

Noun Bias in Chinese Children: Novel Noun and Verb Learning in Chinese, Japanese, and English Preschoolers

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1. Introduction

Young children acquire words with amazing rapidity, and this rapid growth is mostly due to the increase of the noun vocabulary (e.g., Bates et al., 1994). To explain this, Gentner (1982) proposed that children acquire nouns more easily and earlier than verbs because the concepts denoted by nouns are easier to access than those denoted by verbs (the universal noun advantage view). Some researchers, however, challenged this view, arguing that verbs can be learned more easily and earlier than nouns if the input language has properties to foster verb learning (the input-dependent view). For example, in argument-dropping languages such as Korean, Japanese and Chinese, verbs may be heard more frequently than nouns in the input, and tend to appear in the salient position in the sentence (Choi & Gopnik, 1995; Gentner, 1982). Another factor that has been noted to foster verb learning is morphological simplicity of verbs (Gentner, 1982; Tardif, 1996). In fact, researchers advancing the input-dependent view have presented data showing that Korean- and Chinese-speaking children have more verbs than nouns in their early vocabularies (Choi & Gopnik, 1995; Tardif, 1996). However, data contradicting this view also exists in the literature. In some studies, children who are learning these ‘verb-friendly’ languages know more nouns than verbs (Au et al., 1994 and Kim et al., 2000 for Korean children; Ogura, 2001 for Japanese children).

The discrepancies seem to have arisen in large part from the fact that these studies relied on either maternal reports or production data. In these methods, a produced word must be classified into an appropriate form class by a caregiver or a researcher. However, it is difficult to set up clear criteria for determining whether the produced word is a noun or a verb, for multiple reasons: (1) when children are at a one- or two-word stage, it is difficult to determine whether a given word is in fact produced as a noun or a verb; (2) the fact that children “say” a given word does not guarantee that they have acquired the full meaning of the word (see Imai et al, in press b, for further discussion). In addition, relative use of nouns and verbs may vary across different contexts.

Given these problems inherent in using the relative proportion of nouns and verbs in the vocabulary inventory or corpus data as a measure of the difficulty of

learning words, Imai et al. (in press a) directly compared the ease of fast-mapping novel nouns and verbs, studying Japanese children. Japanese is considered to be one of ‘verb-friendly’ languages, as it is an argument-dropping as well as an SOV language. They showed Japanese 3- and 5-year-olds a dynamic video scene in which a woman was performing a novel action with a novel object, and introduced either a novel noun or verb. The children were then presented with two test scenes. One of the test scenes was the Action-Same-Object-Different (AS) scene in which the same woman was doing the same action but with a different object from the original scene. The other was the Object-Same-Action-Different (OS) scene in which the same woman was performing a different action with the same object. The children were asked to which of the two test scenes the newly introduced word should be extended. Imai et al. (in press a) found that both 3- and 5-year-olds could map a novel noun onto a novel object, selecting OS events significantly above chance. However, the 3-year-olds failed to extend a novel verb to the same action performed with a different object; only 5-year-olds successfully generalized novel verbs.

This research extended Imai et al.’s (in press a) research crosslinguistically, comparing Japanese-, English-, and Mandarin-Chinese-speaking children. Comparing children learning these three languages is extremely interesting because the three languages are different from one another along two dimensions that have been assumed to affect the difficulty of verb learning. On the first dimension, argument-dropping is allowed in Japanese and Chinese, but not in English. As a consequence, children learning Japanese or Chinese tend to hear verbs more frequently than children learning English do. Because of this distributional property, some researchers predict that children learning Japanese or Chinese will learn verbs more easily (and hence earlier) than nouns (Choi & Gopnik, 1995; Tardif, 1996). However, at the same time, this property may lead to the opposite prediction. It has been proposed that inferring the meaning of a verb is very difficult even for adults without cues from the argument structure (Gillette et al., 1999), and that children do utilize the structural cues in inferring verb meanings (e.g., Fisher, 1996; Hirsh-Pasek & Golinkoff, 1996). Thus, one could make the prediction that verb learning should be more difficult for children learning a language that occasionally allows argument-dropping. (In fact, in Japanese, arguments-dropping occurs more than occasionally—it is *usually* dropped when the arguments can be inferred from the context.)

