Merging Features

Computation, Interpretation, and Acquisition

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List of figures

17

Acquisition of plurality in a language without plurality*

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17.1 Introduction

Interpretable features such as number and definiteness have different morphosyntactic encoding cross-linguistically. This raises a number of questions about how children learn such features. In a language like Mandarin, neither plurality nor definiteness are generally overtly marked, although semantically both concepts are available as interpretations for bare NPs. Furthermore, Mandarin also has one morpheme *-men*, which seems to mark both definiteness and plurality simultaneously. This leads to a situation in which bare nominals, by their lack of featural specification have many interpretations, while *-men* phrases, in which a single form encodes multiple features, have a much smaller range of interpretations. Such a state of affairs leads to some very general acquisition questions concerning children's initial interpretations of multiply ambiguous unmarked forms on the one hand, and of morphologically marked forms that encode multiple features. In this chapter we investigate these more general questions by examining Chinese children's comprehension of *-men* phrases and bare NPs in various contexts, and ask the following questions:

(1) a. Do Chinese children interpret *-men* phrases as definite and plural?
b. In contexts where bare NPs can have multiple interpretations, how are they interpreted by children?

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This chapter is organized as follows. We first lay out some linguistic background about the syntax of *-men* in comparison to bare NPs, and briefly review some previous studies on the acquisition of portmanteau morphemes, plurality, and definiteness. We then present results from two experiments: one to test whether children know the plurality, and definiteness of *-men* phrases and the other to test whether children accept generic readings of them.

17.2 Linguistic background

17.2.1 *Number and definiteness*

Mandarin differs substantially from English in the instantiation of both number and definiteness. With respect to number, English overtly marks plurality on nouns with the plural morpheme *-s*, while Mandarin has no overt marking for plurality. Thus, in phrases such as (2), no morpheme appears on the noun independent of the semantic number of the noun phrase. Consequently, a sentence such as (3) in which there is no other way of determining semantic number (such as the presence of a numeral or quantifier) is ambiguous between a plural and a singular interpretation of the subject DP.[1]

(2) a. *yi-ge xuesheng*
one-CL student
'one student'
b. *san-ge xuesheng*
three-CL student
'three students'

(3) *Xuesheng zou le.*
student leave LE
'The student(s) left.'

Mandarin also differs from English in terms of definiteness marking. While English has both a definite determiner and a demonstrative determiner, Mandarin only has the latter. However, bare nominals may be definite in context (see Chen 2004 for a broad overview of the range of data). This can be seen by the example in (4). In the second sentence of (4) the determinerless DPs *guandao-gong* 'plumber' and *dian-gong* 'electrician' are both interpreted as definite and anaphoric to the previously mentioned indefinites.

[1] We use the following conventions in glosses: CL = classifier; SG, PL = singular, plural. Some elements such as the aspect markers ZAI and LE are left unglossed, as are the relative clause marker DE, the distributive marker DOU, and the question marker MA.

(4) *Jintian XiaoQiang jia lai-le yi-ge guandao-gong he*
today XiaoQiang home come-LE one-CL plumber and
yi-ge dian-gong.
one-CL electrician
'Today, a plumber and an electrician came to XiaoQiang's.'
Guandao-gong qingxi-le shuiguan, dian-gong jiancha-le dianlu.
plumber clean-LE pipe electrician examine wire
'The plumber cleaned the pipes and the electrician examined the wires.'

We follow Cheng and Sybesma (1999) in assuming that Mandarin definite bare nominals are DPs with empty Ds, and can be interpreted as either definites or as kinds. Existentially interpreted bare nominals are syntactically restricted to lexically governed positions, and are therefore not permitted in subject position.

17.3 Mandarin *-men*

Although Mandarin doesn't directly mark either definiteness or plurality, it does have a morpheme, *-men*, that is interpreted as both definite and plural, as shown in (5).

(5) *Xuesheng-men zou le.*
student-MEN leave LE
'The students left.'
≠'Students left.'
≠'The student left.'

-men cannot appear with numerals or classifiers, so an example such as (2b) is unacceptable with *-men*, as shown in (6).

