Y.	2;9*	2;9	2;9	3;4
L.T.F.	2;2*	2;2*	2;3	2;11
M.H.Z.	1;11	2;2	1;8*	(2;8)
W.B.H.	2;4*	2;4	2;9	3;4

Note. Asterisks mean that the target word was produced in the first available transcript. Entries in parentheses are the child's age for the last available transcript, at which time the target meaning still had not been produced.

helpful contrast to children acquiring English. Nonetheless, the basic pattern of acquisition was quite similar.

What might account for this developmental shift in reference and usage? One possibility is that these data evidence an underlying change in children's conceptions of person's mental states. The basic idea is that a simple conception of desire (and simple emotions) is achievable by construing persons as having drives for, or "connections" to, external objects or events—"He wants an apple"; "She hates apples." In contrast, to conceive of a person's thoughts or knowledge requires a more representational understanding of those mental states in which the person captures in his or her mind some construal or idea about an object or event. For thoughts and beliefs, this is pushed one step further, in that a clear distinction exists between the actual state of affairs and the represented state of affairs (that is, the thought-about, believed state of affairs). This distinction is most easily seen, perhaps, in the case of a false belief—in which a person's representation contradicts reality. According to this proposal, children understand mental states only in terms of drives and connections—and hence simple desires

and emotions—early on. Only later do they also come to understand representation itself and hence thoughts and beliefs. Consequently, very young children find it easy to acquire and use terms for desire but not terms for thought and belief. Variations and elaborations on this basic idea are detailed in Bartsch and Wellman (1995), Flavell (1988), Gopnik and Wellman (1994), and Perner (1991).

An alternative possibility that needs consideration is that perhaps early in life parents talk to young children exclusively about desires (wants, needs, etc.) and not about thoughts, beliefs, or knowledge. Thus, children's order of acquisition of these terms and meanings would match the frequency of mention of these terms in adult speech to children. However, the English data here are clear. The English-speaking parents in Bartsch and Wellman's (1995) study talked to their young children frequently about beliefs in their earliest transcripts, and talked about beliefs as much as desires. Yet those children, like the Chinese ones in the present study, talked at first only about desire and not about belief. Adults' talk to children about mental states is a complex topic in need of considerable further research, but when we looked only at adult-to-child uses of *xiang3* (think/want) to refer to thinking, we found that it was quite low across all families and all visits (with the exception of one mother and her child talking about a Japanese cartoon monk who thinks by rubbing his temples). Thus, it appears that thinking was not a salient topic of conversation for these Mandarin-speaking caregivers and their toddlers. This paucity of reference to thinking may have several explanations. One intriguing possibility might be a disinclination to talk about thinking with young children that is due to a limited conception of children's capacities or to related differences in adults' theories of mind in Chinese cultures. In particular, Hansen (1983, 1989) claimed that unlike the Greek traditions on which contemporary Western folk and academic psychologies are based, "the philosophical psychology of ancient China did not use a cognitive/affective contrast" (Hansen, 1989, p. 97). Both Western and Chinese theories of mind, claimed Hansen, are closely related to their theories of language.