The second dimension is the presence of morphological inflection in verbs. On this dimension, Chinese contrasts not only to English but also to Japanese. While verbs are inflected in both English and Japanese, they are not in Chinese. In other words, verbs cannot be morphologically distinguished from nouns in Chinese. Remember that in Chinese and Japanese, verb arguments are often dropped, and a verb alone can constitute a sentence. Even when this occurs, verbs can be identified by inflectional morphology in Japanese. That is, when a verb is produced without any arguments, as in “*Mite* (Look), *X-teiru* (X-ing),” one can tell that the word X is a verb attending to the morphological affix

“-teiru.” However, in Chinese, when a word is produced by itself, it is difficult to tell whether it is a noun or a verb. In other words, one can identify a novel word as a verb *only when* it is embedded in an argument structure (see Li, Bates & MacWhinney, 1993). It is of great theoretical interest to see whether the morphological simplicity makes verb learning even easier, as argued by some researchers (Tardif, 1996), by comparing Chinese- and Japanese-speaking children.

If children in all the three languages perform better in fast-mapping novel nouns than in fast-mapping novel verbs, it will be the strongest evidence for the universal noun advantage view. If the difficulty of noun and verb learning varies across the three languages, we can proceed to identify what properties of languages affect the ease of children’s word learning.

2. Main Crosslinguistic Study

2.1. Method

2.1.1. Participants. Thirty six 3-year-old (mean=3;5) and 38 5-year-old (mean=5;6) monolingual Mandarin-Chinese-speaking children and 49 3-year-old (mean=3;5) and 52 5-year-old (mean=5;2) monolingual English-speaking American children participated in this study. The children were randomly assigned to one of the three conditions, the *noun* condition, the *verb with arguments* condition, and the *bare verb (word)* condition (see Section 2.1.3.). Thirteen 3-year-old and 14 5-year-old monolingual Japanese children were tested on the *verb with arguments* condition. (The data of the *noun* and the *bare verb* conditions for the Japanese group was borrowed from Imai et al. (in press a).

2.1.2. Stimuli. The stimuli used in this research were the same as those used in Imai et al. (in press a). Six sets of video action events were used as stimulus materials. Each set consisted of a standard event and two test events. In each standard event, a young woman did a novel repetitive action with a novel object. The two test events were variants of the standard event. In one test event, the same woman did the same repetitive action but with a different object (Action-Same-Object-Different scene; AS). In the other test event, a different repetitive action was performed by the same woman with the same object (Object-Same-Action-Different scene; OS). (For the full description of the objects and the actions, see Imai et al., in press a.)

2.1.3. Conditions and Instructions. The children were asked to fast-map six novel nouns or six novel verbs depending on the condition, since the major goal was to examine whether English-, Japanese- and Mandarin-Chinese-speaking children understood the basic principles governing noun extension and verb extension. In the *noun* condition, a novel noun was introduced to English-speaking children by saying, “Look, there is an X.” The equivalents of

this expression were used for Japanese and Mandarin Chinese children.

The verbs were presented in two different forms, one with full arguments (*verb with arguments* condition) and the other with no arguments (*bare verb* condition), in order to see whether dropping of the verb arguments affects children's performance in learning novel verbs. In providing the arguments, in English, the pronoun "she" served as the subject, and "it" as the object of the sentence (e.g., "Look, she is X-ing it"). In Japanese, the word "onesan" ('young woman') was used for the subject, and "nanika" ('something') was used to refer to the object. For Chinese children, the word "a(1) yi(2)" ('young woman') served as the subject and "yi(2) ge dong(1) xi" ('one thing') was used for the object. In addition, an aspect marker "zai(4)," which marks imperfective aspect and is usually used to express an ongoing action, was put just before a novel verb, to make it clear that the target word is a verb.