(6) * *san-ge xuesheng-men*
three-CL student-MEN
'the three students'

As shown in (7), *-men* can be affixed to proper nouns[2] and pronouns. When attached to a proper noun, two readings are possible: an associative meaning (NP+some others) and a plural meaning (the NPs) as the translations of (7d) indicate. When attached to common nouns, *-men* is restricted to human nouns as shown in (8) and loses the associative meaning.

[2] With proper nouns, most speakers prefer the form *-ta-men* instead of simply *-men*. (Li, 1999).

(7) a. *ta-men*
he-MEN
'they'
b. *wo-men*
I-MEN
'we'
c. *ni-men*
you.SG-MEN
'you (plural)'
d. *Xiao Qiang-men*
Xiao Qiang-men
'Xiao Qiang and others'
'the Xiao Qiangs'

(8) a. *xuesheng-men*
student-men
'the students'
b. **diannao-men*
computer-men
'the computers'

17.3.1 *Previous analyses*

Previous analyses of *-men* either treat it as a plural morpheme (Li, 1999) or as a collectivizer (Cheng and Sybesma, 1999). Li's analysis is the most detailed, and we discuss it briefly here.

Li proposes a unified account for both *-men* and the English plural morpheme. The basic differences in the realization of plural morphology in the two languages is due to the fact that Mandarin has classifiers. For her, *-men* is a simple plural morpheme, just like the English *-s* and the morphemes in both languages are generated in the head of NumP. In English, N raises to Num to license the plural morphology. However, because Mandarin also has a classifier phrase intervening between NumP and NP, nouns cannot raise to Num to license the morphology when a classifier is present because classifiers are not affixal. This captures the co-occurence restriction shown in (6). If *-men* is inserted in Num, it must therefore affix itself to a nominal element in D. There are only two ways that this can be effected: either N raises to D, in which case there can be no intervening classifier, or *-men* affixes to an element base generated in D (for Li, the case of proper nouns). This analysis captures that fact that *-men* cannot appear with numerals or classifiers (since they would block raising), and also captures the fact that common nouns do not have associative meanings, since they cannot be generated directly in D, whereas proper nouns and pronouns can be, according to her.

Zhang (2006) raises some problems for Li's analysis, and proposes a new analysis, which we adopt here. She notes that the humanness restriction on common nouns is not accounted for on Li's analysis, since there is no obvious way in which a plural morpheme in Num should be restricted in this way.[3] Furthermore, as argued by Cheng and Sybesma (1999), there is evidence that

[3] Although, as Corbett (2000) notes, this is a common kind of restriction that plural morphemes have cross-linguistically.

proper nouns and pronouns in Mandarin are always base-generated in N, and therefore Li's analysis of the associative reading being derived by base-generating proper nouns and pronouns in D is not tenable. It is also not clear on Li's analysis how the associative meaning is actually derived from the proposed syntax.

The fact that *-men* phrases are restricted to human NPs, and behave as definites, leads Zhang to analyze *-men* as a portmanteau morpheme that encodes classifier, number, and person (in D), which, following Longobardi (2008) is taken to be the locus of definiteness. Assuming that *-men* is a classifier accounts straightforwardly for the humanness property, since classifiers by their very nature impose selectional restrictions on the kinds of NPs with which they can combine, and *-men*'s inability to appear with other classifiers. Assuming that *-men* is also Num accounts for its plurality and its inability to appear with numerals.

We follow most of the literature on definiteness in assuming that definite determiners (including *-men*) have a uniqueness or maximality presupposition, in that they pick out the unique or maximal individual or plural individual in the context (Heim, 1991; Kadmon, 1990; Roberts, 2003, and others). This can be illustrated by the English examples in (9). (9a) is acceptable, since there is one man in the discourse, and the definite picks out that one man. (9b), on the other hand, is not acceptable, since the singular definite should identify a unique man, but there are two salient men in the discourse. Example (9c) is acceptable, but crucially the definite must pick out the maximal set of men (i.e. all three men in this example.)[4]

(9) a. A man and woman came in. The man sat down.
b. Two men came in. #The man sat down.
c. Three men came in. The men sat down.