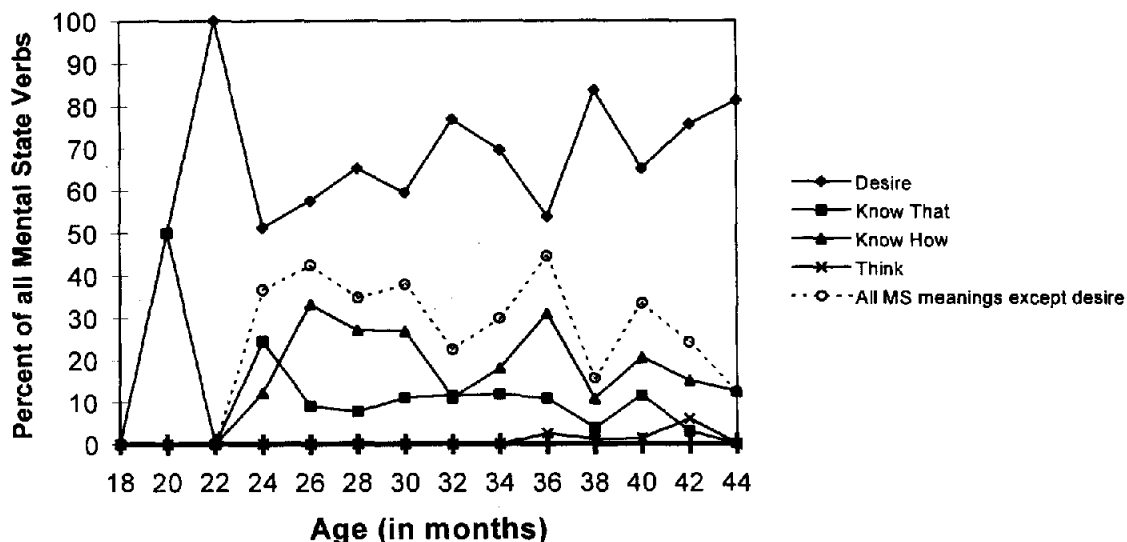


Figure 8. Cantonese-speaking children's mental state (MS) meanings.

Table 7
Age (in Years; Months) of First Self and Other References With Target
Cantonese Mental State Meanings

Child	"desire"		"know how"		"know that"		"think"	
	Self	Other	Self	Other	Self	Other	Self	Other
C.C.C.	2;3	2;6	2;4	2;5	2;4	2;7	(2;10)	—
C.G.K.	1;11*	2;4	1;11*	2;3	1;11*	—	(2;9)	—
C.K.T.	1;8	2;6	1;11	2;1	1;8	—	(2;7)	—
H.H.C.	2;5	3;2	2;10	—	2;5	3;4	3;0	—
L.L.Y.	2;9*	2;11	2;9	2;9	2;9	—	3;4	—
L.T.F.	2;2*	2;6	2;2*	2;5	2;3	3;0	2;11	—
M.H.Z.	1;11	1;11	2;2	2;2	1;8*	—	(2;8)	—
W.B.H.	2;4*	3;0	2;4	3;3	2;9	2;10	3;4	—

Note. Asterisks mean that the target word was produced in the first available transcript. Entries in parentheses are the child's age for the last available transcript, at which time the target meaning still had not been produced.

In the West, this relationship maps onto what Hansen (1989) referred to as a "belief psychology" based on representations of words and sentences, whereas in classical Chinese philosophy, language was for "guiding actions and coordinating social interaction" (p. 85). If this philosophical tradition is still present in contemporary folk theories, we might expect Western adults to focus more on a "belief psychology," as discussed by Wellman and others (e.g., Astington & Gopnik, 1991; Astington, Harris, & Olson, 1988; Bartsch & Wellman, 1995; Flavell, 1988; Gopnik, 1990; Perner, 1991; Wellman, 1990) and Chinese adults to focus more on intentions, desires, and actions. The issue of a cultural disinclination to talk about thinking with young children is fascinating and fits with other data on Chinese versus American mothers' predictions of when their children begin to think (Au & Tardif, 1999). But of course this hypothesis needs further testing. For example, it would be important to assess whether Cantonese-speaking caregivers also tend not to talk about thinking with their young children.

Regardless of what might account for a paucity of reference to thinking in adult speech to Chinese children, it is of interest that if we had only the Mandarin data, an account proposing that children's first uses of mental state terms mimicked adults' conversational topics might make sense. However, this proposal fails to account for the English data, which show that English-speaking children exhibit the same pattern as these Chinese children but that adults talk frequently about both beliefs and desires. Moreover, an examination of *self* versus *other* references in the data of Mandarin-speaking adults and children also failed to produce support for an account in which children's order of acquisition simply mirrors adult frequencies of usage. Specifically, Mandarin-speaking adults talk about others' mental states more often than their own, but Mandarin- and Cantonese-speaking children start out by referring only to their own mental states before referring to the mental states of others. Note that this pattern of *self* references before *other* references appears to be true for English-speaking children also, both for mental state terms (e.g., Bartsch & Wellman, 1995; Hughes & Dunn, 1998; Imbens-Bailey & Fabricius, 1997) and for early conversations in general (Budwig, 1995). Thus, although further investigation is needed of adult talk to children about mental states, neither the Chinese nor the English data can be explained by children's simple mimicry of adult