In the *bare verb* condition, the subject and the object were not specified in the sentence, but a novel word could be identified as a verb by the morphological affix "-ing" and "-teiru," in English and Japanese, respectively. However, since verbs are not morphologically distinguished from nouns in Chinese, one cannot tell whether the novel word is a verb or a noun when both arguments are dropped in Chinese. Therefore, the *bare verb* condition in which a novel verb is presented without any arguments is in actuality a *bare word* condition for Chinese children. We include this condition in order to examine onto which elements of the event Chinese children are likely to map a novel word whose grammatical class is unknown.

2.1.4. Procedure. Participants were tested individually either at a university laboratory or in a quiet room at the preschool they attended. The experiment was conducted by a native speaker of the children's language. While the standard event was presented for about 30 seconds, participants heard a novel verb or a novel noun depending on the condition. Then the two test events were presented simultaneously and side by side on the screen and the participants were asked to which scene of the two test scenes the novel word should be extended.

2.2. Results and Discussion

The number of AS (Action-Same) responses in the six test trials was counted and the proportion of the AS responses calculated. Since it was a forced choice task, the proportion of the OS (Object-Same) responses was 100 minus the proportion of the AS responses. We report the results from the three language groups separately, in the order of English, Japanese, and Chinese.

2.2.1. Results from English-speaking preschoolers. Figure 1 shows the mean proportions of AS responses by 3- and 5-year-old English-speaking children in the *noun* condition, in the *verb with arguments* condition and in the *bare verb* condition. Both the 3- and the 5-year-olds in the *noun* condition successfully

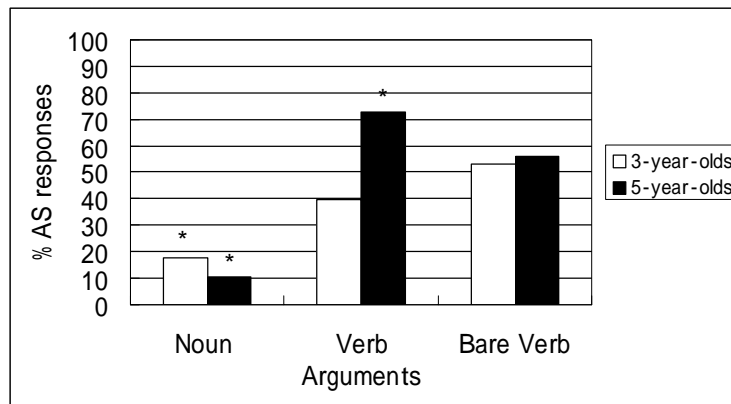


Figure 1. Mean proportions of AS responses in English-speaking children

mapped novel nouns to novel objects, selecting the OS event significantly above chance (82.4%, $t(17)=6.12$, $p<.001$ for the 3-year-olds and 89.5%, $t(18)=13.6$, $p<.001$ for the 5-year-olds). In extending novel verbs, the 5-year-olds in the *verb with arguments* condition successfully selected AS events 72.6% of the time, $t(16)=2.8$, $p<.05$, although the children from the same age group performed at chance in the *bare verb* condition (56.2%, $t(15)=.61$, $p>.1$). The performance of the 3-year-olds did not differ from chance, whether they were in the *verb with arguments* condition or in the *bare verb* condition, 39.6%, $t(15)=1.18$, $p>.1$ and 53.3%, $t(15)=.35$, $p>.1$, respectively.

To see if there was any difference across ages and conditions, an age (2) x condition (3) ANOVA was conducted on the proportions of AS responses. It revealed a significant main effect of condition, $F(2,95)=20.7$, $p<.001$, indicating that the children in the *bare verb* condition and the *verb with arguments* condition selected AS events more often than the children in the *noun* condition. Since an interaction between age and condition was also found to be significant, $F(2,95)=3.83$, $p<.05$, the proportions of AS responses were compared across two age groups for each condition. The age difference was significant only in the *verb with arguments* condition, $F(1,95)=9.25$, $p<.01$.