Both *-men* phrases and bare NPs behave similarly in this context in Mandarin, as shown by the examples in (10).

(10) *Jintian XiaoQiang jia lai-le san-ge guandao-gong.*
today XiaoQiang home come-LE three-CL plumber
'Today, three plumbers came to XiaoQiang's.'
Guandao-gong(-men) qingxi-le shuiguan.
plumber(-men) clean-LE pipe
'The plumbers cleaned the pipes.' (= all three plumbers)

[4] Although this is the generally agreed upon judgment in the literature, as we will see in the results of Experiment 1, maximality effects (in both English and Mandarin) are probably much more context-dependent than has usually been assumed in the semantics literature.

-men phrases also behave similarly to English definite plurals in disallowing generic interpretations. A sentence such as (11a) only receives a referential (discourse-bound) interpretation. This contrasts with the bare NP in Mandarin, which can receive either a referential or a generic interpretation as shown in (11b).

(11) a. *Ta hen xihuan xiao-haizi-men.*
she very like little-child-MEN
'She likes the children very much.
*She likes children very much.'
b. *Ta hen xihuan xiao-haizi.*
she very like little-child
'She likes children very much.
She likes the children very much.'

17.4 Acquisition background

Adopting a portmanteau analysis of *-men* leads to a number of acquisition questions about how the different semantic components of the morpheme are learned, and whether there is any developmental path with respect to these different components. In this section we review briefly previous acquisition work that has addressed some of these issues.

17.4.1 *Portmanteau morphemes*

As far as we know, Karmiloff-Smith (1979) is the only study that has explicitly looked at differential acquisition of the parts of portmanteau morphemes. In her experiments she found that the definiteness and plurality of the French definite plural morpheme *les* were acquired at different times, with definiteness being learned later. Cross-linguistic evidence from order of acquisition supports this view to the extent that portmanteau morphemes are often acquired later than non-portmanteau morphemes. (See Peters 1987 for a review.)

17.4.2 *Plurality*

Ferenz and Prasada (2002) found that English children as young as 17 months correctly produced the plural in elicited production tasks, while Kouider et al. (2006) using a preferential-looking paradigm found plural comprehension as early as 24 months when subject verb agreement was present, and 36 months in contexts with no agreement.

17.4.3 *Classifiers*

In the literature on the acquisition of classifiers, it is known that classifiers appear in production between age two and three (Erbaugh, 1986; Hu, 1993, and others). By age three, children comprehend the difference between count and mass classifiers (Chien et al., 2003), but the full range of classifiers is learned later; default classifiers are learned earlier than more semantically restricted classifiers.

17.4.4 *Definiteness*

As mentioned above, Karmiloff-Smith (1979) found that definiteness is learned later than plurality, and this result is confirmed by a variety of studies that show consistent errors in children's use of the definite determiner. Specifically, errors relating to the discourse use of the uniqueness/maximality presupposition that definites have are cross-linguistically common (Karmiloff-Smith, 1979; Maratsos, 1972; see also Wexler, in press). The source of these errors is still at issue. Wexler, for example, argues that young children lack the maximality presupposition. However, Munn et al. (2006) have argued that the problem lies in how children calculate the domain restriction of the determiner. Pérez-Leroux, Munn, Schmitt, and DeIrish (2004) and Gavarró et al. (2006) have also found that children allow definites to be generic even in languages where they are not allowed. Furthermore, Baauw (2000) and Pérez-Leroux, Schmitt, and Munn (2004) have shown that Dutch and English children allow inalienable possession interpretations of the definite even when the adult language does not allow them.

Gelman and Tardif (1998) have studied the use of generic noun phrases in child-directed speech in both English and Mandarin, and found that the use of generic NPs is domain specific in both languages: they are used more with animals than with other categories. Mandarin-speaking adults can identify generic sentences out of context despite the fact that there are no specific morphological cues to genericity in Mandarin compared to English, in which the simple present on an eventive verb is usually a sign of genericity.