frequencies. Instead, the data show a consistent developmental pattern that holds up across languages and across cultures. We certainly do not mean to suggest that this developmental progression is impervious to linguistic and cultural variation. We conclude only that the basic progression from desire to thought and belief is apparent even amidst such variations. In fact, obvious variation across these language systems is evident in the frequencies of references to thinking, as just discussed. Another obvious difference concerns children's earliest references to mental states. Reference to desires appears in English-speaking children typically in the 3rd year, just after their 2nd birthdays, in their use of the term "want." Many of the Mandarin children we studied were making reference to desires when first studied, at 21–23 months of age. And as noted earlier, there is some evidence that terms referring to desires may appear among Mandarin-speaking children's first words (Tardif et al., 1999). Most likely, Chinese children's overall attention to verbs and their early verb learning can account for their accelerated reference to desires relative to English-speaking children (Leung, 1998; Tardif, 1996).

It is also possible that other child factors besides a universal basis for a theory of mind are responsible for the progression from desire to thought and belief. One of these might have to do with the general pragmatics of being and interacting with a young child. Because toddlers are still unable to care for themselves in most respects, it is possible that they talk about desires early simply because they need assistance from a caregiver in order to fulfill these desires. Such a pragmatic explanation is also consistent with children's referring to their own desires before they refer to those of others and with the adult data as well—because the adults are assisting the child in fulfilling his or her desires, it is natural that they too would speak about the child's desires and not their own.

Another child factor that could explain the relatively early appearance of references to knowing, as well as desiring, in Mandarin and Cantonese has to do with the epistemological status of knowing. In particular, it could be that "knowing how," as talked about with *hui4/neng2* in Mandarin and *sik1* in Cantonese, is more representative of the possibility for an action than of a mental state per se. Thus, it could be that a child who talks about "knowing how" in Mandarin and Cantonese is simply using these words in the way an English-speaking child would use "can" to express the modality for, or the possibility of, a particular action's

occurrence. Moreover, the failure of the Mandarin verbs *hui4* and *neng2* to conform to the self-first pattern of reference suggests that there may be some important differences between these verbs for "knowing how" and other mental state verbs. Interestingly, however, the Cantonese verb *sik1* did conform to the self-first pattern, which suggests that there may also be some inconsistencies across dialects in talk about "knowing how." Given the inconsistencies across children, however, it seems that it would be prudent to conduct further research on this topic.

Our data may also be showing that "knowing that" is acquired relatively early by these Mandarin- and Cantonese-speaking toddlers (before their 2nd birthdays, as shown in Tables 2 and 5) compared with English-speaking children (who, Bartsch and Wellman [1995] found, acquired "knowing that" closer to their 3rd birthdays). Why might this occur? One possibility is simply that the lack of a finite distinction and the lack of a complementizer after the verbs for "know" (*zhidao4* and *zhi1*) makes it easier for Mandarin- and Cantonese-speaking children than for English-speaking children to understand and express notions of knowing that. Perhaps, as suggested earlier, terms for knowledge are representative of an intermediate stage in the development of a theory of mind, and English-speaking children do not acquire them as early because they are hampered by their grammar. Alternatively, or perhaps as a further explanation of why this might be so, it could be that children's early references to "knowing that" involve a more general state of knowing or familiarity with something in the outside world rather than a clear mentalistic concept that involves a certainty (Moore et al., 1989) or the truth-state of an inner representation. Although it would be ideal to go back to the children's production data and code it more carefully for such distinctions, it is difficult to make these distinctions in our data—partly because the children are so young and thus are not producing long enough utterances, partly because our corpus is relatively limited in size and clear distinctions such as these are highly infrequent, but also partly because both Mandarin and Cantonese allow for a number of arguments to be dropped and it is often unclear whether a distinction is being implied. Clearly, experimental follow-up studies to distinguish between these different ways of knowing and children's understanding of them are necessary to explore these possibilities further.