The results showed that English-speaking 3-year-olds could fast-map a novel noun to the object. But at the same time, children of the same age were not willing to extend a novel verb to the event in which the same action was performed with a different object. This suggests that noun learning is easier than verb learning for English-speaking children --as expected. Three-year-olds do not yet understand one of the most basic principles of verb extension: verbs should be extended on the basis of the action independent of the object. By contrast, the 5-year-olds could extend a novel verb properly when it was embedded in a sentence frame with the subject and the object. Performance declined to chance-level, however, when the verb was presented without the explicit mention of the arguments (just saying "X-ing"). As

previous research has shown, argument structure is one of the important resources children can rely on to infer the meaning of a novel verb (Fisher, 1996; Hirsh-Pasek & Golinkoff, 1996; Naigles, 1990). In addition, argument-dropping is not allowed in English and verbs always appear with arguments. As a result, English-speaking children might come to heavily rely on the information about argument structure for learning a novel verb.

2.2.2. Results from Japanese-speaking preschoolers. The mean proportions of AS responses by Japanese children in each condition are shown in Figure 2. In the *noun* condition, both the 3- and the 5-year-olds selected OS events significantly above chance (73.4%, $t(14)=2.88$, $p<.05$ for the 3-year-olds and 92%, $t(13)=5.83$, $p<.001$ for the 5-year-olds), indicating that they could fast-map a novel noun to a novel object. By contrast, in extending novel verbs, only the 5-year-olds in the *bare verb* condition showed successful performance, selecting AS events 83.3% of the time, $t(12)=4.56$, $p<.001$. The 5-year-olds in the *verb with arguments* condition and the 3-year-olds both in the *bare verb* condition and in the *verb with arguments* condition performed at chance, selecting AS events 69.0% ($t(13)=1.56$, $p>.1$), 64.2% ($t(12)=1.53$, $p>.1$) and 41.0% ($t(12)=.7$, $p>.1$) of the time, respectively.

In order to compare the mean proportions of AS responses across ages and conditions, an age (2) x condition (3) ANOVA was conducted. It revealed a significant main effect of condition, $F(2,76)=17.79$, $p<.001$, suggesting that the children in the two verb conditions selected AS events more often than those in the *noun* condition. The interaction between age and condition was also found to be significant, $F(2,76)=3.34$, $p<.05$. The proportions of AS responses were compared across two age groups for each condition and it was found that the 5-year-olds performed significantly better than the 3-year-olds in the *verb with arguments* condition, $F(1,76)=4.14$, $p<.05$. No age difference was found in the *noun* condition, $F(1,76)=1.90$, $p<.1$, and in the *bare verb* condition,

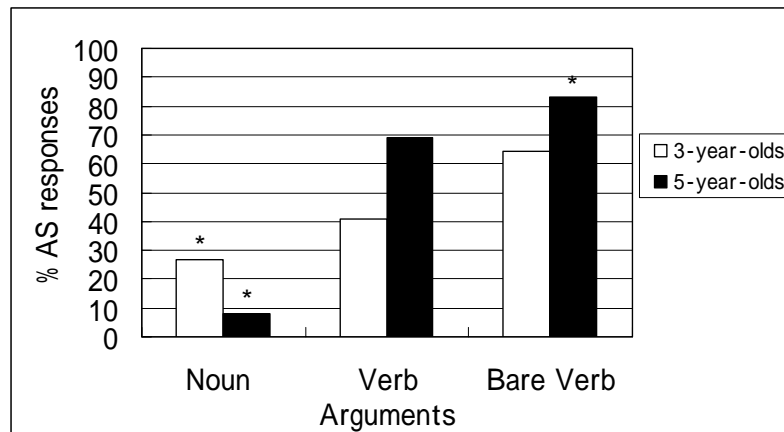


Figure 2. Mean proportions of AS responses in Japanese-speaking children

$F(1,76)=1.88, p>.1$.