17.5 Research questions

Given that *-men* phrases are interpreted as definite and plural, but are generally not allowed as generic statements, we can ask a number of questions concerning their interpretation by children. The simplest question is whether children interpret *-men* phrases as plural definites or not; a second question is whether there are differences in the learning of the semantic parts that *-men* encodes. The same questions can be asked about bare NPs. Are bare NPs interpreted by children as singular or plural? Are bare NPs interpreted as definites in context?

17.5.1 *Hypotheses*

Given the previous research on definiteness, we can put forth some basic hypotheses. First, given that *-men* is a portmanteau morpheme, its different properties are likely to be learned at different times by children, with plurality preceding definiteness. Given previous research on genericity, we hypothesize that young children will have a generic bias in their initial interpretations of DPs, both bare NPs and *-men* NPs.

17.6 Experiment 1

Experiment 1 was designed specifically to test at what age Mandarin-speaking children understand the maximality and plurality properties of *-men*. Given what we know about the acquisition of portmanteau morphemes, plurality, and definiteness, we hypothesized that children would learn the plural property of *-men* before the maximality property.

Consider the situation in which there are three girls, two eating bananas, and one eating an apple. In this situation, if we ask the question "Are the girls eating apples?", the answer should be NO, since only one girl is eating an apple. In addition, if we ask the question "Are the girls eating bananas?", the answer should also be NO, since the maximality presupposition on the definite is not satisfied, because there are three salient girls in the discourse, but only two are eating bananas.

17.6.1 *Subjects*

We tested three groups of children: a younger group (N = 25, ages 3;10–4;11 (mean 4;2)); an older group (N = 35, ages 5–6;11 (mean 5;7)), and a school-age group (N = 16, ages 7–10;9 (mean 8;7)). We also tested 20 adult controls. All children were tested by one of the authors (Zhang) who is a native Mandarin speaker from the same city as the children.

17.6.2 *Experimental design*

Based on the context described above, we constructed four conditions: singular vs. plural (as referred to in the picture) and bare vs. *-men*-NP. There were four stories, with four Yes/No questions corresponding to each of the four

FIGURE 17.1 Sample picture from Experiment 1

conditions. Questions were counterbalanced across stories for NP type and plurality.

17.6.3 *Method*

Children were shown pictures such as in Figure 17.1 and then read a story about the picture shown in (12).

(12) *Kan, zheli you san-ge piaoliang de ayi. Ta-men*
look here have three-CL pretty DE aunt (woman) they
dou hen xihuan chi shuiguo. Yi-ge ayi zai chi pingguo,
DOU very like eat fruit one-CL aunt ZAI eat apple
liang-ge ayi zai chi xiangjiao.
two-CL aunt ZAI eat banana
'Look, there are three pretty ladies here. They all like fruit. One of the ladies is eating an apple, and the other two are eating bananas.'

After hearing the story, they were asked Yes/No questions from one of the four conditions given in (13).

(13) a. Bare-1: Expected response
Ayi zai chi pingguo, dui-bu-dui?
aunt ZAI eat apple right-not-right
'The lady/ladies is/are eating an apple, is that right?' Yes/No

b. MEN-1
Ayi-men zai chi pingguo, dui-bu-dui?
aunt-MEN ZAI eat apple right-not-right
'The ladies are eating apples, is that right?' No

c. Bare-2
Ayi zai chi xiangjiao, dui-bu-dui?
aunt ZAI eat banana right-not-right
'The lady/ladies is/are eating a banana, is that right?' Yes/No

d. MEN-2
Ayi-men zai chi xiangjiao, dui-bu-dui?
aunt-MEN ZAI eat banana right-not-right
'The ladies are eating bananas, is that right?' No

17.6.4 *Predictions*

Based on the theoretical account of the properties of *-men*, and the experimental design, we make the following predictions: if children understand that *-men* is plural, they should answer No to the singular condition; since the NP in the singular condition doesn't refer to a plural referent. If children understand that *-men* is definite, they should also answer No in the plural condition, since the *-men* phrase will not pick out the maximal set in the picture. Since bare NPs can be singular or plural, children could answer either Yes or No to the bare cases.