Finally, there is the issue of why these Mandarin- and Cantonese-speaking children refer to thinking at even later ages than do the English-speaking children studied by Bartsch and Wellman (1995) and others. In part, these Chinese-speaking children may not refer to thinking earlier simply because they do not hear such references enough in their caregivers' input. In addition, it may be that both the grammar and the semantics for talking about thinking present significant difficulties in Chinese, as in English. Thus, although the ability to use and comprehend finite complements for verbs of thought is not an issue for Mandarin and Cantonese speakers, because the markers that make up a finite complement (tense and "that") are not present in these languages, it is still possible that more complex arguments are needed to discuss representations than to discuss desires. Thus, when *xiang3/soeng2* is used to express thinking, it is quite possible that a more complex syntactic structure is produced than when this same verb is used to express wanting. For example, although *xiang3* can be used to express both thinking and wanting with minimal changes

to the following sentences, there are indeed differences in aspect marking between the two sentences:

- | | | | | | |
|-----|-------------------|------------------------|-----------------------------|----------------------|----------------------|
| 10. | <i>ta1</i>
2PS | <i>xiang3</i>
think | <i>ma1ma</i>
mama | <i>hui4</i>
will | <i>lai2.</i>
come |
| 11. | <i>ta1</i>
2PS | <i>xiang3</i>
want | (<i>yao4</i>)
(future) | <i>ma1ma</i>
mama | <i>lai2.</i>
come |

However, these differences, as mentioned earlier, are not obligatory. Thus, it is also possible to produce a sentence in which the syntax is the same but the meaning of *xiang3* could be either to think or to want, as in Sentences 12 and 13 below:

- | | | | | | | |
|-----|-------------------|-----------------------------|---------------------|---------------------|---------------------|----------------------------|
| 12. | <i>wo3</i>
1PS | <i>xiang3</i>
want/think | <i>you3</i>
have | <i>hen3</i>
very | <i>duo1</i>
many | <i>wen4ti3.</i>
problem |
| 13. | <i>wo3</i>
1PS | <i>xiang3</i>
want/think | <i>you3</i>
have | <i>hen3</i>
very | <i>duo1</i>
many | <i>qian2.</i>
money |

The first sentence is generally interpreted to mean "I think [that] there are lots of problems," but it could also mean "I want to have many problems." Similarly, the second sentence is generally interpreted to mean "I want to have a lot of money (be rich)," but it could also mean "I think there is a lot of money." The differences in interpretation have nothing to do with the grammar or the argument structure but rather with the pragmatic implications of the utterance. In general, people want to have lots of money, not lots of problems, and they tend to think about a situation as having lots of problems, not lots of money. Nonetheless, this type of sentence is admittedly rare. Chinese speakers, like speakers of any other language, have difficulty with ambiguous phrases. Thus, it is likely that Chinese speakers habitually distinguish between meanings and that these distinctions may involve differences in syntactic complexity even though the grammar does not require such distinctions. But it is these differences in complexity, together with what appears to be a cultural disinclination to talk about thinking with young children, that could make an input-complexity account plausible and result in even later reference to thinking than in English-speaking children. Nonetheless, such a hypothesis would be a different type of input-complexity hypothesis than one of frequency matching. A cultural disinclination hypothesis would be different, as well, from that put forth by deVilliers (1995), who argued that it was syntax that constrained how early children could make references to thinking.

In sum, our results demonstrate an important consistency in the overall sequence of development of a theory of mind across English- and Chinese-speaking children. At the same time, however, they demonstrate variation in the timing of the beginning and end points of this sequence as a function of various linguistic and cultural factors. Finally, our results suggest a number of future directions for cross-linguistic research on children's theory of mind and some specific directions that would be informative for consideration with Mandarin- and Cantonese-speaking children.