It was found again that verb learning was more difficult than noun learning even for children learning Japanese, a language thought to have linguistic properties that foster verb learning. Even 3-year-olds could extend nouns properly, while the children of the same age performed only at chance in extending novel verbs. Five-year-olds successfully mapped a novel verb to the action above chance when the verb was presented by itself without any arguments, although their performance was slightly lowered if the verb was introduced embedded in the sentence frame with the subject and the object. Thus, Japanese children most successfully extended a novel verb when the verb was presented by itself without arguments. This contrasts to English 5-year-olds who need information about argument structure in extending novel verbs properly. Certainly the information about argument structure is useful when determining what element of the scene should be incorporated into the meaning of a novel verb. However, this information is not always available to Japanese children, as arguments are very usually dropped in Japanese when the arguments can be inferred from the context. As a consequence, Japanese children might develop another strategy to be more attentive to the morpheme ‘-teiru (-ing)’ which suggests that the word is a verb, instead of exclusively relying on the argument structure.

2.2.3. Results from Mandarin Chinese preschoolers. As shown in Figure 3, Chinese children, both the 3- and the 5-year-olds, selected AS events significantly below chance in all the three conditions. An age (2) x condition (3) ANOVA conducted on the proportions of AS responses revealed that neither the main effects nor the interaction was significant. The results indicate that Chinese 3-year-olds, like Japanese- and English-speaking counterparts, were able to fast-map a novel noun. However, in the two verb conditions, both 3-

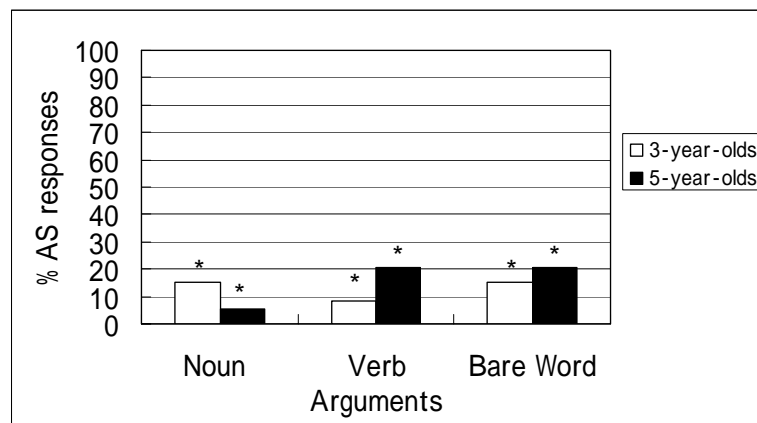


Figure 3. Mean proportions of AS responses by Mandarin-Chinese-speaking children in the main study

and 5-year-olds failed to fast-map a novel verb to the action. Rather, they selected OS events significantly above chance.

The results suggest that Chinese preschoolers, both 3- and 5-year-olds, have a strong tendency to fast-map a novel word to a novel object, whether the word was presented as a noun, a verb, or a bare word whose grammatical form class was not clear. Since these results from Chinese preschoolers were totally surprising, we conducted a series of follow-up studies with Mandarin Chinese speakers. First, we replicated the *verb with arguments* condition with older children and adults to see whether they could extend novel verbs to the same action performed with a different object. In Follow-up Study 2, two additional versions of the *verb with arguments* condition were conducted with Chinese preschoolers in order to see whether their performance in generalizing novel verbs would be improved when provided with additional linguistic cues.

3. Follow-up Study 1: Replication of the *Verb with Arguments* condition with Chinese 6- and 8-year-olds and adults

3.1. Method.

3.1.1. Participants. Twenty adults (mean =23), 15 6-year-olds (mean=6;9) and 15 8-year-olds (mean age=8;7) participated in this study. All the participants were monolingual Mandarin Chinese speakers and lived in Beijing.

3.1.2. Stimuli and Procedure. The stimuli and the procedure were exactly the same as those for the *verb with arguments* condition in the main study.