17.6.5 *Results*

Table 17.1 shows the results of Experiment 1. A mixed design ANOVA revealed a main effect of Condition ($F(1, 92) = 56.603$, $p < .001$), a main effect of Age ($F(3, 92) = 193.035$, $p < .001$) and an Age vs. Condition interaction ($F(3, 92) = 14.31$, $p < .000$). We will present the *-men* and bare NP results separately.

TABLE 17.1 Proportion of No responses

	men-SG	men-PL	Bare-SG	Bare-PL
3–4-year-old	.08	.08	.06	.04
5–6-year-old	.26	.06	.21	.06
7–10-year-old	.98	.83	.62	.69
Adults	.90	.76	.31	.32

17.6.5.1 -men Adults behaved as expected and treated *-men* as both plural (90%) and maximal (76.3%). Older children behaved like adults and also treated *-men* as plural (98.4%) and maximal (82.8%). Among the younger

children, the 5–6-year-olds barely treated *-men* as plural (25.7%) and did not treat *-men* as maximal (6.4%), but did distinguish between the singular and plural conditions ($t(34) = 2.901$, $p < .01$). The 3–4-year-olds exhibited a strong Yes bias, and it is difficult to conclude much from their performance. They did not seem to distinguish the singular from the plural, nor treat *-men* as maximal.

17.6.5.2 *Bare NPs* Adults treated the singular and plural condition equally, and generally answered Yes to the bare plural questions about 70% of the time. They did not treat the bare NP as maximal in the plural condition (~33%). A post-hoc t-test showed that they treated the bare NPs significantly different from *-men* NPs ($t(19) = 4.341$, $p < .001$) The older children also treated the singular and plural conditions equally but treated the bare plural as maximal (~70%) and not significantly different from *-men* phrases. For the older children, *-men* phrases and bare NPs were treated differently only in the singular condition ($t(15) = 2.978$, $p < .01$). The 5–6-year-olds treated the singular and plural conditions differently. They did not treat bare plural NP as maximal (~6%) and there was no difference between the *-men* and bare NP conditions. The Yes bias of the 3–4-year-olds makes their results hard to interpret. They treated the singular and plural conditions the same and almost never treated bare as maximal (~5%). There was also no difference between the *-men* and bare NP conditions.

17.6.6 *Discussion*

Although we cannot conclude much from the youngest children, the differences between the 5–6-year-olds and the older children shows a clear development. The fact that the 5–6-year-old group distinguished the singular from the plural, but did not treat *-men* as maximal supports the hypothesis that the component parts of portmanteau morphemes are learned separately and that plurality is learned before definiteness. For the older children, *-men* phrases are treated as strongly maximal. This shows that *-men* phrases are treated clearly as definites. It is interesting that bare NPs in the plural condition are not generally treated as maximal by the adults, despite the fact that bare NPs in this context are supposedly definite. However, maximality is related to domain restriction and discourse, and in other work (Munn et al. (2006) and Miller and Schmitt (2004)) we have shown that children apply domain restrictions differently from adults. The oldest children seem to prefer the maximal interpretation (a fact which we will see also in the Experiment 2 results).

17.6.7 *English replication*

The Chinese adult results for *-men* seem to show that *-men* is not not necessarily treated as maximal in the context of the picture. This fact is reinforced in the bare NP condition, in which maximal readings in the plural condition were dispreferred. We were interested to see whether the context of the task was sufficient to change the domain restriction on the determiner so as to make it appear to be non-maximal. To test this we ran a version of the same task with English-speaking adults (N = 20, Michigan State University undergraduates who performed the experiment as part of extra credit for a course), just to compare the singular and plural definite conditions. Subjects were shown the same pictures as in Experiment 1, and asked a question using the definite plural (e.g. "Are the girls eating bananas?" (in this context). Interestingly enough, in the plural condition, only 45% of subjects rejected a sentence like "Are the girls eating bananas?" (in this context). This performance is quite different from the theoretically expected one, since the NP *the girls* should pick out the maximal plural entity in the context, which in the case of the picture should be all of the girls in the picture. However, there are two ways in which these data might be explained. First, maximality might be observed, but exceptions allowed in some way. This has been explored in some detail by Lasersohn (1999), who uses the idea of a "pragmatic halo". A pragmatic halo for a definite NP such as *the men* would be "a set of sets of individuals which differ from the set of [men] only in ways that are pragmatically irrelevant in context, ordered according to closeness to the actual set of [men]" (Lasersohn, 1999, 530–1). Alternatively, given the fact that all determiners must have a domain restriction, it is possible that, in the context of the picture, the domain restriction assigned to *the girls* in the context of the question "Are the girls eating bananas?" is the set "the girls who are eating bananas". Assuming this domain restriction would account for the high proportion of Yes responses in the plural condition.[5] (Notice that this explanation won't apply in the singular condition, since in the picture there is no restriction of the plural "girls" which could be "the girls eating an apple".)