We believe that careful choice of contrasting languages (such as Mandarin and Cantonese) will help theory-of-mind researchers to untangle the various proposals for how and when children's understandings of mental states and mental issues develop. Differences of this sort across languages can provide special research opportunities. Slobin (1985) used such cross-language differences in acquisition to examine children's early language learning. Other researchers (e.g., Mandler, 1988) used the very early appearance of

first words for deaf infants learning sign (often at 5½–7 months, as demonstrated by Bonvillian, Orlansky, and Novack [1983]) to argue for the early representational capacities of infants more generally. Perhaps Mandarin- and Cantonese-speaking children's early references to desires (and possibly to other mental states such as emotion and perception) can offer an avenue for research into early development in children's theory of mind more generally.

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Appendix A

Coding System for Mandarin Mental State Verbs

Markers: 1PS = first person singular; SFP = sentence-final particle; CL = noun classifier; DE = the morpheme *de*, which can be used as a nominalizer to mark possession and other relationships between

a noun and the phrase that precedes it; 2PS = second person singular; ORD = ordinal marker; COP = copular verb ("to be"); 3PS = third person singular; @rv = resultative verb complement.

yao4

1. Desire

a) followed by a common noun, e.g.,

wo3	yao4	qiu2
1PS	want	ball

(I want [a/the]ball.)

b) followed by a verb, e.g.,

hai2	yao4	kan4	zhei4	che1
still	want	look at	this	car

([He] still wants to look at this car!)

2. Need to do something, e.g.,

xia4	yu3	yao4	gan4	ma2	ya?
descend	rain	want	do	what	SFP

(What do [you] need to do [when] it rains?)

3. To ask for something, e.g.,

wen4	ba4ba	yao4	yi2-ge	shaor2
ask	daddy	want	one-CL	spoon

(Ask daddy for a spoon.)

4. To want/like a particular person (always followed by a proper noun or pronoun), e.g.,

bu2	yao4	ni3	le
not	want	2PS	SFP

([I] won't want you, [then].)

5. If (abbreviation of a 2-character word, yao4shi4), e.g.,

ni3	yao4	zai4	jue4	de	hua4
2PS	if	again/still	surly	DE	speech

(If you're still surly, [then] . . .)

6. Future marker, e.g.,

haha	ma1ma	yao4	zuo4	di4-er4	ming2
haha	mummy	will	do	ORD-two	name

(Haha! Mom's going to come in second.)

7. Otherwise (abbreviation for yao4bu4ran2), e.g.,

ni3	jiu4	fan4	mao2bing4	yao4 bu4	shuo1	de	ne
2PS	just	recur	problem	otherwise	say	DE	SFP

(You're just back to causing trouble, otherwise [I wouldn't be] scolding [you]!)

8. Other/ambiguous

xiang3

1. Desire:

a) followed by a verb, e.g.,

ni3	shi4	bu2	shi4	hai2	xiang3	wanr2?
2PS	COP	not	COP	still	thinking of/want to	play

(You still want to play, don't you?)

b) followed by a name/pronoun plus a verb

ta1	xiang3	rang4	ni3	na2	yi2-ge
3PS	thinking of/want to	allow	2PS	grasp	one-CL

(He/she wants to let you take one.)

2. To miss someone, followed by a name/pronoun only, e.g.,

<i>xiang3</i>	<i>bu4</i>	<i>xiang3</i>	<i>zu3</i>	<i>a?</i>
thinking of	not	thinking of	grand-father	SFP

 ([Are you] missing grandfather?)
3. To think or imagine, e.g.,

<i>zai4</i>	<i>xiang3</i>	<i>xiang3@rv</i>	<i>ban4fa3</i>
again	think	think	method

 (Think again about another way [to do it].)
4. To believe, e.g.,

<i>wo3</i>	<i>xiang3</i>	<i>Bao3Bao</i>	<i>huai4</i>	<i>hai2zi</i>
1PS	think	treasure-treasure	bad	child