3.2. Results

The adults extended novel verbs to AS events 100% of the time, indicating that a novel word introduced in the *verb with arguments* condition was clearly a verb from the adults' point of view. The 8-year-olds could also map a novel verb to the action, selecting AS events 72.2% of the time, $t(14)= 2.17, p<.05$. However, the performance of the 6-year-olds did not differ from chance, 52.2%, $t(14)=.19, p>.1$.

4. Follow-up Study 2: Providing additional linguistic cues to Chinese preschoolers

4.1. Method

4.1.1. Participants. Twenty seven 3-year-old and 27 5-year-old monolingual Mandarin-Chinese-speaking children who had not been tested in the main study participated. They were randomly assigned either to the *monosyllabic word* condition or to the *monosyllabic word + 3 sentence frames* condition (see below).

4.1.2. Linguistic cues. Additional linguistic cues were provided in two stages.

First, the number of syllables in the word was changed. In the original study for Chinese children, we prepared novel words with two syllables both for novel nouns and for novel verbs. This was because two syllable words were most common for both nouns and verbs. However, verbs referring to simple actions such as “jump” and “kick” tend to be monosyllabic words. Thus, we constructed monosyllabic nonsense words and replicated the *verb with arguments* condition with 3- and 5-year-olds (the *monosyllabic word* condition). In addition to this manipulation, in the *monosyllabic word + 3 sentence frames* condition, we provided additional linguistic cue to further stress that the novel word was not a noun but a verb. In the instruction for the *verb with arguments* condition in the main study, the novel word X could be unambiguously identified as a verb by the structure of the sentence, in particular, by the word order and the presence of the aspect marker “*zai(4)*”. However, “*zai(4)*” is also used as a verb, meaning roughly “exist” or “be present at a place.” In this case, the word that comes after “*zai(4)*” is usually a noun. Young children might have been confused because of this homonymous use of “*zai(4)*” and mistakenly assumed that the given word was a noun. In order to show even more clearly that the newly introduced word was a verb, we presented novel verbs in three sentence frames, using three different auxiliaries, namely, “*zai(4)*,” “*zheng(4)* *zai(4)*,” and “*yi(4)* *zhi(2)* *zai(4)*,” all of which marked the progressive aspect.

4.1.3. Stimuli and Procedure. The stimuli and the procedure were exactly the same as those in the main study, except that additional linguistic cues were provided to emphasize that the novel word was a verb, as described above.

4.2. Results and Discussion.

The mean proportions of AS responses are shown in Figure 4. Both the 3- and the 5-year-olds in both the *monosyllabic word* and the *monosyllabic word + 3 sentence frames* conditions selected AS events at chance. Although the children in both the *monosyllabic word* and the *monosyllabic word + 3 sentence*

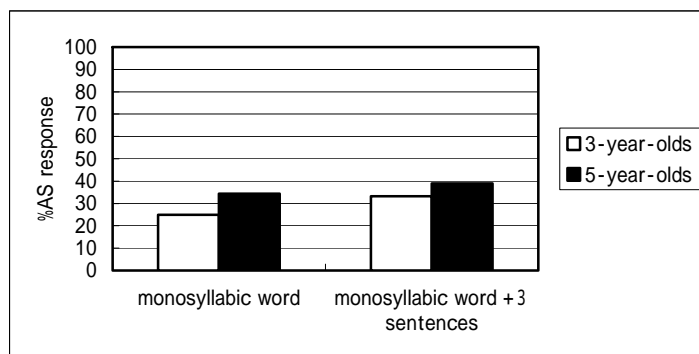


Figure 4. Mean proportions of AS responses in Follow-up Study 2.

frames conditions performed slightly better than their counterparts in the *verb with arguments* condition in the main study, the difference was not statistically reliable. In sum, Chinese preschoolers, not only 3-year-olds but also 5-year-olds, failed to fast-map a novel verb to the action even when linguistic cues were provided to the maximum. These results are striking given that Chinese has been considered as one of the most ‘verb-friendly’ languages. We will discuss this in the general discussion.