TABLE 17.2 Proportion of No responses Experiment 1b (English)

	the-SG	the-PL
Adults	.98	.45

[5] Although this strategy would potentially remove all maximality effects, which doesn't seem to be the case. Lasersohn (1999) explicitly argues against this approach, although his argument is mainly based on its inability to be extended to other sorts of "pragmatic slackness", such as *Mary left at 3:00*, which doesn't necessarily mean the same thing as *Mary left at exactly 3:00*.

17.7 Experiment 2

Experiment 2 was designed to test whether children were sensitive to the discourse boundedness of *-men* phrases, and to investigate whether the generic bias found in other experiments involving definites would be replicated either with *-men* phrases or with bare NPs. For this experiment we used a modified version of Pérez-Leroux, Munn, Schmitt, and DeIrish's (2004) experiments.[6]

We hypothesized that children's lack of knowledge of *-men* would give rise to generic readings of *-men* phrases, since we observed this pattern in English definites as well (Pérez-Leroux, Munn, Schmitt, and DeIrish, 2004). We were also interested in the effects of the discourse on the interpretation of bare NPs in Mandarin, since, unlike English bare plurals, bare NPs in Mandarin are ambiguous between referential and generic readings.

17.7.1 *Subjects*

The subjects for Experiment 2 were the same as for Experiment 1.

17.7.2 *Experimental design*

The basic idea of the task is to show children exemplars of a non-typical kind, and then ask questions about either the exemplars themselves or the kind. For example, children would look at a picture such as Figure 17.2 in the following context: "Look, these boys have wheels instead of legs. The woman wonders why they look different from the other boys." There are two types of questions that can be asked in this context, as shown in (14). What we call a "canonical" question, asks about the normal properties for the kind, while a "non-canonical" question asks about the non-normal properties.[7]

(14)	a.	Canonical Q	Generic Response
		Do boys have legs?	Yes
		Do the boys have legs?	No
	b.	Non-canonical Q	
		Do boys have wheels?	No
		Do the boys have wheels?	Yes

In English, since bare plurals are unambiguously generic in this context, the bare plural canonical question should be answered by Yes, and the bare plural non-canonical question should be answered by No. Since the definite in English is unambiguously referential, the definite canonical question should

[6] Because of *-men*'s restriction to human NPs, the original materials could not be used.

[7] Note that these terms do not refer to the syntactic properties of the question but rather to whether the property being asked about is canonical or not with respect to the bearer of the property.

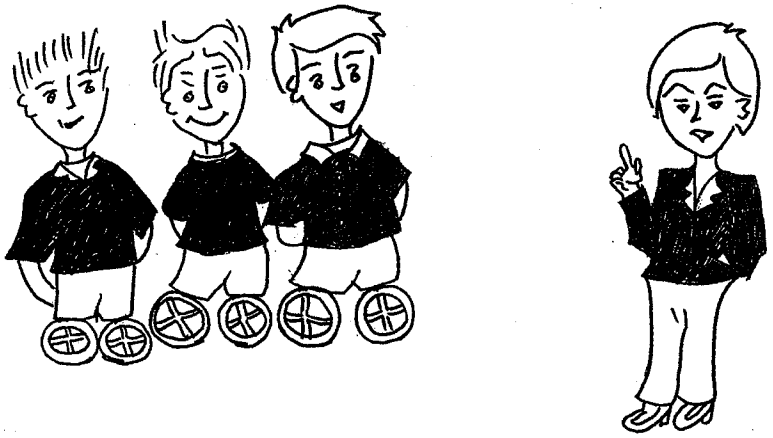

FIGURE 17.2 Sample picture from Experiment 2

be answered with No since the question refers to the kind in the picture, while the non-canonical question should be answered Yes.