 (I think that [my little] treasure is a bad child.)
5. Other/ambiguous

hui4

1. To be possible (expressing disbelief/suspicion),

<i>ta1</i>	<i>na3</i>	<i>hui4</i>	<i>chi1</i>	<i>ya</i>
3PS	where	can	eat	SFP

 ([How] can he eat?!)
2. To know how or have learned how, e.g.,

<i>hui4</i>	<i>tiao4wu3</i>	<i>zen3me</i>	<i>tiao4</i>
can	dance	how	dance

 ([If you] can dance [then show me] how [you] dance.)
3. Future marker, e.g.,

<i>Bao3bao</i>	<i>ke1ke1</i>	<i>le,</i>	<i>hui4</i>	<i>teng2</i>	<i>de</i>
treasure	bump	ASP	will be	sore	DE

 ([My little] treasure bumped [himself], [it] will hurt.)
4. Other/ambiguous

neng2

1. To be possible (expressing disbelief), e.g.,

<i>ta1</i>	<i>na3</i>	<i>neng2</i>	<i>lao3</i>	<i>zhei4yang4</i>	<i>zhuan4</i>	<i>ya</i>
3PS	where	can	always	this way	spin	SFP

 ([How] can he keep spinning like this?!)
2. To be permissible, e.g.,

<i>zher4</i>	<i>bu4</i>	<i>hao3,</i>	<i>bu4</i>	<i>neng2</i>	<i>dao4</i>	<i>zher4</i>	<i>lai2</i>	<i>a</i>
here	not	good	not	can	arrive	here	come	SFP

 (Here's no good, [you] can't come [over] here!)
3. To be possible only after something else is completed (causal), e.g.,

<i>bu4</i>	<i>chi1</i>	<i>jiu4</i>	<i>bu4</i>	<i>neng2</i>	<i>pao3</i>
not	eat	just/then	not	can	run

 ([If you] don't eat, then [you] won't be able to run.)
4. To have the physical/mental/whatever ability to, e.g.,

<i>neng2</i>	<i>zi4ji3</i>	<i>chuan1</i>	<i>yi1fu</i>	<i>le</i>
can	self	wear	clothing	SFP

 ([Wow, you] can put on [your] own clothes!)
5. Other/ambiguous

zhidao4

1. To know, e.g.,

<i>ni3</i>	<i>zen3me</i>	<i>zhidao4</i>	<i>ta1</i>	<i>neng2</i>	<i>chi1</i>	<i>ren2</i>	<i>a</i>
2PS	how	know	3PS	can	eat	person	SFP

 (How do you know it can eat people?)
2. Other/ambiguous

(Appendixes continue)

Appendix B

Coding System for Cantonese Mental State Verbs

Markers: 1PS = first person singular; CL = noun classifier; 2PS = second person singular; SFP = sentence-final particle; COP = copular verb ("to be")

jiu3

1. Desire (i.e., "to want"), followed by a common noun, e.g.,

<i>ngo5</i>	<i>jiu3</i>	<i>saam1</i>	<i>zi1</i>	<i>bat1</i>
1PS	want	three	-CL	pen(s)

 (I want three pens.)
2. Desire (i.e., "to want"), followed by a verb, e.g.,

<i>ngo5</i>	<i>jiu3</i>	<i>tek3</i>	<i>bol</i>
1PS	want	kick	ball

 (I want to play ball.)
3. To want/like a particular person (always followed by a proper noun or pronoun), e.g.,

<i>ngo5</i>	<i>m4</i>	<i>jiu3</i>	<i>nei5</i>
1PS	not	want	2PS

 (I don't want/like you [anymore].)
4. To want a particular person to do something, e.g.,

<i>ngo5</i>	<i>jiu3</i>	<i>nei5</i>	<i>co2</i>	<i>dai1</i>
1PS	want	2PS	sit	low

 (I want you to sit down.)
5. To want a thing to do something, e.g.,

<i>ngo5</i>	<i>jiu3</i>	<i>gaa3</i>	<i>cel</i>	<i>haang4</i>
1PS	want	CL	vehicle	walk/move