5. General discussion

Both the 3- and the 5-year-olds in all the three languages could fast-map a novel noun to a novel object. By contrast, children had much difficulty in generalizing novel verbs. All the 3-year-olds from the three language groups were reluctant to extend the novel verb to the scene in which the same action as the standard event was performed but with a different object. Japanese- and English-speaking 5-year-olds could generalize a novel verb to the Action-Same event, although Chinese 5-year-olds selected the Object-Same event in the verb extension task. Thus, the results from this research strongly supported the universal noun advantage view.

At the same time, we also found that linguistic properties did influence how children learn verbs, although not in the expected way. Children learning Chinese, which had been thought to be the most ‘verb-friendly,’ had the most difficulty in fast-mapping novel verbs. In addition, while both Japanese and English 5-year-olds successfully fast-mapped novel verbs, the condition under which English-speaking children showed the best performance was different from that for Japanese-speaking children. English-speaking children attended to the cues from the argument structure, while Japanese-speaking children utilized the verb morphology. In other words, both Japanese- and English-speaking children rely on some linguistic cues that are useful and available in their own language, in order to identify a given novel word as a verb and to determine what element of the scene should be incorporated into the meaning. From this point of view, Chinese lacks important linguistic cues children can utilize in learning verbs.

The present research has shown that children cannot fast-map a novel verb to its meaning properly until five years of age. These findings seem to contradict the fact that children younger than five years of age know and use many verbs. However, producing a word in an appropriate situation does not guarantee that the child knows the full, adult-like meaning of the word, as we discussed earlier. If the child can associate a novel verb with the situation in which the verb is introduced, and if she limits the use of the word only to the situations that are very similar to the original situation, she can use the word correctly. In fact, while Casasola and Cohen (2000) found that 18-month-olds could form the linkage between a word and an action on the one hand, other studies, on the other hand, have shown that it is difficult not only for 18-month-olds but also for 3-year-olds to generalize a newly learned verb on the

basis of the same action, ignoring the sameness of the actor or the object (Imai et al., in press a; Kersten & Smith, 2002; Maguire et al., 2002). Children seem to start out with a very conservative verb meaning representation in which the “core” meaning is not yet separated from other non-core elements (such as the object involved) of the event. The process of extracting the adult-like meaning seems to take place only gradually and progressively, requiring many instances of the verb with different objects in different contexts.

5.1. Reconsidering factors affecting the ease of verb learning

Our results from Chinese children are really surprising as Chinese has been considered to be one of the most ‘verb-friendly’ languages. These results led us to reconsider what properties of languages really help children learn verbs. In order for children to fast-map a novel word to its meaning, they need to identify the form class the word belongs to and find the appropriate referent based on their knowledge about the correspondence between each form class and the kind of concepts it encodes. If the novel word is a noun, it should be associated with an object and be extended to the same kind of objects. When the novel word is a verb, an action or a relation between objects should be attended to as a meaning of the word. Now that the results from the *bare word* condition suggest that children have a default bias to map a novel word to a novel object, what is important in verb learning is that this noun bias should be suspended in face of a novel verb. For this decision, children need some cues that tell them that the novel word is a verb. For such cues, English-speaking children utilize the argument structure of the sentence and Japanese children attend to the morphological inflection of the novel word. Since Chinese is an argument-dropping language, however, the arguments are often omitted from the sentence. In addition, verbs are not inflected, and therefore cannot be morphologically distinguished from nouns. The combination of these properties means that the linguistic cues children should utilize in determining whether they should map the novel word to the action or to the object are not always available. As a result, Chinese children might take more time to extract the linguistic cues they should rely on in learning verbs. Thus, the lack of verb morphology, especially when it is combined with the argument-dropping property of the language, seems to make verb learning even more difficult.

However, at the same time, we believe that there must be conditions under which Chinese preschoolers, especially 5-year-olds, can extend novel verbs to the action performed with a different object. We suspected that the difficulty in identifying a word’s grammatical form class solely from structural cues such as morphological marking or word order leads Chinese children to rely heavily on extra-linguistic cues. We are currently investigating this possibility (see Imai et al., in press b, for some preliminary report on this).

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