In order to test for possible discourse effects in the interpretation of the NPs, two (slightly) different discourse conditions were set up, an immediate condition and a delayed condition. In the immediate condition, the target question was asked immediately after presentation of the story. In the delayed condition, a question unrelated to the story was asked first.

There were thus three conditions in the experiment: bare vs. *-men*, canonical vs. non-canonical questions, and the delayed vs. immediate condition. All questions were counterbalanced across stories for canonicity, definiteness, and order of presentation.

17.7.3 *Predictions*

We expect that *-men* phrases should allow generic readings in younger children, with the effect decreasing with age. If bare NPs are initially treated as kinds, then they should also exhibit a generic bias. There should be no effects of canonicity. It is possible that discourse order might affect bare NPs, since they can be interpreted as either definites or kinds; *-men* phrases should not show discourse effects.

17.7.4 *Materials*

Children were shown pictures such as in Figure 17.2 and then read a story about the picture as shown in (15).

(15) *Kan, zhe ji-ge nanhaizi zhang-zhe lunzi. Tamen mei you*
look this several-CL boy grow-ZHE wheel they not have
tui. Ayi jue-de hen qiguai.
leg aunt feel-DE very weird.
Weishenme tamen he biede nanhaizi zhang-de bu-yiyang ne?
why they and other boy grow-DE not-same NE
'Look, these boys have wheels instead of legs. "Why do they look different from the other boys?"'
Xianzai wo wen ni ji-ge went
now I ask you several-CL question
'Now let me ask you some questions...'

After hearing the story, they were asked a question corresponding to one of the four conditions shown in (16).

(16) a. Bare NP Canonical — Expected Response
Nanhaizi zhang tui ma?
boy grow leg MA
'Do boys have legs? or Do the boys have legs?' — Yes/No

b. Bare NP Non-canonical
Nanhaizi zhang lunzi ma?
boy grow wheel MA
'Do boys have wheels? or Do the boys have wheels?' — No/Yes

c. *-men* Canonical
Nanhaizi-men zhang tui ma?
boy-MEN grow leg MA
'Do the boys have legs?' — No

d. *-men* Non-canonical
Nanhaizi-men zhang lunzi ma?
boy-MEN grow wheel MA
'Do the boys have wheels?' — Yes

17.7.5 *Results*

We will discuss the results for the discourse order effects separately from the results for canonicity. The results for discourse order are given in Table 17.3.

17.7.5.1 *Discourse order* Analysis of Variance revealed a main effect of condition ($F(1, 92) = 6.908$, $p < .01$) and a main effect of Age ($F(3, 92) = 85.556$, $p < .01$). Post-hoc Bonferroni tests showed that the 3–4-year-olds differed from all others while the 5–6-year-olds differed from 7–10, but not from the

TABLE 17.3 Proportion of generic responses: discourse order

	-men immediate	*-men* delayed	Bare immediate	Bare delayed
3–4-year-olds	.54	.60	.62	.58
5–6-year-olds	.34	.36	.43	.34
7–10-year-olds	.03	.00	.06	.06
Adults	.20	.18	.38	.28

adults, and the 7–10-year-olds also did not differ from adults. Adults, somewhat surprisingly, allowed *-men* phrases to be generic approximately 18% of the time. They gave more generic responses to bare NPs in the immediate condition compared to *-men* phrases ($t(19) = -2.101$, $p < .05$). There were no other significant effects. The older children showed no significant differences between conditions and showed no generic bias. In fact, they gave very few generic responses, although they did not differ from the adults statistically. The 5–6-year-olds allowed generic interpretations of *-men* phrases (~35%), although this response rate was not significantly different from adults. They also allowed generic responses to bare NPs, and there was no effect of discourse order. Finally, the 3–4-year-olds allowed generic interpretations of *-men* phrases (~52%) and allowed generic responses to bare NPs (~54%), with no effect of discourse order.