 (I want the car to move.)
6. To need to do something, e.g.,

<i>nei5</i>	<i>jiu3</i>	<i>sik6</i>	<i>faan6</i>
2PS	want	eat	rice

 (You should/need to eat.)
7. Future marker, e.g.,

<i>baa1si2</i>	<i>jiu3</i>	<i>hoi1</i>
bus	will	start

 (The bus is going to leave.)
8. Desire with omitted object or complement (i.e., not followed by either a noun or verb phrase), e.g.,

<i>ngo5</i>	<i>jiu3</i>
1PS	want

 (I want [X]. / I want to [X].)
9. Other/ambiguous

soeng2

1. Desire, e.g.,

<i>ngo5</i>	<i>soeng2</i>	<i>tai2</i>	<i>din6si6</i>
1PS	want	look	TV

 (I want to watch TV.)
2. To miss someone (followed by a name/pronoun only), e.g.,

<i>soeng2</i>	<i>m4</i>	<i>soeng2</i>	<i>zyu6</i>	<i>po4po4</i>	<i>aa3</i>
think about	not	think about	fixedly	grandmother	SFP

 (Do [you] miss grandmother, or not?)
3. Desire a person to do something, e.g.,

<i>ngo5</i>	<i>soeng2</i>	<i>nei5</i>	<i>tung4</i>	<i>ngo5</i>	<i>waan2</i>
1PS	want	2PS	with	1PS	play

 (I want you to play with me.)
4. Desire a thing to do something, e.g.,

<i>ngo5</i>	<i>soeng2</i>	<i>gaa3</i>	<i>cel</i>	<i>haang4</i>	<i>faai3</i>	<i>dil</i>
1PS	want	-CL	vehicle	walk/move	fast	a little

 (I want the car to move a little faster.)
5. To think/imagine, e.g.,

<i>soeng2</i>	<i>tung1</i>	<i>zau6</i>	<i>tung4</i>	<i>ngo5</i>	<i>gong2</i>
think	through	just/then	with	1PS	speak

 ([If you've] figured it out, then tell me.)
6. Other/ambiguous

sik1

1. To know how to do something, e.g.,

<i>m4</i>	<i>sik1</i>	<i>gong2</i>	<i>jing1man2</i>
not	know	speak	English

 ([I] don't know how to speak English.)
2. To know something or somebody, e.g.,

<i>ngo5</i>	<i>dou1</i>	<i>m4</i>	<i>sik1</i>	<i>nei5</i>
1PS	all	not	know	2PS

 (I don't know you at all.)
3. Question form for knowing how, e.g.,

<i>sik1</i>	<i>m4</i>	<i>sik1</i>	<i>gong2</i>	<i>aa3?</i>
know	not	know	speak	SFP

 ([Do you] know how to speak?)
4. Question form for knowing that, e.g.,

<i>sik1</i>	<i>m4</i>	<i>sik1</i>	<i>ze4ze1</i>	<i>aa3?</i>
know	not	know	elder sister	SFP

 (Do [you] know elder sister or not?)
5. Other/ambiguous

zil

1. To know, e.g.,

<i>zil</i>	<i>m4</i>	<i>zil</i>	<i>ceot1min6</i>	<i>jau5</i>	<i>mou5</i>	<i>lok6</i>	<i>jyu3?</i>
know	not	know	outside	have	not	descend	rain

 (Do [you] know [if] it is raining outside?)
2. Other/Ambiguous

nam5

1. To think

<i>dang2</i>	<i>ngo5</i>	<i>nam5</i>	<i>haa3</i>	<i>nei5</i>	<i>hai6</i>	<i>bin1go3</i>	<i>sin1</i>
wait	1PS	think	a little	2PS	COP	who	first

 ([Let me] think of who you are first.)
2. Other/ambiguous

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