17.7.5.2 *Canonicity* The results of Experiment 2 with respect to canonicity are shown in Table 17.4. The adults and older children showed no effects of canonicity, while the 5–6-year-olds showed a canonicity effect in the bare NP condition only ($t(34) = 2.533$, $p < .05$) The 3–4-year-olds showed a strong canonicity effect for both *-men* and bare NPs ($t(24) = 4.615$, $p < .001$; $t(24) = 4.707$, $p < .001$), but, as in Experiment 1, they also showed a strong Yes bias, and so the apparent effects may be due to this factor.

TABLE 17.4 Proportion of generic responses: canonicity

	Men-C	Men-NC	Bare-C	Bare-NC
3–4-year-olds	.80	.34	.84	.36
5–6-year-olds	.36	.34	.46	.23
7–10-year-olds	.00	.03	.06	.06
Adults	.20	.18	.35	.30

17.7.6 *Discussion*

As in previous work, it appears that there was a generic bias decreasing with age for *-men* phrases, although adults seemed to allow generic interpretations for *-men* at a higher rate than expected. The fact that the 7–10-year-olds showed very few generic responses even in the bare NP condition patterns with their behavior on bare NPs in Experiment 1. It appears that these older children were highly sensitive to the discourse context, and treated all of the questions as being about the picture. This would account for their rejection of non-maximal bare NPs in Experiment 1, and their interpretation of the bare NP as definite in the present experiment.

Almost no order effects were observed, which matches expectations for *-men* phrases and is also not very surprising with bare NPs. Adults did show an order effect in the bare NP condition, by giving more generic responses in the immediate condition. Importantly, no order effects were found with *-men* phrases. This makes sense because *-men* phrases are always definite, and are therefore not susceptible to effects of the context except those pertaining to domain restriction This contrasts with bare NPs, which are highly dependent on the context for their interpretation. The fact that only the youngest children showed a canonicity effect is also expected, although, as noted, it is difficult to distinguish this result from the strong Yes bias that they exhibited.

17.8 Conclusions

The present experiments have only scratched the surface of investigating how children learn semantic properties that are unmarked in the syntax (bare NPs) or multiple semantic properties that are bundled into a single morphosyntactic piece. Some initial conclusions can be tentatively made: the distinct properties of the portmanteau morpheme *-men* are learned separately, with comprehension of plurality preceding mastery of the factors underlying domain restriction as it relates to maximality. There also seems to be a generic bias in the interpretation of definites that reduces with age. What is especially intriguing, and something that clearly requires more research, is the behavior of the 7–10-year-old group in these experiments, which seemed in both tasks to be heavily inclined to treat all of the NPs (and most interestingly the bare NPs) as directly connected to the discourse, yielding very strong maximality effects in Experiment 1, and very few generic responses in Experiment 2. We should note that these results do not necessarily reflect a lack of linguistic knowledge on the part of this group of children. Since both *-men* phrases and bare NPs can be interpreted as definite and maximal, the children's deviation from the

adult patterns reflects a different preference of interpretation rather than some property of the linguistic representation that is learned very late. It is also unlikely that knowledge of *-men* and bare NPs is "not part of the core grammar of Chinese", a possibility suggested by a reviewer. Bare NPs are certainly part of the core grammar of Mandarin; learning the pragmatics of their use, however, is a separate component. Similarly, the fact that *-men* is used regularly with pronouns to pluralize them makes it also an unlikely candidate for a non-core property.

It is clear that much work needs to be done in sharpening our understanding of how children arrive at adult-like performance on tasks that involve connecting NPs and discourse. Looking at languages such as Mandarin, which do not overtly mark such properties, may be particularly instructive in this respect, since simple-minded distributional learning is not going to be sufficient to solve the problem.